



FINAL EVALUATION

Second National Communication to the United Nations Framework on Climate Change – UNFCCC Brazil

United Nations Development Programme Global Environment Facility

UNDP project ID (PIMS): 2613 GEF project ID: 1612

Final version

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LIST OF ABBREVIATIONS

| ABAL | Brazilian Aluminum Association |
|-----------------|---|
| ABCM | Brazilian Society of Mechanical Sciences and Engineering |
| ABIQUIM | Brazilian Chemical Industry Association |
| ANEC | National Association of Grain Exporters |
| APR-PIR | Annual Project Review – Project Implementation Report |
| BRL | Brazilian real |
| CDM | Clean Development Mechanism |
| CETESB | Environment Sanitation Agency of the State of São Paulo |
| CIGMC | Inter-Ministerial Commission on Global Climate Change |
| CO_2 | carbon dioxide |
| COP | Conference of Parties |
| COPPE-UFRJ | Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering |
| | of the Federal University of Rio de Janeiro |
| CPTEC | Center for Weather Forecasts and Climate Research |
| E&E | Economy & Energy (<i>Economia & Energia</i>) |
| EMBRAPA | Brazilian Agricultural Research Corporation |
| FBDS | Brazilian Foundation for Sustainable Development |
| FINEP | Financing Body for Studies and Projects |
| FIOCRUZ | Oswaldo Cruz Foundation |
| FUNCATE | Foundation for Space Research, Application and Technology |
| GEF | Global Environment Facility |
| GHG | greenhouse gas |
| GWP | global warming potential |
| HFC | hydrofluorocarbon |
| INPE | National Institute for Space Research |
| IPCC | Intergovernmental Panel on Climate Change |
| LULUCF | land-use, land-use change and forestry |
| M&E | monitoring and evaluation |
| MBSCG | Brazilian Global Model of the Climate System |
| MCT | Ministry of Science and Technology |
| MMA | Ministry of Environment |
| MME | Ministry of Mines and Energy |
| N_2O | nitrous oxide |
| PFC | perfluorocarbon |
| R&D | research and development |
| SF ₆ | sulphur hexafluoride |
| SNIC | National Cement Industries Association |
| ToR | Terms of Reference |
| UFBA | Federal University of Bahía |
| UNDP | United Nations Development Program |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | United States dollar |
| V&A | vulnerability and adaptation |

EXECUTIVE SUMMARY

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change, recognizing that that the climate system is a shared global resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. One of the main commitments is to develop, periodically update, publish and make available to the UNFCCC, inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol by means of the so-called National Communications. The financial mechanism of the UNFCCC, the Global Environment Facility, can help developing countries in providing the financial support needed to be able to draft national inventories, strategies, action plans, and reports under the Convention in the so-called 'enabling activities'. Brazil presented its Initial National Communication in December 2004, financed by GEF as enabling activity and with budget allocation from the federal Government as co-financing.

Again, GEF funding was applied for through the UN Development Program (UNDP) for the elaboration of the Second National Communication. The UNDP Project document for the Enabling Activity was signed in December 2005 with a GEF budget of USD 3.4 million and estimated co-financing of USD 821,709. Work started early 2006, executed by the Brazilian Ministry of Science and Technology (MCT). The planning closing date was December 2008, but was extended with 2 years during the course of the project.

In accordance with UNDP and GEF regulations, an evaluation of a project needs to be carried upon completion of the project. The Final Evaluation was carried out in June 2012 by the international consultant, Mr. J.H.A. van den Akker and this report describes the main findings, conclusions and recommendations.

The UNDP Project Document mentions that "The immediate **objective** of the project is to prepare the Second National Communication of Brazil to the UNFCCC". This objective has been fully met as the Second National Communication was deposited in the UNFCCC Secretariat on 30 November 2010 in two Volumes containing about 460 pages of text, tables and figures.

It contains five Parts, following the UNFCCC guidelines:

- 1. National circumstances and special arrangements of Brazil;
- 2. Brazilian inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases (not controlled by the Montreal Protocol);
- 3. Description of steps taken or envisaged to implement the UNFCCC in Brazil;
- 4. Other information considered relevant to the achievement of the objective of the Convention;
- 5. Financial, technical and capacity needs associated with the implementation of activities related to the elaboration of the 2^{nd} National Communication.

The Project Document was structured to produce a number of sectoral or technical reports as **outcomes** that have provided the basis for the above-mentioned five Parts of the National Communication. In comparison with the Initial National Communication, two points should be noted. First, the project of the Second National was designed to enhance and extend the studies on activity data and emission factors related to the sectors that were believed to require intensive country specific research, in particular land-use, land-use change and forestry (LULUCF) and agriculture. Detailed estimates of LULUCF and agriculture as greenhouse gas emission sources or sinks are important. Brazil is one of the most important repositories of the world's forest (and biodiversity). LULUCF and agriculture by consequence make up a large share of Brazil's GHG emissions (over 75%). One main outcome of the project has been to produce 18 sectoral reports (covering energy, industry, waste management, agriculture and LULUCF sectors), which are all available (as the National Communication itself) on the MCT website (see www.mct.gov.br/clima)

Second, the Communication project enlarged the scale and scope of other activities to be undertaken, included the downscaling of existing global circulation models (using a regional model, run by CPTEC-INPE). Regional climate models combine the calculated climate change conditions from the global models with more detailed land surface characteristics on a smaller scale and allow for modeling of local effects. This has provided provide more realistic predictions of local climate effects and extreme events, allowing for a more accurate vulnerability and adaptation (V&A) assessments (focusing on the health sector; energy sector; water resources, floods, and desertification; agriculture, pasture and livestock sector; coastal zone management; and aquatic biodiversity).

The MCT engaged a broad-based network of partners. The Communication mentions that "over 600 institutions and 1,200 experts with recognized competence in their respective areas of expertise from a variety of sectors (energy, industry, forestry, agriculture/livestock, waste treatment, etc.) were involved, coming from the public and private sectors, as well as from the academia". The participation of multiple stakeholders from the public and private sectors in the elaboration of the National Communication has promoted the **mainstreaming** of climate change issues in Brazil. This is part of an ongoing effort to improve scientific understanding, to influence national policies, and to enhance national awareness on climate change.

