



Integration of biodiversity in Brazil

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1. Introduction

Brazil reported¹ on a comprehensive integration measures, such as pharmaceutical and cosmetic products; biotechnology; agriculture including integrated production in agriculture certification, family production, organic agricultural production, on-farm conservation, moratorium on soybean from Amazon Deforestation – ABIOVE and ANEC; fisheries and aquaculture; forestry, including deforestation, forest fire, non-timber forest products, sustainable forest management; biofuels; extractive activities; mining; livestock; health; industry; construction sector; science and technology; commerce; education; bank and administrative services; tourism; general initiatives for the economic sectors; ecological and economic zoning and priority areas; pollution, including water quality, agricultural pollution, mining pollution and degradation, air pollution; achievements .

2. Overview of current status

The environment and biodiversity issues have been gradually gaining a central position in the national and international arenas with the growing global debate on the sustainability of development processes. Since the 1992 Rio Conference, the discussion on the impacts of human activities on the environment and the consequent loss of biodiversity has gained global importance, establishing a new basis for negotiation and collaboration among countries, and mobilizing society. Since then, themes such as climate change, biodiversity protection and sustainable development have become permanent items in the global and Brazilian environmental agenda. The sustainability challenge for development involves multiple governmental and private sectors as well as various social segments, each with a specific framework of public policies.

In Brazil, most discussions on strategic environmental issues occur during the processes for environmental licensing, and evidence the need for a broader adoption and application of strategic and integrated environmental assessments, with an ecosystem approach. Requirements from international and multilateral funding agencies, such as IBRD and IDB, also increase the demand for the use of these tools, particularly when financing infrastructure and economic development programs. Thus, the debate on strategic environmental assessment is primarily centered in sectoral programs (such as tourism, energy and transports) and in development planning, as in the federal Multi-Year Plan.

These discussions, as well as the various governmental and private sector initiatives (see private sector digest), contribute to gradually incorporate biodiversity considerations into plans, programs and actions of various economic sectors, although this integration is not yet formalized in the vast majority of sectoral policies and require considerable debate and efforts to consistently reflect in more sustainable policies and practices. There is currently no practical instrument to measure the degree of biodiversity

¹ Brazil (2010). Fourth National Report to the Convention on Biological Diversity, Office of the National Program for Biodiversity Conservation, Secretariat of Biodiversity and Forests, Ministry of the Environment, COP-10 Special Edition, October 2010, 286 pp.

integration into the various sectors, although it is worth mentioning that the federal 2008-2011 Multi-Year Plan includes 26 programs that contribute to the achievement of CBD goals and numerous other programs implemented by various ministries that contain actions which contribute to reducing developmental impact on biodiversity. The previous Multi-Year Plan (2004-2007) included 61 programs interfacing with biodiversity themes.

One of the most important aspects of the current line of action adopted by the Ministry of the Environment (MMA) is the diversification of actions to consolidate sustainable development in Brazil. Since 2008, MMA has been implementing a strategy to increase its interlocution and intervention capacity within the governmental sectors and with the private sector, building a complex network of relations to allow an unprecedented frontal role of MMA in the national political, cultural and socio-economic arenas. This strategy contributes to the CBD recommendations regarding the mainstreaming of biodiversity considerations across sectors and is in line with the growing global perception of the transversal aspect of environmental issues. In particular, MMA's strategy to promote the dialogue and collaboration with the various economic sectors deserve special notice, seeking to ensure, as much as possible, the environmental sustainability of the current national process of economic growth. The lines of action adopted by the Ministry involve the primary, secondary and tertiary sectors of Brazilian economy through multi-sectoral pacts and punctual economic interventions, which promoted an extremely dynamic interface for the consolidation of sustainable development principles.

The mainstreaming of biodiversity issues across sectors remains one of the greatest challenges. The National Biodiversity Commission (CONABIO) is part of the effort to facilitate the dialogue with other sectors and increase awareness on the importance of biodiversity conservation, but the penetration of biodiversity issues discussed by the Commission into sectors through their representatives is much less effective than originally expected.

The PROBIO II project (National Biodiversity Mainstreaming and Institutional Consolidation Project), currently under implementation, is one of the main instruments to put in practice the integration of biodiversity issues in other sectors. The project involves 10 governmental agencies of the environmental, health, agriculture, and science and technology sectors, each with biodiversity-related objectives funded through the project.

Individual and often isolated initiatives of the private sector are increasing, but there is still a long process ahead to root environmental and biological issues into other sectors. The financial sector, for example, has already adopted some environmental criteria for specific lines of credit, but the challenge remains to provide adequate training to professionals on the front line of credit concession, providing them with the information and instruments necessary for providing guidance to clients and for decision making.

3. Pharmaceutical and cosmetic products

The vast plant biodiversity in the Brazilian territory has also been used for the development of pharmaceutical and cosmetic products since colonial times, and millennia before that by indigenous

peoples. These uses, however, remained at a smaller scale until the mid-20th century, when larger-scale companies took greater notice of the potential value of this biological heritage and large-scale Brazilian biodiversity-based companies arose in these sectors. The Natura cosmetic company is the largest biodiversity-based company in the sector (18.9% of the cosmetic sector), with the 2008 net revenue reaching approximately US\$ 2.1 billions and strong environmental commitment and sustainability principles and targets (<http://scf.natura.net/Conteudo/Default.aspx?MenuStructure=5&Menuitem=12>). Another example is Ybios (www.ybios.com.br), a Brazilian company resulting from a joint venture among Natura Inovação e Tecnologia, Centroflora, and Orsa Florestal, and focused on the development of new biodiversity-based technologies, product prototypes, and innovative concepts, with actions directed at the cosmetic, human and animal health, and food sectors. In the Amazon state and Region, the plant extracts production sectors have leveraged the expansion of the cosmetics and phytotherapics production chain, currently leading the 4th place in the exports table of the Manaus Industrial District, with revenue over US\$ 106 millions¹²⁰.

4. Biotechnology

Technological development for the biodiversity-based industry has seen increasing efforts being applied in the past several years to support biodiversity-based development and biotechnology ventures with technological innovations. The Amazon Region production chains, for example, receive significant technical support from the National Amazon Region Research Institute (INPA), CBA, EMBRAPA, Emílio Goeldi Museum (MPEG), and Federal University of Pará (UFPA). The Brazilian biotechnology market, encompassing the various economic sectors and all categories of biodiversity-based industrial products, corresponds to approximately 2.8% of the national GDP and counts with the participation of approximately 120 biotechnology-based companies.

5. Agriculture

In 2004 Brazil had 27.75% (approximately 2,356,065 km²) of its territory altered by human use (agricultural and urban areas, deforestation, other). The most recent national agricultural census (2006) indicated a total of 2,549,779 km² of the national territory occupied by agricultural activities, including natural and planted pastures (Table 1). This leads to a coarse estimate of approximately 70% (5,942,065 km²) of the total territory still maintaining original vegetation ranging from intact to varying degrees of conservation or recuperation.

Table 1: Area (thousands km²) occupied by agricultural activities over time in Brazil.

Year	Total area w/agricultural activities	Planted and natural pasture	Crops	Other
1940	1,486	881	188	417
1950	1,762	1,076	191	495
1960	1,919	1,223	287	409
1970	2,363	1,541	340	481
1975	2,532	1,657	400	475
1980	2,767	1,745	491	531
1985	2,859	1,792	521	546
1996	2,593	1,777	418	398

2006	2,550	1,723	767	59
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Source: http://www.ibge.gov.br/series_estatisticas

Over the last three decades, Brazil experienced an explosive growth in agricultural production unmatched by any other country. It is one of the world leaders in the production and export of coffee, sugar, orange juice, soybean, beef and chicken, among other agricultural products. This growth enhanced the importance of agricultural production to the country's economy, with agribusiness representing approximately 5.7% of the country's GDP in 2008. Sustainable agricultural development is a recent concept in Brazil.

Although agricultural technology has improved significantly, allowing increased production without necessarily increasing the production area, land conversion to pasture and crop lands remains an important factor of habitat modification, fragmentation, and loss.

Plant foods based on Brazilian biodiversity (fruits, greens, legumes, grains, roots, nuts) are still underexploited by the agricultural sector. With a few exceptions, most products have mainly regional markets or are produced for export, and companies such as EMBRAPA recently began to test and explore possible products based on Brazilian biodiversity.

For a long time in Brazil the vision that the productive agriculture responsible for income and food production was solely located in large mechanized properties and export monocultures directed the largest portion of public investments to agribusiness. However, the government recently began to recognize and value family agriculture as a fundamental economic force for Brazil's food security and for the country's development. According to data from the IBGE 2009 Agricultural Census, family agriculture produces 70% of all food consumed daily by Brazilians using only 24% of the agricultural land in the country, which makes it 89% more productive than the employer system and responsible for 10% of the entire Brazilian Gross National Product (GNP).

The realization of the importance of the agricultural production in small properties is increasing the attention given to alternative production methods, which are generally more diversified than the conventional agriculture developed in large properties, and which frequently apply traditional practices with lower environmental impacts.