In 2007 the Brazilian Research Network on Global Climate Change (*Rede Clima*) was launched with the aim to generate and disseminate knowledge (to enable Brazil to face the challenges of climate change more adequately) and to integrating national experts and expertise on climate issues (to enhance the effectiveness of scientific research programs).

As mentioned earlier, the project had to be extended with 2 years from the end of 1008 to November 2010, due to delays and issues encountered, which are detailed below:

- The establishment of these agreements with over 20 key institutions related to the outcomes and outputs of the Project Document suffered a considerable delay due to administrative processes within these institutions as well as within the Government ministries;
- The LULUCF inventory is extremely complex as Brazil has a huge land area in forestry and agriculture. Key institutions involved in LULUCF and agriculture inventories faced some technical difficulties. Data gathered from various sources left gaps and blank areas for the purpose of national reporting, which had to be complemented with additional satellite imagery data. Efforts were undertaken to correct errors and generate information regarding the blank areas, which took considerable amount of additional financial resources (national) and time;
- Regarding the vulnerability and adaptation (V&A) assessment, problems were identified in the development of climate change downscaled scenarios for Brazil, given that the team in charge faced difficulties in getting adequate time use and storage space in the supercomputer needed to run the regional model, which caused a delay in the development of methodological approach regarding vulnerability assessment and adaptation measures;
- Funding additional to what was planned in the project documentation was needed, first, to cover the additional activities needed for the LULUCF inventory, and, second, to cover for hefty exchange rate losses with the dollar going down from USD 1 = BRL 3.15 to around BRL 1.70. With expenses paid in Brazilian Reais (BRL), additional funds were needed in the form of MCT cash co-financing and additional contributions from the participating key institutions.

It must be noted that despite these delays Brazil managed to submit in 2010 to UNFCCC on time, that is, within the timeframe stipulated in relevant UNFCCC decisions that suggest submission within 4 years after the first disbursement of the funds (in 2006), with a possible extension up to one year that should be informed to the UNFCCC. Nonetheless, since delays are also identified as a risk in the project document of the planned Third National Communication the underlying causes should be closely watched.

Apart from meeting its international obligations, Brazil is concerned with the problem of global warming. Brazil has played an important role in the international discussions and scientific assessment of climate change, as well as in setting up an international institutional framework. However, without GEF intervention, climate change reporting in Brazil would have been limited to the financial resources allocated in the Brazilian budget, which would not have been sufficient to allow the elaboration of the National Communication in its current detailed form. The UNDP/GEF intervention can be considered as quite **relevant**, therefore.

From the point of view of **replicability**, the project has generated improved approaches (in comparison with the Initial Communication), methodologies and tools, especially regarding inventory and vulnerability and adaptation assessment, which will prove useful to share with peer organizations, as well as important inputs for the scientific literature review periodically undertaken by IPCC. The general strategy was to use available information and, at the same time, put in place research programs to improve the knowledge of a particular problem and the data at hand.

The Government of Brazil is strongly committed to its obligations under the international agreements on Climate Change and in particular to the reporting under the UNFCCC, as evidenced by the previous reporting. Nonetheless, regarding **sustainability** one concern of this evaluation is regarding staffing at MCT, responsible for elaboration of the National Communication. At the moment of the evaluation mission (June 2012), most of the project staff of the MCT, i.e. the 'country team' responsible for previous Communications had left. The leaves concern on how the elaboration of the Third National Communication will take place. Future elaboration of the National Communication institutionalized in MCT that is supported with short term consultancies on an as-needed basis. This would also help to streamline data gathering which becomes an increasingly complex task as more data are required with higher accuracy involving even more organizations. For example, staff dedicated at adopting surveys and data collection by specialized organizations in such a way that these can be readily used in the National Communication and other climate reporting.

As required per GEF-UNDP, the terminal evaluation needs to be providing ratings for the project's performance, which is summarized below.

| Criteria | Rating | Rating | Item |
|---------------------|-------------------|---------------------|---------------------------------------|
| | Satisfactory | Highly satisfactory | Effectiveness and results |
| Project performance | | Satisfactory | Project design and relevance |
| | | Satisfactory | Project implementation and efficiency |
| Sustainability | Moderately likely | | |
| Relevance | Relevant | | |
| Impact | Significant | | |

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1. INTRODUCTION

1.1 Background

In 1992, at the Earth Summit in Rio de Janeiro, countries joined an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), to cooperatively consider what they could do to limit average global temperature increases and the resulting climate change. At the Rio Summit, the UNFCCC was opened for signature along with its sister Rio Conventions, UNCBD and UNCCD¹, and having reached the required quorum of signatures, entered into force in 1994.

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change, recognizing that that the climate system is a shared global resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. There are now 195 Parties to the Convention². The UNFCCC Secretariat supports all institutions involved in the international climate change negotiations, particularly the Conference of the Parties (COP)³, the Subsidiary Bodies⁴ (which advise the COP), as well as Kyoto Protocol bodies (such as the Executive Board of the CDM)⁵ and other Convention bodies.

The commitments of the Parties to the UNFCCC are described under paragraph 1 of Article 4 of the Convention, which establishes common obligations for all Parties, taking into account the common but differentiated responsibilities of industrialized and developing countries, and their specific national and regional development priorities, objectives and circumstances. One of the main commitments is to develop, periodically update, publish and make available to the COP, inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol by means of the so-called National Communications. These include the above mentioned inventory of net anthropogenic emissions of GHGs and a general description of the steps taken or envisaged to implement the Convention.

According to Article 4.3 of the UNFCCC, "the developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties". Industrialized nations agreed under the Convention to support climate change activities in developing countries by providing financial support for action on climate change (in addition to any financial assistance they already provide to these countries). A system of grants and loans has been set up through the Convention and is managed by the Global Environment Facility as the financial mechanism of the UNFCCC (Article 11). The GEF supports projects and programs as well as "enabling activities". Enabling Activities aim to help countries prepare national inventories, strategies, action plans, and reports under the above-mentioned Conventions.

Apart from the international obligations, Brazil is concerned with the problem of global warming. Brazil has played an important role in the international discussions, scientific assessment of climate chang and in setting up the current international institutional framework.