Integrated Production in Agriculture certification

Brazil is implementing a national strategy for promoting Integrated Production in Agriculture, with the objectives of promoting sustainable development and improving the competitiveness of Brazilian agribusiness. This initiative (SAPI – Sistema Agropecuário de Produção Integrada) intends to produce safe foods with reduced use of agricultural chemicals and improved access to production technologies, seeking the environmental, social and economic sustainability and traceability of production.

This strategy supports the global and national conservation targets for 2010 by reducing agricultural pollution, decreasing impacts on pollinators, and increasing productivity, which may lead to a decrease in the need for new agricultural lands. In support of this strategy, there is currently a trend among

consumers to favor healthy foods with no chemical residues. Furthermore, Brazil's main European markets require products with lower levels of agricultural chemicals and originating from production processes that are environmentally friendly and apply proven socio-environmental management, among other requirements.

Thus, SAPI is a voluntary certification system for production based on sustainability principles and on the use of natural regulation methods to substitute polluting agents, applying adequate monitoring tools to the entire process to ensure economical viability, environmental adequacy and social fairness. This system certifies complying producers through the Ministry of Agriculture. SAPI started in 2001 with the Integrated Fruit Production (PIF) to comply with European markets' requirements. However, adhesion to this program is still incipient as compared to the entire agriculture sector: by 2007, 2,333 certified producers verified improved product quality and increased income, corresponding to a production of 1,686,260 tons in 63,919 hectares.

The Ministry of Agriculture Livestock and Supply (MAPA) provides training to producers on Integrated Agricultural Production practices to promote their dissemination. In 2007/2008, 493 capacity building courses reaching 30,000 rural extension agents were provided on agricultural technologies and good practices, including environmental preservation; 17 courses on Integrated Agricultural Production were carried out, training 929 technicians; 60 presentations were made in relevant technical meetings, academic courses and field days, reaching 4,200 participants; and several dissemination and technical documents were published, among other dissemination and training activities. By 2008, there were 56 Integrated Agricultural Production on-going projects distributed through 18 states and involving 32 production chains. Results indicate that these practices tend to increase production and decrease costs, as shown in the examples below (Table 1). There are 102 Integrated Production projects planned for 2008/2009, involving 41 animal and plant products.

Table 1: Comparative productivity and costs between conventional production and integrated production.

Product	Conventional production	Integrated production	Cost reduction (%)
Potato (tons/ha)	17.0 to 20.0	34.0 to 40.0	19.0 to 25.0%
Coffee (sacs/ha)	18.0 to 20.0	36.0 to 40.0	25.0 to 35.0%
Apple (tons/ha)	24.0 to 27.0	32.0 to 36.0	14.0 to 16.0%
Pineapple (fruits/ha)	28,000	28,000	~18.0%

Source: Nasser, L.C.B. (Ministry of Agriculture) 2008. Implementation, progress and challenges of the integrated production of fruits – PIF in Brazil: presentation to the Regional South American Workshop on Capacity Building for National Strategy and their Implementation Across Sectors. Rio Branco/Acre, Brazil.

The adoption of SAPI can also result in a significant reduction of the use of chemicals in agricultural practices. In 2007, soil fertilization in current production systems applying SAPI principles required 25% less ammonium sulfate; 25% less simple super-phosphate; 31% less urea; and 43% less potassium chlorate. The application of agricultural chemicals for pest control also showed a significant reduction (Table 2).

Table 2: Percent reduction of chemical applications in SAPI cultures (2007).

Product	Insecticide	Fungicide	Herbicide	Acaricide
Apple	70.0%	15.0%	67.0%	67.0%
Grapes	89.0%	42.0%	100.0%	100.0%
Papaya	50.0%	50.0%	78.0%	35.7%
Peach (PR state)	75.0%	55.6%	60.0%	100.0%
Peach (RS state)	34.0%	28.0%	50.0%	87.5%
Pineapple	37.0%	20.0%	50.0%	-
Banana	-	40.0%	100.0%	-
Cashew	25.0%	30.0%	-	-
Citrus	-	-	33.0%	40.0%
Mango	70.0%	31.0%	95.0%	72.0%
Mellon	40.0%	40.0%	100.0%	20.0%
Strawberry	60.0%	80.0%	-	-
Rice	100.0%	100.0%	-	-
Peanuts	25.0%	-	-	-
Potato	50.0%	50.0%	100.0%	-
Coffee	50.0%	33.0%	66.0%	-

In 2009, MAPA created the Brazilian Association of Integrated Production, and approved and institutionalized the Integrated Production Seal, which is an important instrument for communication with consumers. To-date, 16 Specific Technical Guidelines for Integrated Fruit Production have already allowed the certification of 19 fruit species, and 35 production chains are being addressed by this program in 21 states: pineapple; peanuts; rice; banana; potato; coffee; citrus fruits; beans; tropical flowers; Tahiti acid lime; apple; papaya; cassava; mango; mangaba; melon; strawberry; peach; post-harvest; roots; roses; soybeans; tomato for direct consumption; tomato for the industry; wheat; table grapes; wine grapes; tropical fruits agro-forestry; leafy greens; guaraná; anonaceas; sugar cane; corn; cotton; tobacco; and the Integrated Agricultural Production Systems in Micro-watersheds project (PISA).

Progress foreseen for 2010 includes the publication of a Normative Ruling as a legal framework for Integrated Agricultural Production; publication of Technical Guidelines for additional products (tobacco, peanuts, potato, coffee, table tomato, flowers, rice, wine grapes, wheat, soybeans, and dairy cattle); implementation of 25 Integrated Production projects; and establishment of a monitoring database, in addition to several dissemination and training activities (these latter to reach at least 2,400 participants).

Family Production

Family agriculture has a very representative participation in Brazilian agriculture, corresponding to 84.4% of the rural properties in the country (4.3 million parcels), according to the IBGE 2006 census, published in 2009. These properties cover 80.3 million hectares (24% of the area occupied by agriculture and livestock) and employ 12.3 million people (74.4% of rural production workers). Family production generates 38% of the gross agriculture value (approximately US\$31.8 billion). A significant share (70%) of produce consumed by the Brazilian population is produced by family agriculture: 87% of cassava; 70% of beans; 46% of corn; 38% of coffee; 34% of rice; 21% of wheat; and 16% of soybeans.

Family agriculture generates almost two times the income per hectare generated by the employer system and occupies slightly less than a quarter of the agricultural land in the country. The realization of the importance of this type of production led to the recent development of specific public policies and is increasing the governmental investments directed to family agriculture, the availability of credit lines and crop insurances, in addition to the provision of technical assistance to producers. This favorable environment and the capacity of family agriculture to respond rapidly to incentives led to a productivity increase: in the 2008/2009 harvest, family agriculture increased by 7.8 million tons the production of milk, cassava, corn, beans, coffee, rice, and wheat. Family agriculture comprises the most significant portion of rural Brazil and occupies a large diversity of physical environments, natural resources and ecosystems. It is present throughout the country and represents a wide variety of human cultures, types of social organization and technological standards, demonstrating the diversity of the rural area of the country. The investments made by the Ministry of Agrarian Development in family agriculture also seek the improvement of the life quality of these families, and the maintenance and production of cultural heritage and environmental services.

Organic Agricultural Production

The growing increase of the demand for resources free from agricultural chemicals is stimulating organic agriculture in Brazil. As a sustainable management system that foregoes the use of synthetic agricultural chemicals, this agricultural system values environmental preservation, biodiversity, the biological cycles, and the human life quality. The Brazilian organic agriculture is growing at a 20% annual rate and already has large participation in the internal market, with the intention to increase its presence in the international market in the near future. The growing demand for organic products is strongly connected to higher standards required by national and international consumers regarding the quality of food and the agricultural impacts on the environment. However, it should be noted that agricultural properties that produce organic products still represent a very small portion of the national agriculture (only 1.8% of the total in 2006, corresponding to 90,500 organic producers).

According to the 2006 Agricultural Census, in the distribution of organic producers by group of economic activity, livestock raising (41.7%) and temporary crops (33.5%) predominate over the other activities. Properties with permanent cultures, and with the production of greens, vegetables and flowers respectively represent 10.4% and 9.9% of total producers, followed by 3.8% of forest organic production (planting and extraction).

Although recent policies connected to rural credit have been developed with the intention to promote organic agriculture through the Program to Promote Sustainable Agricultural Production (PRODUSA), only a portion of the producers are certified. There are currently approximately 20 certifying agencies for organic products in the country but, given the high cost of certification, a portion of the producers is applying an alternative self-certification system through producer associations, where each producer supervises and is supervised by the other members of the association.