¹ UN Convention on Biological Diversity; UN Convention to Combat Desertification

² June 2012

³ Including the COP Bureau, which deals mainly with procedural and organizational issues arising from the COP and also has technical functions

⁴ The Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI)

⁵ Clean Development Mechanism

Brazil presented its Initial National Communication in December 2004. The report focused mainly on the preparation of a detailed inventory of GHG emissions and a general description of steps taken or envisaged to implement the Convention. It was financed by GEF (enabling activity) as well as through budget allocation from the federal Government. Afterwards, preparations to prepare the successor Second National Communications were initiated.

1.2 Project objectives and strategy

In the preparation of Initial National Communications more than 150 institutions and 700 experts⁶ from different sectors and parts of the country were engaged and the Ministry of Science and Technology, responsible for the implementation of the project, was able to organize a "country team", with specialists in charge of assessing data and verifying the quality of information provided by the institutions involved.

In order to ensure the continuation of this "country-team" approach and Brazil's progress towards the implementation of the UNFCCC in general, it was felt necessary that a second Enabling Activity project be approved to assist Brazil in the preparation of its Second National Communication with the intention to enlarge the scope of the Report, including scenario work and vulnerability and adaptation assessment.

GEF funding was applied for through the UN Development Program (UNDP) of USD 3.4 million with an estimated co-financing of USD 821,709. The UNDP Project document for the Enabling Activity was signed in December 2005 and work started early 2006, executed by the Brazilian Ministry of Science and Technology (MCT). The planning closing date was December 2008, but was extended with 2 years during the course of the project. The Second National Communication was deposited in the UNFCCC Secretariat on 30 November 2010.

The UNDP Project Document (or ProDoc) mentions that "The immediate objective of the project is to prepare the Second National Communication of Brazil to the UNFCCC", encompassing the following main components (termed 'outcomes' in the ProDoc):

- 1. Preparation of National Inventory Refinement;
- 2. Methodological Approach regarding Vulnerability Assessment and Adaptation Measures Elaborated;
- 3. Description of the Brazilian National Circumstances and the Steps Taken or Envisaged to Implement the Convention prepared;
- 4. Public Awareness and Education Strategy in place;
- 5. Preparation of the Second National Communication

The Enabling Activity project has aimed to assist Brazil in preparing the Second National Communication to the UN Framework Convention on Climate Change (UNFCCC). According to the project document, the project will extend the coverage of the annual Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases to the 1990 to 2000 period⁷, focusing on the sectors/gases that have either a significant share of the greenhouse gas emissions or present a large degree of uncertainty, or both.

Brazil's description of national circumstances will be updated, as will be steps taken or envisaged to implement the Convention. Finally, the project would build institutional capacity for implementing the

⁶ As mentioned in the Initial National Communication

⁷ The actual Communication mentions data from 1990-2005. See, for example, the table on greenhouse emissions of Brazil given in Annex C presents data for 1990, 1994, 2000 and 2005.

Convention in Brazil including undertaking activities related to climate change education, and awareness-raising.

1.3 Evaluation methodology and structure of the report

In accordance with UNDP and GEF regulations, an evaluation of a project needs to be carried upon completion of the project. The Final Evaluation was carried out in June 2012 by the international consultant, Mr. J.H.A. Van den Akker. This included a short mission to Brazil, of which the agenda is given in Annex B.

This report describes the findings and recommendations of this **final evaluation**. The terminal evaluation (TE) has been carried out in accordance with the Terms of Reference (ToR) of the evaluation (attached as Annex A). The ToR mentions that "The overall objective of the TE is to analyze the implementation of the project, review the achievements made by the project to deliver the specified objectives and outcomes. It will establish the relevance, performance and success of the project, including the sustainability of results. The evaluation will also collate and analyze specific lessons and best practices pertaining to the strategies employed, and implementation arrangements, which may be of relevance to other projects in the country and elsewhere in the world".

The Evaluator has applied the following **approach** in the collection of data⁸:

- i) Review of project documentation and progress reports (such as the APR-PIRs), the National Communication and the underlying technical reports as well as the relevant pages on the MCT website (see Annex B);
- ii) Meetings with stakeholders from Government entities and key institutions responsible for the technical inputs into the National Communication. A list of people interviewed is given in Annex B.

The evaluation has looked at the following main criteria areas which are presented in the section below together with an indication in which Sections of the Evaluation Report the main area and topics can be found⁹:

Main findings:

a) Achievement of <u>results</u>:

| Criteria | Description |
|----------------------------|---|
| Effectiveness and results: | Extent to which an objective has been achieved. |
| 1. Achievement of | Progress towards results is based on a comparison of the progress |
| objective and outcome; | indicators of the project's outcomes and outputs at project inception |
| Attainment of outputs; | (baseline) and situation at the end of the project intervention. |
| Overall impacts | Assessments of longer-term impacts (greenhouse gas emissions) ¹⁰ |
| (sections 2.1, 2.2, 3.1) | Linkage with other areas (mainstreaming, cross-cutting issues). |

⁸ The evaluation has been carried out as much as possible following the latest guidelines. See for example "*Project-Level Evaluation, Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects*" (UNDP, 2012)

⁹ The underlined words refer to the GEF criteria of relevance, effectiveness, efficiency, results and sustainability

¹⁰ Impacts are given the **ratings** of Significant (S), Minimal (M) and Negligible (N)

b) Project formulation and <u>relevance</u>:

| Criteria | Description |
|-------------------------|--|
| Conceptualization and | The approach used in design and an appreciation of the appropriateness |
| design | of problem conceptualization, including an assessment of the way in |
| (section 2.4.3) | which the selected intervention strategy addressed the main barriers. It |
| | also includes an assessment of the project's logical (results) framework |
| | and monitoring and evaluation (M&E) framework, including |
| | assumptions and risks, partnership arrangements as well as the |
| | suggested timeframe of the project, financial planning and co-financing |
| Relevance and | Extent to which the project had its origin in national priorities and |
| ownership ¹¹ | organizational policies, reflects environmental and development issues |
| (section 2.4.1) | and is in line with the strategic priorities of the GEF Operational |
| | Program on climate change; Involvement of stakeholders in the project |
| | design; |

c) Project implementation and <u>efficiency (cost-effectiveness</u>)

| Criteria | Description | | |
|--------------------------|--|--|--|
| Effectiveness of project | Efficiency and effectiveness of activities carried out; | | |
| management | Changes in the project's objective and outcome $(if any)^{12}$, as a response | | |
| (section 2.3.1) | to external factors, (see further); | | |
| | Use of adaptive management in response to such changes and | | |
| | evaluation recommendations and APR-PIR suggestions | | |
| Monitoring and | Assessment of quality and effectiveness of monitoring tools used, | | |
| evaluation | including logical framework (and indicators) and monitoring reports | | |
| (section 2.3.3) | (APR-PIRs); Work planning and progress and financial reporting. | | |
| | Discrepancies in ratings given in APR-PIRs and evaluation reports (if | | |
| | any). Assessment of the role of UNDP | | |
| Budget and co-financing | Assessment of budget planning and actual expenditures. Quality and | | |
| (<i>section 2.3.2</i>) | timeliness of inputs in relation with realized outcomes and out. | | |
| | Realization of promised co-financing and integration of external | | |
| | funding into the project | | |
| Involvement of partners | Assessment of involvement of stakeholders (partners, governmental | | |
| and other stakeholders | entities, NGOs, private sector, beneficiaries) in project implementation | | |
| (section 2.3.4) | | | |
| External factors | Assessment of the underlying factors and risks beyond the project's | | |
| (section 2.3; 3.1) | immediate control that have influenced outcomes and results. | | |

Conclusions

These three main areas are given a **rating** (in chapter 3) that can range between:

- Unsatisfactory (US): major shortcomings
- Marginally unsatisfactory (MU): significant shortcomings
- Marginally satisfactory (MS): moderate shortcomings
- Satisfactory (S): minor shortcomings
- Highly satisfactory (HS): no shortcomings

¹¹ Relevance is given the rating of Relevant (R) or Not Relevant (NR)

¹² For example, due to unforeseen positive and negative factors (external factors), changes in assumptions and risks, restructuring of the project, etc.

| Criteria | Description |
|-----------------------|---|
| <u>Sustainability</u> | Extent to which the benefits of the project will continue after it has |
| (section 3.1) | come to an end, (risks that are likely to affect the project's outcomes), |
| | distinguishing between financial, socio-economic, institutional & |
| | governance and environmental risks |

Sustainability is given a **rating** ranging from:

- Likely (L): negligible risks to sustainability (key outcomes expected to continue);
- Moderately likely (ML): moderate risks, but some outcomes will be sustained;
- Moderately unlikely (UL): substantial risks that key outcomes will not continue;
- Unlikely (UL): severe risks (outcomes and key outputs will not be sustained).

The report ends with **recommendations** and lessons learned that can be taken from the evaluation, including best (and bad, if any) practices. The report follows as much as possible the new UNDP *Project-Level Evaluation Guidance for Conducting Terminal Evaluation of UNDP-supported, GEF-Financed Projects* (2012). The order in this report slightly deviates from the outline suggested in the Guidance to allow the Evaluator to give a more logical flow and presentation of the information. To keep track, the Outline given at the end of Annex A indicates where each item can be found in this Evaluation report.

1.4 Main project partners and stakeholders

Key partners

A broad-based network of partners has been engaged to prepare the Second National Communication. This network started taking shape in the mid-1990s to prepare the Initial National Communications and has become stronger since then. Over 600 institutions and 1,200 experts with recognized competence in their respective areas of expertise were involved in the preparation of the Second Communication, coming from a variety of sectors (energy, industry, forestry, agriculture/livestock, waste treatment, etc.), representing public and private sectors, as well as academia¹³. A full list of institutions and organizations (as well as individuals) is given in the National Communications reports.

Here follows a list of main organizations as relevant to this evaluation, i.e. that have had a major responsibility in executing components of the National Communication formulation and/or have been interviewed during this evaluation missions (as mentioned in Table 2 of Section 2.2 and in Annex B), given in alphabetical order:

- ABAL Brazilian Aluminum Association (Associação Brasileira do Alumínio)
- BCM Brazilian Society of Mechanical Sciences and Engineering (Associação Brasileira de Engenharia e Ciéncias Amecánicas)
- ABIQUIM Brazilian Chemical Industry Association (*Associação Brasileira da Indústria Química*)
- ANEC National Association of Grain Exporters (*Associação Nacional dos Exportadores de Cearais*)
- CETESB Environment Sanitation Agency of the State of São Paulo (*Companhia de Tecnologia de Saneamento Ambiental do Estado de São Paulo*)
- COPPE Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering of the

¹³ See National Communication, Executive Summary, pg. 6

Federal University of Rio de Janeiro (Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa em Engenharia - UFRJ)

- CPTEC Center for Weather Forecasts and Climate Research (*Centro de Previsão do Tempo e Estudos Climáticos*)
- E&E Economy & Energy (*Economia & Energia*)
- EMBRAPA Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária*)
- FBDS Brazilian Foundation for Sustainable Development (*Fundação Brasileira para o Desenvolvimento Sustentável*)
- FIOCRUZ Oswaldo Cruz Foundation (Fundação Oswaldo Cruz)
- FUNCATE Foundation for Space Research, Application and Technology (*Fundação da Ciência, Aplicação e Tecnologias Espaciais*)
- INPE National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais)
- MCT Ministry of Science and Technology (*Ministério da Ciência e Tecnologia*)¹⁴
- MMA Ministry of Environment (Ministério do Meio Ambiente)
- MME Ministry of Mines and Energy (*Ministério das Minas e Energia*)
- SNIC National Cement Industries Association (Sindicato Nacional da Indústria de Cimento)
- UFBA Federal University of Bahía (Universidade Federal da Bahía)

Institutional setup

After the ratification of the UNFCCC by Brazil in February 1994, the Government established *the Inter-Ministerial Commission for Sustainable Development (CIDES)* in1994 (chaired by the Ministry of Planning and Budget). The objective of the CIDES was to provide assistance to the Government in decision-making about national strategies and policies geared towards sustainable development. The responsibility for the coordination of the implementation of the UNFCCC was given to the Ministry of Science and Technology (MCT). In response to the mandate granted by CIDES, MCT established the *General Coordination on Global Climate Change (CGMC)* in August 1994. Its principal goal was to coordinate the implementation of the UNFCCC in Brazil and its initial main task was to develop the initial and subsequent National Communications¹⁵.