On-farm conservation

Several initiatives are being carried out by the Ministry of Agrarian Development, Ministry of Agriculture, EMBRAPA, and the Ministry of the Environment, to support the development of such actions. A significant number of traditional communities and family farmers already conserve numerous species significant for agrobiodiversity, also stimulated by national policies and the federal programs (National Policy for the Sustainable Development of Traditional Peoples and Communities; National Regional Development Policy (PNDR); Territories of Citizenship Program; National Program for Strengthening Family Agriculture (PRONAF); Program for the Acquisition of Food Produced by Family Agriculture (PAA); Policy on Minimum Price Warranty; Program to Support the Commercialization of Products from Extractive Activities (PAE); Permanent Working Group for Local Production Schemes; Demonstration Projects of Sustainable Production (PDA/PPG7); Agrobiodiversity Program; Program to Support Ecotourism and Environmental Sustainability of Tourism (ProEcotur); National Policy for Environmental Management in Indigenous Lands (PNGATI); Law 11.947/2009, on the use of resources from the National Fund for Student Development (FNDE) for the acquisition of school lunch) to acquire produce from these producers for public schools and hospitals and to ensure minimum prices for these products (over R\$ 45 million – approximately US\$ 26.5 million were already invested in these two programs, benefitting 30,000 families of traditional peoples and communities); and to promote cultivation of traditional varieties (CIMAS). Additionally, various initiatives involving NGOs and social movements or organizations (Small Farmers Movement; CONTAG; Ecovida Network; Cerrado Network, etc.) contribute to onfarm conservation.

The government supported 1,300 projects of extractive communities for the use and conservation of sociobiodiversity products, benefitting close to 80,000 families and investing R\$ 55 million (approximately US\$ 32.4 million). There is also an on-going governmental initiative that provides direct support to indigenous peoples through project portfolios, and has already supported 448 projects managed by indigenous organizations, providing direct benefits to approximately 20,000 families and investing the total amount of R\$ 65 million (approximately US\$ 38.2 million). However, additional inventories and data collection are needed, as well as further analysis to better define status of target achievement.

Moratorium on Soybean from Amazon Deforestation – ABIOVE and ANEC:

In 2008 the MMA, the Brazilian Association of Plant Oils (ABIOVE), the National Association of Cereal Exporters (ANEC), and associated companies renewed for an extra year the Term of Commitment signed in 2006 for the non-commercialization of soybeans originating from deforested areas of the Amazon Biome (see private sector digest). The renewed agreement includes commitments on the MMA side, such as the development of the Ecological-Economic Zoning of priority areas for soybean production, as counterpart to the private sector commitments.

6. Fisheries and aquaculture

Up to early 2010, only 1.57% of the marine zone (including the Exclusive Economic Zone) was under official protection, with $\frac{3}{4}$ of the protected areas located on the coastal zone and the area inside full

protection protected areas corresponding to only 0.12% of the marine zone. However, given the large extension of the Brazilian coast, this percentage (1.57%) corresponds to 54,389 km². Additionally, Brazil has adopted since 1984 the practice of “defeso”, meaning temporary suspension of fishing activities for specific targeted species during their reproductive period and recruitment and growth periods.

This practice was established by law in 1967, but specific legislation for each benefitted species has been developed since 1984. A total of 19 species benefit from the defeso (8 crustaceans and 11 fish species). For freshwater species, Brazil determined the temporary suspension of fishing activities during reproductive migrations in the 10 main watersheds in the country. The National Protected Areas Plan (PNAP) foresees the definition of no-take zones inside or outside protected areas as one of the components of a representative system of protected areas. This fisheries management instrument is generally applied by the 18 federal marine Extractive Reserves (RESEX) in strategic portions of their areas, as well as by the marine Environmental Protection Areas. There is also a growing trend to create marine protected areas at the state level, which may contain permanent or temporary no-take zones, or zones where specific fishing activities are disallowed.

The fisheries sector only recently has begun to develop and implement mechanisms to recover and maintain the much damaged sustainability of resources exploited by sector activities.

The government monitors fisheries activities along the Brazilian coast through the specialized centers of the Chico Mendes Institute for Biodiversity Conservation – ICMBio and published, in 2006, the results of an extensive assessment of the sustainability potential of marine living resources in the Brazilian Exclusive Economic Zone – the REVIZEE Program. The REVIZEE Report informs that a large portion of the Brazilian Economic Zone is characterized by the low concentration of nutrients in its waters and by low productivity. Thus, despite its great extension, the EEZ does not offer the necessary conditions for the existence of significant fisheries resources of high biomass. Some fish stocks were identified as potential resources although different limiting factors must be considered.

At the end of the 1960's the Brazilian government started to strongly promote fisheries activities, offering new credit lines and tax incentives for the development of the national fisheries industries, mainly directed to the external market. This development led to the rapid increase of fisheries production: the marine fisheries production jumped from 294,000 tons to 760,000 tons from 1965 to 1985. Starting in 1985, despite increased efforts of fisheries activities, the marine production began to fall, reaching 435,000 tons in 1990 and, since then, oscillating between the minimum of 419,000 tons in 1995 and the maximum of 540,000 tons in 2007. This scenario indicates a process of rapid exhaustion of the marine fish stocks that are traditionally exploited, and freshwater fish stocks face a similar situation. For example, the REVIZEE Program identified, at the end of the 1990's, the blackfin goosefish (*Lophius gastrophysus*) as a potential resource for the Brazilian fisheries industries. The identification of a market for this product (mainly Spain) triggered a process of intense exploitation of this resource with leased foreign vessels, with no concern regarding its actual sustainable potential. Three years were enough to reach overexploitation of this resource. Fisheries activities directed at the deep water crab, reopened in 1999 by leased foreign vessels, also led this resource to over-fished status in five years.

The marine environment remains the primary source of fisheries production (49% in 2003), followed by freshwater fisheries, freshwater aquaculture, and marine aquaculture. Seeking the sustainable use of fisheries resources, composed of approximately 157 marine species (134 fish species, 13 crustacean species and 10 mollusk species) the Ministry of the Environment published the national list of threatened and overexploited marine fish and aquatic invertebrate species. The official list includes both marine and fresh water species, and lists 78 aquatic invertebrate species and 154 fish species as threatened with extinction, as well as 11 aquatic invertebrate species and 39 fish species that are overexploited or threatened with overexploitation, as defined by MMA Normative Instruction 05, of 21 May 2004 (http://www.ibama.gov.br/rec_pesqueiros/legislacao.php?id_arq=98), which determines the notake of the threatened species and establishes the need to develop and implement restoration and management plans.

To minimize the impacts from fisheries activities, the Ministry of the Environment develops joint actions with the Ministry of Fisheries and Aquaculture (MPA) directed at environmental sustainability through the monitoring and regularization of fisheries and aquaculture activities, as well as through the establishment of criteria and standards for the implementation of fisheries and aquaculture projects.

Aquaculture

Aquaculture and mariculture can contribute significantly not only to fisheries production, but also to social and economic development and food security. Nevertheless, the sustainability of these activities depend on careful planning based on solid environmental, social and economic criteria for the establishment of these activities to prevent and/or reduce social and environmental impacts. In Brazil, aquaculture production increased 329.7% from 1997 (87,674 tons) to 2007 (289,050 tons).

The Ministry of Fisheries and Aquaculture (MPA – Ministério da Pesca e Aquicultura) prepared a Plan for Aquaculture Development (2008-2011) defining actions and principles for the sustainable development of aquaculture, to be implemented in aquaculture areas and parks: aquaculture areas are individual sites in public areas or waters granted to the use of individuals or legal entities; while aquaculture parks are groups of several aquaculture areas within an organized economic or production context. The Plan foresees support to production activities in salt water and freshwater of the production chains for mollusks, freshwater species and native species, including the establishment of demonstrative units, and support to the commercialization infrastructure.

The Plan's principles for sustainable aquaculture are: (i) support to the control of diseases in aquatic animals; (ii) quality and safety control of aquaculture products; and (iii) territorial planning and regularization for aquaculture (including plans for the development of local shrimp production; territorial planning for freshwater aquaculture; promotion of family aquaculture in rural areas; mariculture; and development of coastal communities). Nevertheless, it is worth noting that aquaculture actions may cause relevant impacts if environmental laws and directives are not followed.

7. Forestry

Brazilian biodiversity has been used for large-scale business ventures since the time of its colonization by Portugal, beginning perhaps with the intensive cut and export of pau-brasil (*Caesalpinia echinata*) for the commercialization of timber and pigment, driving the species to endangered status. The forestry sector (timber, cellulose, rubber) has arguably been the main focus of large-scale biodiversity-based operations for the longest period of time and, until recently, a mostly unsustainable activity from the environmental point of view. Since the time of the first publication of the Forest Code (1934), Brazilian environmental legislation has evolved significantly and, although illegal activities are still significant despite greater monitoring and control efforts, most legal large-scale forestry activities are working to comply with stricter conservation rules. In 2008, the national primary forest production reached R\$12.75 billions (approximately or US\$7.5 billions). Of this total, 69.3% (approximately US\$5.2 billions) originated from silviculture (planted forests) and 30.7% (approximately US\$2.3 billions) from extractive activities (26.0% from timber extraction 4.7% from non-timber products).