In 1999 the Government created the Inter-Ministerial Commission on Global Climate Change (CIMGC), with the purpose of coordinating the actions of the government in this area (by Presidential Decree of July 7, 1999, amended by Decree of January 10, 2006). The Commission is composed of several ministries¹⁶ and is headed by the Ministers of Science and Technology (MCT) and of Environment (MMA), respectively as President and the Vice-President of the Commission. MCT's CGMC serves as Executive Secretariat of the Commission and provides technical and administrative support to its operation. The CIMGC provides input on the Government's involvement with the UNFCCC and sets criteria and makes decisions on Clean Development Mechanism (CDM).

In 2007, the Federal Government created the Inter-Ministerial Committee on Climate Change with the task of steering the development, implementation, monitoring and evaluation of the National Plan on Climate Change, among other functions. The Committee is coordinated by the Executive Office of the Presidency of the Republic and is composed of seventeen federal bodies and the Brazilian Forum on Climate Change.

¹⁴ MCT has been renamed recently as the Ministry of Science, Technology and Innovation (*Ministério da Ciência, Tecnologia e Innovação*)

¹⁵ The General Coordination is also the Executive Secretariat of the Brazilian Designated National Authority (DNA) under the Clean Development Mechanism (CDM), which is the Inter-Ministerial Commission on Global Climate Change (CIMGC).

¹⁶ Ministries of External Relations (MRE); Agriculture and Food Supply (MAPA); Transport (MT); Mines and Energy (MME); Planning, Budgeting and Management (MPOG); Environment (MMA); Science and Technology (MCT); Development, Industry and Trade (MDIC); of Cities (MCid); Finance (MC) and the Executive Office of the Presidency of the Republic.

In addition to the Government, the Brazilian non-governmental organizations, the private sector, and the academic community did also manifest interest in enhancing the debate on climate change. In order to allow a greater integration of the diverse social actors, increasing awareness on climate change, the Brazilian Forum on Global Climate Change was created in June 2000, aiming at serving as a public arena for discussion on climate change issues and opportunities¹⁷.

¹⁷ See <u>www.forumclima.org.br</u>

2. FINDINGS

2.1 Effectiveness; achievement of the project's objective

The report is available in two Volumes in print and in electronic form and can be downloaded (also in individual chapters) from the climate change website, <u>www.mct.gov.br</u> of MCT (Ministry of Science and Technology). The National Communication consists of five Parts, following the UNFCCC guidelines¹⁸:

- National circumstances and special arrangements of Brazil;
- Brazilian inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases (not controlled by the Montreal Protocol);
- Description of steps taken or envisaged to implement the UNFCCC in Brazil;
- Other information considered relevant to the achievement of the objective of the Convention;
- Financial, technical and capacity needs associated with the implementation of activities related to the elaboration of the 2nd National Communication.

Box 1 gives the outline of the five Parts of the Second National Communication. The Executive Summary of the National Communication is put in Annex C to this report to provide the reader with a quick overview of the content of and ideas presented in the Communication.

The Communication comprises the Brazilian Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases not controlled by the Montreal Protocol, covering the period 1990-2005, providing emission estimates for the years 1990, 1994, 2000 and 2005. This is the result of the consolidation of 18 sectoral reference reports (see Table 1, page 19). This inventory covers carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

The preparation of the Inventory was based on the following technical guidelines of the Intergovernmental Panel on Climate Change (IPCC):

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (1997);
- Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (2000);
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003);
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

The CGMC (General Coordination on Global Climate Change) of MCT has been in charge of coordinating activities related to Brazil's Second National Communication to the UNFCCC. In terms of work division for the Second Inventory, the Ministry of Mines and Energy (MME) coordinated the energy sector; FUNCATE was in charge of the forestry and land use sector; EMBRAPA, the agriculture and livestock sector; CETESB, the waste treatment sector; and the coordination of the industrial sector was up to each of the main trade associations, such as aluminum (Brazilian Aluminum Association - ABAL), cement (National Cement Industry Union - SNIC), steel (Brazilian Steel Institute - IABr), chemical (Brazilian Chemical Industry Association - ABIQUIM) and coal (Brazilian Coal Association - ABCM).

 [&]quot;Guidelines for the preparation of National Communications from non-Annex I Parties to the Convention" (Decision 17/CP.
 8)

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1 Constrainsts and Gaps, and Related Financial, Technical and Capacity Needs On methodology, it should be mentioned that the Brazilian government objects to the use of the Global Warming Potential (GWP) for the comparison of greenhouse gases. The option for aggregating the reported emissions into carbon dioxide equivalent units using the GWP for a period of 100 years was not adopted by Brazil. Therefore, its National Communications report emissions just in units of mass for the individual greenhouse gases¹⁹.

In comparison with the Initial National Communication, two points should be noted. First, the project of the Second National was designed to enhance and extend the studies on activity data and emission factors related to the sectors that were believed to require intensive country specific research, in particular land-use, land-use change and forestry (LULUCF) and agriculture.

Detailed estimates of LULUCF and agriculture as greenhouse gas emission sources or sinks are important. Brazil is one of the most important repositories of the world's forest (and biodiversity). LULUCF and agriculture by consequence make up a large share of Brazil's GHG emissions (over 75%). This situation is different from that of most countries, where CO_2 emissions from fossil fuels by the energy and transport sectors are dominant. In Brazil, LULUCF is dominant and the energy sector is characterized by a relatively high share of hydropower in power generation and use of ethanol as transportation fuel.

The LULUCF and agriculture inventory is extremely complex as Brazil has a huge land area in forestry²⁰ and agriculture. The sectors involve a high degree of uncertainty, considering the lack of emission factors and/or activity data (savanna burning, waste, soil carbon emissions and, planted forests emissions/uptake)²¹. Priorities for the Second National Inventory were then set taking in consideration these results together with an assessment of the feasibility and cost/benefit of each research activity proposed. The Second National Communication contains a detailed assessment of the contribution of forest and grassland conversion and the abandonment of managed lands to overall Brazilian emissions; and a review of the use of default and international data. The assessment follows the most detailed methodology included in the IPCC Good Practice and Guidance 2003, departing from satellite imagery. Though the data on land use conversion by itself are reliable, one problem encountered was to estimate the biomass content, which varies extremely between different regions, even for different parts of the Amazonian forest. An assessment of emission uncertainties was made and presented in Chapter 4 of Part II of the Communication.

Second, the Communication project enlarged the scale and scope of other activities to be undertaken, included the downscaling of existing global circulation models (using a regional model; see further); vulnerability and adaptation (V&A) assessments (focusing on the health sector; energy sector; water resources, floods, and desertification; agriculture, pasture and livestock sector; coastal zone management; and aquatic biodiversity) and studies on possible V&A measures.

Global coupled ocean-atmosphere models are used to generate global climate change scenarios. To generate climate simulations over hundreds of years with computational efficiency, global models are limited to rather coarse resolutions. Studies for assessing vulnerability and climate

¹⁹ According to Brazil, the GWP does not adequately represent the relative contribution of the various greenhouse gases to climate change. Its use would overemphasize and erroneously stress the importance of greenhouse gases that remain in the atmosphere for only short periods of time, such as methane.

²⁰ Amazonian rainforest: 3.5 million km², Cerrado (savannah): 2.5 million km², Caatinga (semi-arid): 1.5 million km², the swamp area Pantanal (about 140,000 km²) and patches of Atlantic forest

²¹ The methodology is based on the analysis of satellite images, allowing assessing the amount of annual deforested or left to regrow areas. The results put together with the area converted allow making an estimate of the biomass content. However, these data are extremely variable for different regions and even for different parts of the Amazonian forest.

change impact require a more detailed resolution at the Earth's surface. Regional climate models combine the calculated global climate change conditions with detailed land surface characteristics on a smaller scale and allow for modeling of local effects.

CPTEC has developed a regional climate model (ETA) that can be applied easily to South America to generate detailed climate predictions, including climate change²². Regional climate models have a much higher resolution²³ (referred to as *downscaling*) than the global climate models and, as a result, provide climate information with useful local details, including more realistic predictions of extreme events.

2.2 Achievement of results

For each of the four outcomes, as mentioned in paragraph 1.2, this section assesses the progress in the implementation of the project's outcomes and outputs. The numbering of outcomes and outputs in Table 1 follows the format as given in the UNDP Project Document. The main objective is the preparation of the Second National Communication. The last column indicates how the project's activities (outcomes/outputs) have contributed to the formulation of a particular Part or Chapter of the National Communication. The third column indicates the current status of activities with in brackets indicates the main organization involved. For the main background studies institution or organization (e.g. industry association) an was typically involved/subcontracted as main responsible. For example, the first row in column three indicates, for example (CETESB). This means that CETESB was the main party in the preparation of the waste management inventory report.

The information is based on reports provided by UNDP (progress reports and final report, including the annual UNDP/GEF APR-PIRs (Annual Project Review-Project Implementation Reports), the actual Second National Communications and its various underlying technical reports, and checked with the information obtained from the various interviews held during of the evaluation mission.

Table 1Overview of the project's outcomes and outputs

| Outcome | Output | Status | Part and Chapter in National Communication |
|--|---|---|---|
| 1. National Inventory refinement | 1.1 Inventory improvement carried out Energy Sector²⁴; Industry Sector²⁵; Agricultural | Inventories completed: Summary inventory report 18 sectoral reports (agriculture, industrial processes, energy sector, | Part II 1. Introduction 2. Summary of anthropogenic emissions by sources and |

²² The ETA Model is a full-atmospheric regional model in use by CPTEC since 1997 for operational weather and seasonal forecasts. The model has been adapted to work as Regional Climate Model (RCM) and was used to produce climate change scenarios for the Second National Communication

²⁵ Involving the activities: 1) improve the assessment for the cement production sector, 2) improve activity data and assessment for lime production, limestone and dolomite use sectors, 3) improve activity data and assessment of iron and steel industry sector, 4) improve activity data and assessment of chemical industry sector, 5) improve activity data and assessment of HFCs, PFCs and SF₆ sector

²³ Spatial resolution is 40x40 km², whereas the global models, such as ECHAM and HadleyCM3 use grids of about 300 by 300 km

²⁴ involving the activities: 1) assess and improve the Energy Balance Information, 2) improve and extent the Bottom-Up approach for GHG emissions estimation, 3) improve knowledge of Brazilian specific energy transformation sectors, 4) improve data and emissions estimation for the transportation sector using the IPCC Tier 2 Approach, 5) improve methodology and obtain and extend data for estimating fugitive emissions

| Outcome | Output | Status | Part and Chapter |
|---|--|--|--|
| | | | in National |
| | 26 | | Communication |
| | sector²⁶; LULUCF²⁷; Waste sector²⁸ 1.2 Strengthening of national structure for estimation of greenhouse gas emissions Establish quality control and quality assurance²⁹; Establish database for activity data and emission factors³⁰ | waste management, land use and forest) (available at www.mct.gov.br/index.php/ content/view/310922.html Fuels, top-down (E&E) Air transportation (ANEC) Road transport (E&E) Fuels, bottom-up (E&E) Fuel industry (Petrobras) Mining (ABCM) Agricultural waste (EMBRAPA) LULUCF (FUNCATE) Waste management (CETESB) Industrial processes, HFCs and PCFs Industrial processes, chemical (ABIQUIM) Aluminum (ABAL) Iron and steel (Instituto Aço) Minerals, cement (SNIC) Minerals A databank has been developed on the inventory and can be downloaded from the MCT website | removal by sinks of greenhouse gases by gas 3. Anthropogenic emissions by sources and removal of greenhouse gases by sector 4. Estimate uncertainties |
| 2. Methodological approach regarding vulnerability | 2.1 Regional modeling of climate and climate change scenarios³¹ Analyze climate | ETA model enhanced to climate change modeling (CPTEC-INPE) Report on regional climate | Part III / B: Programs containing measures to facilitate adequate |
| assessment and adaptation measures elaborated | change scenarios for South America based on global climate change | change modeling and scenarios available at www.mct.gov.br/index.php /content/view/330437.html | adaptation to climate change 1. Program for |

²⁶ Involving the activities: 1) improve country specific emission factors for livestock enteric fermentation and manure management sectors, 2) improve the assessment of N₂O emissions from agricultural soils, 3) develop country specific emission factors for rice cultivation and improve and extend activity data, 4) improve the assessment of CO, CH₄, N₂O and NOx emissions from agricultural residues burning, and 5) improve the methodology and obtain and extend data to estimate emissions due to the prescribed burning of savannahs