Deforestation

Amazon: The Amazon is the largest of Brazilian biomes, corresponding to approximately 50% of the national territory and expanding into several neighboring countries. Brazil reached a 75% decrease in the deforestation rate of the Amazon in 2009 as compared to 2004. It is expected that deforestation rates will continue to decrease significantly in response to the strong investment Brazil is applying to reach the 2010 target of a maximum 11,720 km² deforestation rate. In addition to the National 2010 Deforestation Target, the Brazilian National Climate Change Plan established in 2004 the target of reducing deforestation in the Amazon by 30% every 4 years, as compared to the previous period, until 2017. The ultimate goal is to achieve 0% illegal deforestation in the medium and long term. A study promoted by The Applied Economic Research Institute (IPEA) in 2001 estimated the economic cost of deforestation in the Amazon as US\$108.1 per hectare per year, an amount large enough to finance the sustainable use of a vast portion of the Amazon Region.² This estimate took into account the direct and indirect value, such as provision of extractive resources and environmental services; and the option value and the intrinsic value of the future use of genetic resources and the existence of non-human species, as well as external factors.

Atlantic Forest. Data are available on deforestation occurring in five-year periods and indicate strong human pressure and intervention on native vegetation, resulting in a high level of forest fragmentation and low rates of vegetation regeneration. The overall 76.9% decrease in deforestation rates was estimated in 2008 as compared to 2000, and the Atlantic Forest lost at least 15,880 km² in the last 20 years, which represents an area approximately the size of Belgium.

As annual deforestation rate data is not yet available for the other biomes, only punctual comparisons can be made. These data indicate that from 2002 to 2008 4.17% of the Cerrado, 2.01% of the Caatinga,

² Brazil Ministry of Planning Budget and Administration/IPEA (2001). Estimate of the Economic Cost of Deforestation in the Amazon. Author: Ronaldo Seroa da Motta. 29pp.

and 2.82% of the Pantanal were deforested. Data on the Pampas biome were published in July 2010, indicating that 1.2% of the biome was deforested between 2002 and 2008.

However, UNEP recently published an Atlas of mangroves and revealed that these habitats continue to disappear at a rate four times higher than the terrestrial forests in the entire world. These data point out the relevance of addressing these habitats specifically during the next revision of the national biodiversity targets.

Forest fire

A study promoted by the Applied Economic Research Institute (IPEA) in 2002 estimated the economic cost of fire in the Amazon to be on average US\$102 million per year, or 0.2% of the regional GDP for the period 1996-1999. This estimate may vary according to the value attributed to the carbon liberated into the atmosphere by the burning of forests.³

The total percent reduction of the number of heat sources in 2009 as compared to 2002 was 75.35% in the Amazon; 74.56% in the Atlantic Forest; 72.16% in the Cerrado; 55.56% in the Pampas; 52.34% in the Pantanal; and 46.68% in the Caatinga. This translates into a national reduction average of 70.30%. INPE's long term monitoring program combined with governmental programs to promote alternative production practices that forego the use of fire, and to combat illegal fire use in the Amazon (PROARCO and PREVFOGO), have significantly contributed to this outstanding reduction. It should be noted, however, that this reduction was not linear through time, and that increase or decrease of human pressure as the main source of fire occurrences still vary with external factors such as market pressure/crisis, climate changes (rainfall, temperature variations), etc.

Non-timber forest products

In addition to rubber, many other non-timber forest products for food, arts, furniture and other uses (such as straws, reeds, leaves, fibers, seeds, resins, essential oils) are exploited for economic purposes but production scales varies significantly and species and/or environmental sustainability is not yet ensured for all products. Such products are mostly produced by traditional and rural communities, often comprising an important (if not the only) source of income and life quality improvement. The productive chains currently being developed in the Manaus and Belém (Amazon Region) Industrial District, for example, connect and coordinate extractive activities in forest communities with urban economic sectors, small and medium-size processing industries, local research and technological support institutions, and other sectors addressed by these activities.

Sustainable forest management

Brazil created the Brazilian Forest Service (SFB) in 2006, together with the National Fund for Forestry Development (FNDF), to promote and enforce the management of federal public forests, ensuring the

³ Brazil Ministry of Planning Budget and Administration/IPEA (2002). The Economic Cost of Fire in the Amazon. Authors: R.S. Motta, M.J.C. Mendonça, D. Nepstad, M.C.V. Diaz, A. Alencar, J.C. Gomes, and R.A. Ortiz. 42pp.

efficient and rational use of forests with the protection of ecosystems, soil, water, biodiversity and associated cultural values. The relevant state and municipal environmental agencies are responsible for enforcing adequate forest management in forests under their jurisdiction.

Local communities are granted priority access to public forests and to the benefits resulting from their use and conservation, particularly regarding public forests they traditionally occupy or use. Such forests are protected areas of sustainable use under SNUC in the Extractive Reserve and Sustainable Development Reserve categories. Nevertheless, community use of the forest requires prior use concession according to an approved management plan. The National Community and Family Forest Management Policy, currently in its final approval phase, was developed in response to a request from community leaderships to strengthen community forest management in all biomes. The primary innovation of this policy is the implementation of an annual routine of planning and action involving the various relevant federal, state, and civil society agencies for the effective implementation of credit instruments, technical assistance, capacity building, infrastructure, and commercialization. SFB's goal is to reach four million hectares of forests under community management by 2010.

Forest management by agents other than local communities is granted concession according to public bids, which must comply with the relevant Annual Forest Concession Plan. Public forests eligible for such public bids must be listed in the National Cadastre of Public Forests and are those in exception of integral protection protected areas (or localities where the creation of such areas is being considered), extractive reserves, sustainable development reserves, fauna reserves, areas of relevant ecological interest, and indigenous lands, as well as areas occupied by local communities. Therefore, under SNUC legislation in effect today, only protected areas in the national forest, state forest or municipal forest categories are available for public bids for non-community forest management.

The strong pressure exerted by public opinion, combined with NGO campaigns and increased governmental enforcement requiring timber companies to adopt forest management led to a reduction of illegal timber production and increased request for timber certification, especially from community ventures. Certified forest plantations already represent 25% of the total area of planted forests in the country. The tendency for large businesses in this sector is to expand production through small producers, collaborating with social inclusion and improving their commercial image⁸³. By 2007, over 50,000 km² of Brazilian forests had obtained FSC certification for timber and non-timber products (http://www.fsc.org.br/arquivos/Completo_PV.pdf) from planted and native forests, involving 67 forest management projects and 206 chains of custody.

A case study on the impacts of forest certification concluded that, for planted forests in the south of Brazil, FSC forest certification resulted in positive impacts on all socioenvironmental aspects evaluated: worker's health and safety, professional training, pesticide handling and reduction, natural resources conservation, forest management, and relationship with the community⁴. In extractive communities in

⁴ Does certification make a difference? Impact assessment study on FSC/SAN certification in Brazil/Ana Carolina Barbosa de Lima, André Luiz Novaes Keppe, Fábio Eduardo Maule, Gerd Sparovek, Marcelo Corrêa Alves and

Acre, the same study found that certification contributed to positive impacts, which in this state can be partially granted to public forestry policies. Nevertheless, positive environmental changes were observed among these certified groups, such as better management plans, waste disposal, awareness of the use of fire, measures to protect the fauna from hunting, and the degree of involvement in reports of environmental crimes. Similarly, this study also found positive social and environmental impacts from agricultural certification on the evaluated coffee companies.

The 2009 Annual Forest Concession Plan points out that by June 2008 the National Public Forests Cadastre registered 2,108,705.85 km² of federal public forests and 123,543.07 km² of state forests in Amazonian states, totaling almost 25% of the Brazilian territory (http://www.mma.gov.br/estruturas/sfb/_arquivos/paof_res_exec_05_08_08.pdf). Of all these public forests, 58.7% are available exclusively for community use (These are Sustainable Development Reserves (RDS), Forestry Settlement Projects (PAF), Extractive Settlement Projects (PAE), Extractive Reserves (RESEX), and Indigenous Lands (TI). The latter represent 87.6% of federal public forests for community use); 15.1% are integral protection protected areas; 14.1% are areas for sustainable use; and the remaining 12.1% are federal public forests still lacking management definition. After applying the legal selection criteria, this Annual Forest Concession Plan identifies approximately 429,000 km² of federal public forests legally apt for forest management, of which 120,000 km² are available for forest concession bids.

There are currently 7,780 km² of federal public forests being sustainably managed under transition contracts. Management concessions for these areas translate into the potential offer of 110,713.76 m³ of timber with legal origin. Five other forest management units within two National Forests are currently included in on-going public bids, totaling 96,361 km² in the Amazonian states of Rondônia and Pará. In addition to the federal forests, the state Annual Forest Concession Plans of Amapá and Pará indicate that 23,711.65 km² and 13,104.48 km², respectively, are also available for forest concession in 2009.

The 2009 Annual Forest Concession Plan also presents SFB activities planned for the year, such as delimitation and demarcation of public forests, preparation of Preliminary Environmental Reports, publication of bids, and the development of a monitoring system for public forests, among other. The estimated budget for the 2009 activities is equivalent to US\$ 28 million.