²⁷ involving the activities: 1) improve the assessment of emissions for the forest and grassland conversion sector, 2) improve the assessment of emissions for the changes in forest and other woody biomass sector, 3) improve activity data and assessment of emissions of the CO₂ emissions and removals from soilds sector, and 4) methane emissions from water reservoirs

²⁸ involving the activities: 1) improve data and extend estimates for solid waste disposal sector, 2) improve data and extend estimates for wastewater handling sector, and 3) estimate the GHG emissions from waste incineration sector

²⁹ involving two activities: 1) develop and implement a quality control pilot plan, and develop and implement quality assurance procedures

³⁰ Involving one activity: develop a database for storing activity data and emission factors, keeping track of methodology and assumptions underlined in their establishment

³¹ This outcome relates to the need for downscaling methods for Brazil that could be applied to the climate change scenarios based on global climate models, i.e. "downscaling" means more detailed projections of climate with a higher spatial resolution than that provided by a global climate model. which would provide more reliable scenarios for South America, in respect to the impacts of climate change either on mean surface temperature or on precipitation patterns.

| Outcome | Output | Status | Part and Chapter |
|---------|--|---|---|
| | | | Communication |
| | models from the IPCC-Data Distribution Center³² Develop and improve the regional ETA/CPTEC model Develop and analyze climate- change downscaled scenarios for Brazil Enable the specialists of the CPTEC/INPE (National Institute for Space Research) to develop capacity for climate modeling on longer time scales, and to develop capacity building in V&A 2.2 Vulnerability and adaptation research and studies concerning strategic sectors that are vulnerable to the impacts associated with climate change in Brazil carried out Health sector (study : study the vulnerability to climate related diseases - such as malaria, leishmaniasis and cholera - and adaptation measures Energy sector (vulnerability of the power sector and possible adaptation measures Water Resources, floods and desertification (estimate the biophysical | (note: simulations served as inputs in the vulnerability assessments) Sectoral reports were finalized by August-October 2010): Health (Fiocruz) Energy V&A (COPPE-UFRJ) Water (FBDS) Coastal zones (UFRJ) Biodiversity (UFBA) | Communication modeling future climate change scenarios Effects of climate change in marine and land ecosystems |

³² The global models HadCM3 and ECHAM were used with scenario calculations for the period 2010-2100.

| Outcome | Output | Status | Part and Chapter |
|---|--|---|--|
| | | | Communication |
| 3. Description of the Brazilian national circumstances and the steps taken or envisaged to implement the | impacts of climate change on hydrologic resources in terms of water quantity – annual and seasonal distribution) Agriculture Coastal zone management Biodiversity Establish a Coordination between the elaboration of the Regional Modeling of Climate and Climate Change Scenarios and the vulnerability and adaptation research S.1 Elaborate a report on national circumstances National and regional development priorities Institutional arrangements relevant to the preparation of the | Elaborated reports: National circumstances (with demographic and economic indicators updated) elaborated. Mercosur, Relevant, Institutional Arrangements and Special Circumstances; Programs and Activities Related to Sustainable | in National Communication |
| ртератей | preparation of the inventory Special circumstances 3.2 Steps taken or envisaged to implement the Convention in Brazil Describe programs containing measures to mitigate climate change implemented or been elaborated in Brazil; Describe programs implemented or been elaborated in Brazil; Describe programs implemented or been elaborated in Brazil containing measures to facilitate adequate adaptation to climate change; Describe other | Related to Sustainable Development and energy programs Research and systematic observation as well as on national and regional capacity | Part III / A: Programs containing measures to mitigate climate change: Programs and actions related to sustainable development Programs and actions that contain measures that contreibute towards climate change and its adverse impacts Integration of climate change to mid- and long-term |

| Outcome | Output | Status | Part and Chapter |
|-------------------|---------------------------|-----------------------------------|--------------------|
| | | | in National |
| | information | | Communication |
| | considered relevant | | 4 Clean |
| | to the achievement | | Development |
| | of the objective of | | Mechanism |
| | the Convention in | | (CDM) |
| | Brazil, regarding | | () |
| | transfer of | | Part IV: |
| | technologies, | | 1. Transfer of |
| | research and | | technologies; |
| | systematic | | 2. Research and |
| | observation, | | systematic |
| | education, training | | observation |
| | and public | | 4. National and |
| | awareness, capacity | | regional |
| | building activities | | capacity |
| | and, information | | building |
| | and networking | | |
| | change described | | |
| 1 Public | 4.1 Spread of information | Webpage on National | Part IV. |
| awareness and | nublications of | Communication available as part | 3 Education |
| education | documents | of MCT's climate change | training and |
| strategy in place | organization and | webpages at | public |
| 85 F | participation in events | www.mct.gov.br/index.php/ | awareness |
| | related to climate | content/view/310581.html in | 5. Information and |
| | change issues | Portuguese, English, Spanish and | networking |
| | 4.2 Make available in the | French | |
| | web site of the | | |
| | Ministry of Science | Public consultation were | |
| | and Technology | facilitated through a window on | |
| | (MCT) updated | MCT's climate change website | |
| | information | was especially created to receive | |
| | concerning climate | National Communication and its | |
| | as the undated national | hackground and sectoral reports | |
| | GHG inventory | Suckeround and sectoral reports | |
| 5. Preparation of | 5.1 Publish Brazilian | | The Second |
| the Second | Second National | | National |
| National | Communication in | | Communication is |
| Communication | English and | | available in |
| | Portuguese | | Portuguese, |
| | | | English, Spanish |
| | | | and French. |

To sum up, this Enabling Activity has achieved its planned outcomes and outputs, by producing quite an extensive Second National Communication (SNC) and a number of well-appreciated underlying technical reports, database and research. The elaboration of the SNC met some delays that will be discussed in the next section. Nonetheless, the SNC was presented in a timely manner at UNFCCC's COP in Mexico in November 2010,

Apart from achieving the project's objective and outcome, the project has some longer-term impacts and replication effects that will be discussed in Section 3.1.