8. Biofuels

The Brazilian government and companies are also strongly investing in biofuels (ethanol and biodiesel) and technology for adapted engines. These fuels and new technology should reduce CO₂ emissions from vehicles, but continuing efforts are necessary to reduce the use of fire in sugar cane plantations for ethanol production to enhance contribution to the reduction of greenhouse gases emissions. Biodiesel production is also based on non-native biodiversity (palm oil, soybeans and colza). An analysis of the

Rodrigo Fernando Maule – Piracicaba, SP: Imaflora, 2009. 96 pages.
(http://www.imaflora.org/arquivos/Does_certification_make_a_difference.pdf).

impact of biofuels production on biodiversity did not differ significantly from impacts caused by the expansion of agriculture directed at food production: possible negative impacts include loss of habitat, increase of alien invasive species and increase in the use of agricultural chemicals; while a positive impact would be the reduction of CO2 emissions, hindering the negative effects of climate change on biodiversity.

9. Extractive activities

Sustainability of the extractive products chain: In partnership with the National Supply Company (CONAB – a public agency connected to the Ministry of Agriculture), MMA developed studies to support the definition, by the National Monetary Council (CMN), of minimum prices for some products from extractive activities. This initiative is part of a policy to support the commercialization of these products and enhance the self-sustainability capacity of traditional communities. Provisional Measure 432, of 27 May 2008, established minimum prices for nine products: Brazil nut, andiroba, copaiba, buriti, rubber, piassava, carnauba, pequi, and assai. MMA supported training workshops in 2009 with communities at Extractive Reserves to disseminate these minimum prices. This initiative involved private sector institutions such as Instituto Ethos and the Brazilian Sustainable Development Council, as well as community representatives, which discussed with MMA the creation of new production chains and the strengthening of existing ones. In June 2009, MMA and the Ministry of Agrarian Development instituted the National Plan for Promoting Production Chains from Socio-biodiversity.

Leaf Collectors and Vegetal:

The Chico Mendes Institute for Biodiversity Conservation (ICMBio), under MMA, mediated a partnership between a leaf collectors' cooperative and Vegetal Extrações do Nordeste Ltda., a company specialized in plant extracts for the chemical-pharmaceutical sector, to ensure the sustainable management of jaborandi and better conditions for the extractive activities. Under the negotiated agreement, the company provides the adequate equipment and infrastructure for the extractive activities and buys the entire production for a given period of time, while leaf collectors follow the sustainability rules established by the management plan.

10. Mining

Mining Pact – Vale do Rio Doce:

The MMA and the Vale do Rio Doce mining company signed Terms of Commitment through which the company agrees to sell ore and services exclusively to clients that prove the legal origin of timber and charcoal used in their production processes. Under the agreement, the MMA committed to support and promote the Ecological-Economic Zoning of several biomes and implement the rural property registry and environmental licensing in partnership with state environmental agencies.

11. Livestock

“Pirate Ox” Operation:

This operation was launched in 2008 by MMA to confiscate livestock raised in rural properties under irregular land tenure situation in states of the Amazon Region. At the end of five months, results of this operation included the farmer's initiative to remove 30,000 cattle that had been illegally released into the Terra do Meio Ecological Station (Pará state), after MMA confiscated 3,300 cattle at Lourilândia Farm.

The confiscated animals were auctioned, and proceeds were directed to programs of the Ministry of Social Development, such as the "zero hunger" program, and to the health care of indigenous communities. In parallel, MMA provided incentives to aquaculture as an alternative income-generating activity for the region, under an agreement with Banco da Amazônia and Banco do Brasil, for the creation of credit lines for this activity.

BNDES and small cattle raisers in the Amazon:

A partnership between MMA and the National Economic and Social Development Bank (BNDES) ensured the availability of a credit line to finance projects for the modernization and legal compliance of small and medium-sized cattle raisers in the Amazon Biome supplying beef to large cold storage plants. This credit line fits the "anchor company" model, by which the largest company in the production chain warrants the debt of the small suppliers: as co-responsible for eventual environmental crimes committed by its suppliers, the cold storage plant has greater interest in ensuring the legal compliance of the production chain; and on the other side, the small producers which previously did not have the necessary means to comply with the legislation now gain access to cheap credit to modernize production and regularize the legal situation of their activities.

Legal Meat Campaign:

The Federal Public Ministry (MPF), together with the Brazilian Institute for Consumer Rights (IDEC) and Repórter Brasil (a communications NGO) initiated in 2010 a campaign to promote consumer awareness regarding the origin of meat sold in the country. The campaign invites consumers to request from supermarkets and other stores information on the origin of meat products, verifying if the production process involved deforestation of the Amazon, slave labor or money laundering (www.carnelegal.mpf.gov.br).

12. Health

Brazilian Olympic Games on Health and Environment (Olimpíada Brasileira de Saúde e Meio Ambiente): The Oswaldo Cruz Foundation (FIOCRUZ), in partnership with the Brazilian Association of Post-Graduate Studies on Collective Health (ABRASCO), created this prize in 2001, directed at students of the last year of middle and high school of private and public schools. The objective is to provide incentives to the development of projects that can contribute to the dissemination of new concepts on the environment and health, and to the improvement of environmental and health conditions. This prize seeks to promote the development of integrated approaches to health and environment and to recognize the

work of schools and teachers developing innovative pedagogical activities, granting prizes to projects and their authors. The prizes to be granted are defined by a National Council.

13. Industry

Timber Pact:

The MMA, the Association of the Timber Export Industries of Pará State (AIMEX), and the Industries Federation of Pará State (FIEPA) signed, on September 18, 2008 the Pact for the Legal and Sustainable Timber. Under this agreement, the federated industries commit not to purchase timber originating from illegally deforested areas and to increase the traceability of their raw materials up to the other end of important production chains, such as furniture. On its turn, the MMA assisted the sector to find solutions for bottlenecks hindering industrial investments in the region through three lines of action: (i) streamlining the environmental regularization of suppliers and community producers; (ii) editing technical rules with the rules and procedures for enforcement actions; and (iii) increasing the targets of the forest concession plan, which presented the initial proposal of bidding 2 million hectares of forest in 2009, only 66,000 of which can be effectively explored.

Industry Pact – FIESP:

MMA and the São Paulo Federation of Industries signed a protocol of intentions whereby the forest-based industries of São Paulo state would only acquire raw products – and especially timber – from legal suppliers, to combat illegal deforestation and extraction in the Amazon Forest and other regions. Through this agreement, the São Paulo industries agreed to acquire certified timber only, with the accompanying Document of Forest Origin (DOF), and to include information on the origin of the raw materials in the fiscal documents for commercialization, thus enlisting the final consumer in the enforcement process. Under this agreement, the MMA committed to work towards increasing the offer of certified products, streamlining the environmental licensing procedures for managed forests.

“Vesuvius Operation”:

Launched in 2008 in the region of Pernambuco state known as “Charcoal Polygon”, this Operation destroyed hundreds of illegal ovens for charcoal production, which supplied the iron industries of Minas Gerais and Espírito Santo states. With support from IBAMA, the military police, the federal police, and the highway patrol, the Operation estimated that, for each full oven, approximately 15 trees were cut from Caatinga vegetation, which is extremely serious considering that over 45% of this biome were already deforested.

Substitution of Refrigerators:

In 2009, the Ministry of the Environment, in collaboration with the Ministry of Mines and Energy and the Ministry of Social Development, prepared a project of high positive impact on the Brazilian environment and economy: the substitution of 10 million refrigerators in 10 years. The project will use funds from energy taxes to subsidize the gradual substitution of CFC-based refrigerators produced before 2001. The

project also foresees the logistics for the adequate disposal of the old refrigerators, which will have support from the German Technical Assistance (GTZ) through the donation of equipment for recycling obsolete refrigerators.

14. Construction sector

Timber Pact – Caixa Econômica Federal:

Until 2007, 97% of the total timber consumed in Brazil was not certified. To change this scenario, MMA and IBAMA established a partnership with the Caixa Econômica Federal (CEF - a federal bank), through which CEF will require proof of legal origin for timber used by construction companies and real estate companies providing services to CEF. This initiative resulted in enormous impact on the production chain, since in 2008 alone CEF invested approximately US\$ 9 billions in the construction of 350,000 homes, for which 78% of the timber used in the catwalks and supporting structures came from the Amazon Region. Through another agreement between CEF and MMA, CEF agreed to offer special financing opportunities to borrowers of the “my house, my life” program that decide to install solar energy panels on their new homes.

CFCA and the Environmental Compensation Fund:

To provide greater transparency to the management of the Environmental Compensation Fund, MMA created the Federal Environmental Compensation Chamber (CFCA) as a dispute resolution panel for the definition of payments owed by entrepreneurs as compensation for environmental impacts of their operations. Composed by representatives of the civil society, ABEMA (Brazilian Association of State Environmental Agencies), ANAMA (National Association of Municipal Environmental Agencies), CNI (National Industries Council), Headmasters Council of Brazilian Universities, and the Brazilian NGO Forum, the CFCA also has the responsibility of establishing guidelines for the investment of the Fund’s resources in the enhancement of protected area management.

Bioconstruction:

A partnership among MMA, the National Institute for Agrarian Reform (INCRA) and the Senate TV offered in 2008 a capacity-building course on bioconstruction directed at 40 families of a rural settlement located in one of the largest islands of the Parnaíba River Delta, in Maranhão state. The project allowed the construction of low-cost low environmental impact homes, using local materials and architectonic techniques adequate for the regional climate, and valued solutions suggested by the community. As a result from this action, MMA published the Bioconstruction Manual, available at the link <http://www.mma.gov.br/proecotur>.

15. Science and Technology

SBPC and the Protected Areas:

On August 5, 2008, the MMA presented to the Brazilian Society for the Progress of Science (SBPC) a proposal for facilitating the conduction of research projects inside federal protected areas. The proposal

was transformed into an Administrative Ruling, and restructured the Biodiversity Authorization and Information System (SISBIO) and granted to ICMBio the power of transferring to scientific institutions the responsibility for approving research projects within protected areas following the execution of Terms of Responsibility.

16. Commerce

“Bag is a Bore” Campaign:

MMA launched this campaign in June 2009 with the objective of raising public awareness and promote the avoidance, whenever possible, of the use of plastic bags in commercial establishments, promoting the use of reusable bags. The campaign was supported by various private companies such as Carrefour, Wal-Mart, CPFL Energia, Tim, Vivo, and Kimberly-Clark, among other businesses. Currently, Brazil consumes approximately 12 billion plastic bags per month (66 bags per person), according to data from the Brazilian Supermarket Association (ABRAS).

Beef Pact – ABRAS:

With MMA support, the Brazilian Supermarket Association (ABRAS) launched in December 2009 the project for the Responsible Production Certification for the Beef Production Chain. The objective of this initiative is to promote the environmental, economic and social sustainability of the sector’s companies, as well as to control the origin of beef consumed by Brazilians. ABRAS will promote the adhesion to this program by all companies of the beef supply chain. The certification process is independent and identifies actions for environmental protection, respect to the consumer, and respect to the social, health and labor issues.

17. Education

Virtual community for the young:

The MMA, the Ministry of Education and the Telefônica company signed in 2008 an agreement for the creation of a virtual community directed at the environmental education of the young public. The community is hosted at the Educarede site: http://www.educarede.org.br/educa/index.cfm?id_comunidade=114 . This is a broad forum for environmental discussions directed at children and youth, and an important vehicle for the dissemination of events such as the 3rd National Youth Conference on the Environment – global climate change, held in April 2009, and the International Youth Conference – Let’s Take Care of the Planet, held in Brasília from June 5-10, 2010.

18. Bank and Administrative Services

Environmental criteria for rural credit concession in the Amazon:

A partnership between MMA and the National Monetary Council (CMN) ensured the inclusion of environmental criteria for the concession of credit to agricultural and livestock activities in the Amazon Region. Adopted since July 2008, this measure is in force for public and private financial institutions,

conditioning the credit concession to the presentation, by producers, of the Rural Real Estate Registry Certificate (CCIR), the environmental license of the rural property, declaration of non-existence of legal impediments to the economic use of illegally deforested areas, and the commitment to comply with recommendations and restrictions established by the Ecological-Economic Zoning.

Bank Pact – FEBRABAN:

In April 2008, MMA and the Brazilian Federation of Banks (FEBRABAN) signed a Protocol of Intentions, through which the private banks adopt socio-environmental principles and directives for the approval of credit to companies. These latter will be required to prove their commitment to respect human and labor rights, preserve biodiversity, value local cultures, and contribute to poverty and inequality reduction. This Protocol of Socio-environmental Intentions is part of the Green Protocol, signed with public and private banks in 1995 and revised in 2008.

19. Tourism

Ecotourism in National Parks:

In 2008, the MMA and the Ministry of Tourism made a joint investment of approximately US\$16.5 millions into the recuperation of the visitation structure of the national parks, to promote an increase in the visitation to these areas, reinforcing ecotourism and contributing to the economic sustainability of these protected areas. During implementation, the program identified the need to broaden this investment, including 25 of the 64 existing national parks, and attracted the interest of national and international investors, leading MMA to define precise rules for investments and donations, strategies to manage visitation, and visitor's behavior rules. In October 2008 the EBX corporate group established a partnership with MMA and ICMBio, donating approximately US\$ 7 millions to the maintenance of three national parks. In September 2009, the Vale do Rio Doce mining company announced the investment of approximately US\$ 1.2 millions in the preservation of the open area of the Rio de Janeiro Botanical Garden.

20. General initiatives for the economic sectors

LIFE Certification:

MMA supported the NGO initiative for the adoption, in Brazil, of the LIFE (Lasting Initiative for Earth) seal as a new certification option for the private sector. This certification recognizes corporate initiatives for biodiversity protection of any organization of the private sector, regardless of size.

In addition to the initiatives listed above, in September 2008 the Ministry of the Environment began implementation of a GEF-funded project (National Biodiversity Mainstreaming and Institutional Consolidation Project - PROBIO II), specifically designed to mainstream biodiversity considerations across sectors. PROBIO II involves five ministries and five connected agencies and research institutions of three different sectors: the Ministry of the Environment; Ministry of Agriculture Livestock and Supply (MAPA); Ministry of Agrarian Development (MDA); Ministry of Health (MS); Ministry of Science and Technology (MCT); Oswaldo Cruz Foundation (FIOCRUZ); Brazilian Institute for the Environment and

Renewable Natural Resources (IBAMA); Rio de Janeiro Botanical Garden (JBRJ); Brazilian Agricultural Research Corporation (EMBRAPA); and the Brazilian Network of Botanical Gardens (RBJB). The project is implemented through three main components: mainstreaming biodiversity in the public sector; mainstreaming biodiversity in the private sector; and generation of biodiversity information for policymaking.

Additionally, at the policy level, the Ministry of the Environment and the Ministry of Culture prepared the inter-ministerial administrative ruling no 8, of February 9, 2010, establishing an inter-ministerial working group to define actions and programs under both Ministries for the implementation of a cultural policy for the valuation and conservation of cultural and biological diversity for sustainable development.

21. Ecological and Economic Zoning and Priority Areas

Ecological-Economic Zoning (EEZ):

Brazil developed in 2001 and revised in 2003 and 2006 the methodological guidelines for the preparation of Brazil's Ecological-Economic Zoning, to be developed by state or region. The methodology was initially applied to regional EEZ efforts such as the Rio Parnaíba Watershed and the Macro-EEZ of the Legal Amazon, and was later applied by individual states, although few states have already concluded this planning tool. The state of Acre (in the Amazon Region), for example, concluded its EEZ in 2007 and is applying it as a guiding tool for state development. Acre is currently detailing its EEZ to the municipal level and including the ethnological zoning of the indigenous lands in the state. The state of Rondônia has also concluded its EEZ, currently under implementation. The other seven states of the Legal Amazon (Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Roraima, and Tocantins) have also prepared or are preparing EEZs at least at the 1:1,000,000 scale. Some are detailing the EEZ to the 1:250,000 scale and are applying it at varying degrees for strategic decisions such as environmental licensing. In most of the other 17 states and the Federal District EEZs are being developed for specific priority portions of the territory, usually for the major watershed or the coastal zone, or a different crucial area. By 2010, approximately 48-50% of the national territory was addressed by ecological-economic zoning, currently ready for implementation. These EEZs were developed at the 1:250,000 scale, but some projects were detailed to the 1:100,000 or 1:50,000 scale. The remaining EEZ projects under development address approximately 13% of the national territory.

According to MMA records, Ecological and Economic Zoning (EEZs) were prepared and are at different implementation phases in approximately 50% of the Brazilian states (Acre, Amazonas, Distrito Federal, Espírito Santo, Goiás, Maranhão, Minas Gerais, Mato Grosso do Sul, Mato Grosso, Paraná, Rio de Janeiro, Rondônia, Roraima), and were at least initiated in all the other states, some as macro-zoning or partial zoning initiatives. Additionally, various regional and watershed EEZs were already prepared or are under preparation, as well as EEZs for coastal sections.

Priority Areas

Brazil established in 2004 and revised in 2007 its Priority Areas for the Conservation and Sustainable Use of Biodiversity, to guide conservation and development actions and policies. These 3,190 areas distributed throughout all biomes include areas that are already protected in officially protected areas (under the National Protected Areas System – SNUC) and Indigenous Lands, as well as areas that were identified as important for biodiversity and where conservation is urgent. These areas were defined and are periodically revised through a participatory process at regional workshops specifically directed to each biome and with the contribution of a large number of experts. The methodology applied to define and assess each area uses the IBGE Map of Brazilian Biomes as the main base and incorporates the principles of systematic planning for biodiversity conservation and its basic criteria (representativeness, environmental persistence and vulnerability). The current list is officially recognized through a legal document (MMA Administrative Ruling n° 9, of 03 January 2007) and the use of the Map of Priority Areas as a management instrument has increased in the past several years, including in sectors other than the environmental sector.

The Priority Areas were classified according to their priority for conservation (high, very high, or extremely high) and their biological or ecological importance (high, very high, extremely high or insufficiently known). The preliminary analysis of the remaining vegetation cover in Priority Areas indicates that, while in some biome those areas with the highest conservation priority (extremely high) are also the best preserved areas, in other biomes these are the areas presenting the lowest percentage of remaining vegetation cover in Priority Areas, which may suggest an increase in the degree of urgency for their conservation or the need to define new conservation strategies for the least preserved Priority Areas. However, the variation of remaining vegetation cover in each of the two classes (priority and importance) is high.

A 2010 study assessed the protection of the natural vegetation according the Brazilian Forest Code and found that the Permanent Preservation Areas (APPs) and the Legal Reserves (RLs) in rural private lands cover, respectively, 12% and 30% of the national territory, which together correspond to over two times the area currently covered by officially protected areas. According to the legislation, the original vegetation cover of these areas should be maintained by land owners. However, 42% of the APPs present illegal deforestation, as do 16.5% of the RLs. Additionally, 3% of the protected areas and indigenous lands also suffered illegal deforestation. This study also found that the effectiveness of the protection required by law in private properties varies according to geographical region and biome.

The latest revision (2007) indicates 2,684 Priority Areas for biodiversity protection in the country. Protected areas exist in 1,123 (41%) of these Priority Areas, and all 522 Indigenous Lands are considered Priority Areas (by themselves or as part of a larger priority polygon) for biodiversity conservation and sustainable use. Five national consultation processes were carried out involving 1,200 representatives of indigenous peoples to develop the National Policy for Territorial and Environmental Management in Indigenous Lands (PNGATI). The institution of the PNGATI through a governmental decree is expected to occur in 2010. Additionally, the GEF-supported Indigenous Project (GEF Indígena, US\$ 36 million) is currently in its initial phase, under coordination of the federal government and representatives of indigenous peoples. This project will involve 30 indigenous lands and foresees actions for the effective

conservation of a representative sample of Brazilian forest ecosystems in indigenous lands, increasing the value of these lands as conservation areas. The Quilombola Territories are not yet precisely mapped to allow comparison with Priority Areas.

The total area under official protection increased significantly in Brazil, including in Priority Areas, and there was a decrease in deforestation and fire occurrences. The analysis of the status of the Priority Areas for Biodiversity was initiated in 2010 by IBAMA through its new monitoring system. Results are expected to be available by the end of 2010. A 2010 study assessed the protection of natural vegetation provided by the Brazilian Forest Code, and observed that the Permanent Preservation Areas (APPs) and Legal Reserves (RLs) inside private properties cover, respectively, 12% and 30% of the national territory which, combined, correspond to twice the area under official protection (protected areas under the National Protected Areas System - SNUC). However, 42% of the APPs present illegal deforestation, as well as 16.5% of the RLs. Additionally, 3% of the officially protected areas and indigenous lands also suffered illegal deforestation. The effectiveness of legal protection varies with geographical regions and biomes.

Available data for the Cerrado, Caatinga, Pantanal e Pampa biomes from the Project of Satellite Monitoring of the Deforestation in Brazilian Biomes (PMDBBS), overlapped with the map of Priority Areas for Biodiversity, assisted in the definition of a preliminary estimate of the degree of achievement of this target. Priority Areas of the Cerrado still maintain, on average, 65.9% of their original vegetation cover. However, there is large variation among them, with areas presenting the highest degree of deforestation located in the south of the biome, while the best conserved areas are located in the north. The extent of remaining vegetation in these Cerrado Priority Areas varies from 0.3% to 100%. Priority Areas in the Pampas biome maintain on average 63.3% of their original vegetation cover, varying from 7.0% to 100%. In the Caatinga, the average remaining vegetation cover is 70.5%, varying from 4.2% to 100%. Priority Areas in the Pantanal present the highest average of remaining vegetation cover of the biomes included in this analysis (89.7%), suggesting better maintenance of the vegetation, but all Priority Areas in this biome suffered some measure of deforestation, with the extent of original vegetation cover varying from 28.0% to 99.9%.

22. Pollution

Efforts to monitor water quality have increased in Brazil, as well as investments in wastewater collection and treatment services. More investments are needed to reach satisfactory levels of pollution reduction from domestic and industrial discharges. Adequate disposal of solid waste is also still insufficient in the country. Even though Brazil is still the main destination of agricultural chemicals banned in various countries, there are numerous initiatives encouraging the adoption of more sustainable agricultural practices.

Water quality

The government provides four types of sanitation services at its three levels (federal, state and municipal): (i) water supply; (ii) wastewater treatment; (iii) urban drainage; and (iv) urban cleaning and

collection of solid waste. Until the 1960s, provision of these services was localized and sporadic, with stronger investments being applied particularly starting in the 1980s, with the new 1988 constitution and reformulation of public services. A comparison of 1989 with 2000 data can provide an idea of the dimension of the evolution of these services: in 1989 Brazil had 4,425 municipalities, 95.9% of which had a general network for the water supply services, provided by public or private companies, but only 47.3% had wastewater collection networks. In 2000 the number of municipalities increased to 5,507 and the water supply network was expanded to 97.9% of the municipalities, while the expansion of the wastewater collection network lagged behind with 52.2% of municipalities with this service available, one third of which provided wastewater treatment services. In 2000, 78.6% of the Brazilian municipalities had urban drainage services, but this proportion varies with population size: the larger the population, the greater the percentage of municipalities with urban drainage services, reaching 100% for municipalities with more than 300,000 inhabitants (corresponding to 1.6% of all municipalities). Additionally, an improving trend was noted for solid waste collection and disposal: in 1989 (time of first published national assessment) only 10% of municipalities presented adequate disposal of solid wastes, while in 2000 a total of 32.2% used landfills as final destination for collected waste (corresponding to 69% of all solid waste collected in the country).

At the national level, the main current problem related to water quality is the inflow of domestic wastewater, as only 52.2% of the Brazilian municipalities have an established wastewater collection system, and only 18% of wastewaters produced receive some kind of treatment. The estimated total domestic organic discharge is 6,389 tons OBD/day. Nevertheless, for the 81 larger cities in Brazil (over 300,000 inhabitants) from 2003 to 2008 the wastewater collection service increased by 11.7%, and the wastewater treatment service increased by 4.6%. According to IBGE, the primary environmental problem pointed out by most Brazilian municipalities is the siltation of water bodies (53% of municipalities); followed by water pollution (38%); landscape alteration (35%); soil contamination (33%); air pollution (22%); and degradation of protected areas (20%).

In addition to domestic wastewater, the industrial pollution, agriculture runoff, inadequate disposal of solid waste, and inadequate soil management also cause negative impacts on water quality in many watersheds. Nevertheless, industrial organic pollution has significantly decreased in some states, such as sugar and alcohol production effluents in São Paulo state, which are now being reused as fertilized irrigation. Adequate solid waste management, however, remains as a challenge for a great number of cities and an important pollution source of surface water bodies and groundwater.

Approximately 90% of the Brazilian population has access to the service of solid waste collection, although regional percentages vary from less than 20% to over 80%. However, most of the collected waste (58%) has inadequate disposal: 21% goes to dumps; 37% to landfills; 0.1% to flooded areas. Only 451 Brazilian cities provide selective solid waste collection, separating recyclable waste. After a long process, on March 10, 2010 the Chamber of Deputies unanimously approved the Bill 203/91, which institutes the National Solid Waste Policy. This is an important step to improve not only sanitary conditions, but also environmental quality, particularly regarding surface and ground water. However, this bill still requires the Senate's approval before becoming a federal Law.

Monitoring efforts by ANA, SRHU and Ministry of Cities have increased: it is estimated that 50% of the point source of water and soil pollution are currently monitored. Sewage collection has increased from 43.3% of Brazilian municipalities in 1989 to 52.2% in 2000, but only one third of these municipalities provide sewage treatment services. Although progress at the national scale was small, some states have placed significant efforts at the local scale (major cities) that contribute to this target, such as Minas Gerais state: the metropolitan region of Belo Horizonte (3rd largest city in Brazil) had 12% of sewage treatment in 2000 and reached 97% treatment of collected wastewaters by 2010.

Sewage collection services by state have two cases with the best rates (>70%): São Paulo and the Federal District. Three states have the second best rates (from 40.1% to 70%): Minas Gerais, Rio de Janeiro and Paraná; while four states have the worse rates (<10%): Rondônia, Pará, Amapá and Piauí. Of the remaining states, 8 collect between 20.1% and 40% of the produced wastewaters; and 10 collect between 10.1% and 20%.

Solid waste: the 2007 diagnosis carried out by the National Sanitation System – SNIS indicates that 98.8% of the assessed municipalities offer regular solid waste collection services. The amount of daily collected waste is on average around 0.71 kg/person in the smaller towns (up to 30,000 inhabitants) and 1.17 kg/person in cities with population over three million. However, the study revealed that almost 22 million tons of the collected waste were disposed improperly in dumps or landfills with inadequate environmental protection.

Agricultural pollution

The use of agricultural chemicals is still very high in Brazil (Table 1), which holds today the first place in the world as importer of these substances. Although organic production and consumption of organic products is gradually increasing in the country, initiatives to reduce the use of agricultural chemicals still represent a small proportion of the total agricultural activities in Brazil.

Table 1: Estimate of the market of agricultural chemicals in Brazil from January to September.

Type of chemical/Estimate (in million R\$)	2007	2008	Variation (%)
Herbicide	2,685	3,881	45%
Fungicide	1,351	1,721	27%
Insecticide	1,916	2,456	28%
Miticide	127	159	25%
Other	212	266	26%
Total	6,291	8,484	35%

Source: National Union of the Industry of Products for Agricultural Defense (SINDAG), 2008. Estimate of the market for agricultural chemicals. <http://www.sindag.com.br/upload/ApresentacaoCTIAjan-setembro08.ppt>

Irrigation is widely used in agriculture, particularly in the Cerrado and Caatinga biomes (e.g., the São Francisco River valley, with a strong fruit production for national and international markets). In irrigated areas, most of the water entering the planted area and adjacent soils comes from irrigation rather than

rain, which aggravates soil and water contamination by agricultural chemicals that drain with superficial waters or that leach, reaching underground water. Initiatives such as organic agriculture, Integrated Pest Management, and origin traceability are contributing to reduce the use of agricultural chemicals and guide proper and minimal use of these substances. However, such initiatives are recent, as is the voluntary movement of a segment of rural producers to seek qualification for their products to achieve better acceptance by national and export markets.

Brazil instituted the Law nº 7802 on Agricultural Chemicals and Like-substances in 1989, establishing that these substances must be registered with the relevant federal agency to be used in Brazil, and their use must follow specific directives and requirements from the health, environmental and agricultural sectors. The National Agency of Sanitary Vigilance (ANVISA) is conducting a reassessment of the toxic levels of various active ingredients of agricultural chemicals, resulting in use restrictions or prohibition of various chemicals due to their adverse impacts on human health. Detailed information on this reassessment and the list of forbidden or restricted substances can be found at the ANVISA webpage: <http://portal.Anvisa.gov.br/wps/portal/Anvisa/home/agrotoxicotoxicologia>. ANVISA's report indicates that the active ingredients currently being reassessed correspond to only 1.4% of the 431 active ingredients in agricultural chemicals authorized in the country; and many of the ingredients under reassessment continue to be imported in large quantities, according to import information from the Integrated Foreign Trade System (SISCOMEX).

ANVISA implements since 2001 the Program on Analysis of Agricultural Chemicals Residue Content in Food (PARA Program), which provides annual analysis for selected produce. Agricultural chemicals are the second primary cause of intoxication in Brazil, second only to medical drugs. The major problems detected by PARA in 2009 were: agricultural chemical residue contents above acceptable thresholds and the non-authorized use of these substances for specific produce types. Thirty types of produce were monitored in 2009 (lettuce, potato, strawberry, tomato, apple, banana, papaya, carrot, orange, pineapple, rice, onion, beans, mango, bell pepper, cabbage, grapes, kale, beet, and cucumber). Of the 3,130 samples tested in 2009, 29.0% were rated unsatisfactory. The 2009 results of the PARA program confirm the illegal use of agricultural chemicals in cultures where, in general, the exposure of small and medium producers to these chemicals occur in high rates, as most of these producers use portable equipment to pulverize cultures. As family agriculture represents 84.4% of the rural properties in the country, this is a widespread issue in Brazil.

Agriculture: Brazil is still the main destination of agricultural chemicals banned in various countries. The use of these chemicals is still allowed according to controlled commercialization and application criteria. Brazil imported 1.84 thousand tons of agricultural chemicals in 2008. This volume increased 29% in 2009 reaching 2.37 thousand tons. In 2009, one million tons of agricultural chemicals were applied to food cultures in the country, representing 5 kg of these substances per Brazilian person.

Mining pollution and degradation

The national ore extraction has increased significantly since 2001 (Table 2). Although environmental legislation for mining ventures and enforcement has also increased, the potential environmental pollution resulting from mining activities and wastes is still high.

Table 2: Examples of the evolution of mineral ore production in Brazil 2001 – 2007

Production (tons)	2001	2007
Concentrated plumb	14,779	24,574
Concentrated copper	32,734	205,728
Chromite	419,049	627,772
Sulfur	384,672	479,666
Contained tin	13,016	12,596
Processed iron (103t)	201,438	354,674
Concentrated phosphate (103t)	4,684	6,158
Potassium (T K2O)	318,585	471,333

Source: DNPM - <http://www.dnpm.gov.br/assets/galeriadocumento/balancomineral2001>

The production of aggregates for construction is widespread through the country. Approximately 250 family-owned businesses produce crushed rock, where 10% of these businesses produce over 500,000 tons/year; 30% produce between 200,000 and 500,000 tons/year; and the remaining 60% produce less than 200,000 tons/year. Additionally, approximately 2,000 businesses, mostly family-owned, extract sand for works and construction. Of these, 5% produce over 300,000 tons/year; 35% produce between 100,000 and 300,000 tons/year; and 60% produce less than 100,000 tons/year.

Sand is extracted from riverbeds (90%), floodplains, lake deposits, and layers of eroded rocks and sandstone. However, the official records available from the National Department of Mineral Production (DNPM) have always reflected a very small portion of the actual number of aggregate producers, which work mostly without permits. The historical series (Table 3) is based on data obtained from DNPM, mineral tax documentation, and producer associations.

Table 3: Evolution of the production (m3) of aggregates for construction 1988 – 2000

YEARS/AGGREGATES	SAND	CRUSHED ROCK	TOTAL
1988	31,726,200	58,094,330	89,820,530
2000	141,100,000	97,300,000	238,400,000

Source: DNPM - <http://www.dnpm.gov.br/assets/galeriadocumento/balancomineral2001>

Although pollution and degradation caused by mining and aggregate extraction are mostly localized impacts, such impacts cause non-reversible changes in the landscape through removal of soil and habitat. Legislation requires the environmental restoration of areas after the cessation of mining activities, which mitigates biodiversity loss but does not prevent it.

Air pollution

The Ministry of the Environment carried out in 2007 a national assessment of the status and trends of pollutant emissions by motorized vehicles, developing scenarios up to 2020. The objective of this study is to assess the PROCONVE – National Program for Controlling Air Pollution Caused by Vehicles, establishing a basis to develop new actions and strategies to combat and mitigate air pollution in the next decade. Current national consumption of fuels by the transport sector (buses, cars and trucks) is equivalent to 1.7 times the consumption of electric energy in the entire country, and the combined potency of engines in the entire fleet is equivalent to 170 Itaipu hydroelectric power plants. These facts clearly indicate that the air pollution issues in urban areas result mostly from the lack of efficiency in the vehicles and the transport system, requiring a differentiated environmental strategy targeted at the entire transport system.

The study evaluated the trends from 1980 and extrapolated to 2030 for various polluting elements based on a “business as usual” scenario, producing emission evolution patterns for carbon monoxide, total hydrocarbons, aldehydes, volatile organic composites, nitrogen oxide, particles, sulfates, and fossil carbon dioxide.

The 2007 study concludes that the technological evolution introduced by PROCONVE along the past 20 years played an extremely important role in the efforts to halt the growing atmosphere degradation in the large Brazilian cities, but it represented only the first step to address this issue. It will be necessary to improve the established strategies during the next decade, as well as to enhance methods and assessment procedures to make Brazilian vehicles increasingly economic and less polluting. It will also be necessary to alter the distribution of the means of transportation, seeking a better balance among the demand of the various types of fuel.

IBGE also carried out an assessment of the annual emission of selected pollutants in the largest Brazilian state capitals and the Federal District for the period 1995 to 2006.

23. Achievements

The mainstreaming of biodiversity into economic sectors is still at the initial stages and will require continuous effort and strong investments, particularly from the side of the public environmental agencies. Although ministries of various sectors plan and implement actions causing direct and indirect impacts on biodiversity (either positive or negative), there is no defined institutional border clearly indicating where the action of one agency ends and the action of another begins, despite the clearly defined missions and responsibilities in the statute of each agency. If this absence of borders can be positive on one hand, allowing wide spread conservation and biodiversity related actions, or even facilitating the mainstreaming of biodiversity considerations, on the other hand it leads to action overlaps and a reasonable amount of lack of coordination among the decision-making levels of these institutions. Nevertheless, important initiatives exist for the mainstreaming of biodiversity considerations, both within the public sector and the private sector, with results that are not always measurable but are nonetheless perceived as positive attitude changes and evolving policies.

Even though environmental impact assessments have been part of Brazilian procedures for environmental licensing since 1986, stronger biodiversity considerations have only recently been included. These criteria are in the process of being officially incorporated into legal requirements, with several licensing agencies investing efforts into the development of technical definitions and new standard procedures. The use of strategic environmental assessments tends to increase gradually, motivated by the environmental licensing processes.

The Ecosystem Approach is new to Brazil. Initiatives to apply this tool are still punctual and its incorporation into required procedures needs further discussion, as well as the definition of methodologies and national protocols. Nevertheless, some governmental sectors are investing efforts to include principles of this approach into their planning and implementation processes, such as the water sector.