2.3 Project implementation and efficiency

2.3.1 Project implementation

Delays

When the negotiations on the project document were concluded, it was established that project duration would be three years (2006-2008). As mentioned earlier in Section 1.2, the project had to be extended with 1 year and then with another year up to November 2010^{33} . The reasons for these extensions are detailed below:

- One difficulty encountered in the beginning of the implementation of the project was the establishment of agreements with key institutions related to the outcomes and outputs of the Project Document. The establishment of these agreements suffered a considerable delay due to administrative processes within these institutions as well as within the Government ministries;
- The LULUCF inventory is extremely complex as Brazil has a huge land area in forestry and agriculture. In the overall CO₂ inventory of emission sources and sinks, the sector plays a crucial role. For example, LULUCF was responsible for around 75% of CO₂ emissions of Brazil in 2005. However, technical difficulties were faced by the team at key institutions, FUNCATE (in charge of preparation of the LULUCF inventory) and EMPRABA (agriculture). For example, the project National Biodiversity project PROBIO (World Bank/GEF) provided many data, but with gaps and blank areas for the purpose of national reporting, which had to be complemented by other satellite imagery data. Furthermore, different representation of types of vegetation for the same class or lack of continuation in the classification for neighbor images created significant problems in data harmonization process regarding transition areas between and within biomes. Efforts were undertaken to correct errors and generate information regarding the blank areas, which took considerable amount of additional financial resources (national) and time;
- Regarding the vulnerability and adaptation (V&A) assessment, problems were identified in the development of climate change downscaled scenarios for Brazil, given that the team in charge faced difficulties in getting adequate time use and storage space in the supercomputer installed at CPTEC³⁴ (from the INPE³⁵), which caused a delay in the development of methodological approach regarding vulnerability assessment and adaptation measures.

It should be noted that the UNFCCC allows that the Second National Communications can be submitted within four years³⁶, with a possible extension up to one year (that should be informed to the UNFCCC). Thus, despite the before-mentioned delays, the SNC was deposited in its

³³ At formulation of the Project Document, it was originally thought that project duration would be 3 years.. Decision 8, adopted by the 11th Conference of the Parties of the UNFCCC, entitled "Submission of second and, where appropriate, third national communications from Parties not included in Annex I to the Convention"). However, Paragraph 3 of Decision 8/CP. 11 states that "non-Annex I Parties shall make all efforts to submit their second and, where appropriate, third national communication, within *four* years of the initial disbursement of financial resources for the actual preparation of the national communication. it is worth mentioning that the extension of one year of the project in light of the technical difficulties faced during the implementation was allowed in light of the decision 8/CP. 11, (which states that an extension up to one year, in this case up to 2010, should be informed to the UNFCCC).

³⁴ Center for Weather Forecast and Climate Studies

³⁵ National Institutional for Space Research

³⁶ Paragraph 3 of Decision 8/CP. 11 (cf. Decision 8, adopted by the 11th Conference of the Parties of the UNFCCC, entitled "Submission of second and, where appropriate, third national communications from Parties not included in Annex I to the Convention") states that "non-Annex I Parties shall make all efforts to submit their second and, where appropriate, third national communication, within four years of the initial disbursement of financial resources for the actual preparation of the national communication, in accordance with Article 4, paragraph 3, of the Convention, under the expedited procedures or standard approved procedures, on an agreed full-cost basis".

Secretariat on the 30th November, 2010, in other words, in compliance with the deadlines for the submissions of National Communications under the UNFCCC.

Project team

A project team was established at MCT in Brasília headed by a Coordinator³⁷, supported by two teams. One team³⁸ for the "National Circumstances, Steps Taken or Envisaged and Other Information Considered Relevant to Implement the Convention" and one team for the "Second Brazilian Inventory Brazilian Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases" based in Brasília³⁹, based at the premises of FINEP⁴⁰ in Río de Janeiro. The place of the second team can be explained by the location of many of the research institutes and organization within or in the vicinity of the São Paulo - Río de Janeiro area.

UNDP mentions in the 2010 APR-PIR (progress report) the following about the project team; "the project was well-managed and reached the planning targets on time. The Project team is dedicated, knowledgeable of the rules and regulations applicable for project implementation and well versed on international projects implementation, assuring a smooth performance throughout the years". The size of the project team has varied over the project implementation period ranging from 3-6 staff per team. Staff was typically hired on the basis of 'temporary contracts' as government employees. However, many contracts of experts were not extended after July 2009. This created significant constraints to the capacity of the Ministry of Science and Technology (MCT) in analyzing the sectoral reports resultant from the project and in completing the draft of the Second National Communication. Some of the experts who were under these temporary contracts left MCT; other experts were retained by using additional funding through UNDP, as will be explained in the next section.

2.3.2 Financial aspects and cost-effectiveness

Table 3 on the next page gives an overview of the financial data of the UNDP/GEF project on supporting the Second National Communication, i.e. original budget, actual expenditures as well as planned and realized cash cofinancing. Table 2 provides details on the in-kind co-financing.

Regarding cash funding (by GEF), it needs to be mentioned that in the end MCT had to make additional cash funds available (in addition to its inkind co-financing) for the following two reasons:

Table 2 In-kind co-financing, planned and realized

| Contributor | In-kind <i>(3)</i> | Realized |
|-------------|--------------------|-----------|
| INPE | 2,500,000 | 2,500,000 |
| МСТ | 1,675,600 | 2,940,206 |
| EMBRAPA | 330,000 | 334,793 |
| FUNCATE | 430,000 | 587,605 |
| CPTEC-INPE | 870,000 | 870,000 |
| Others | 1,940,000 | 841,819 |
| TOTAL | 7,745,600 | 8,074,423 |

Source: Project Document and progress reports (APR-PIR, 2008, 2010). Note that the in-kind co-financing of INPE and MCT has been reported in US dollars (USD); this was the co-financing, amounting to USD 4,175,600, as mentioned in the Project Document

The co-financing of the other organizations has been added after project inception (due to reasons mentioned in the main text; see 2.3.1 and 2.3.2) and are quoted in Brazilian currency, the real (BRL) and the dollar-equivalent varies according to the exchange rate used. Realized co-financing in this table is based on the 2010 APR-PIR and uses the exchange rate of that report

³⁷ Mr José D.G. Miguez, supported by Mr Adriano S. de Oliveira as Deputy Coordinatior

³⁸ Headed by Technical Coordinator, Mr Haroldo de Oliveira Machado Filho, supported by Mr. Renato Rodrigues as Deputy Coordinator

³⁹ Headed by Technical Coordinator Mr Newton Paciornik, supported by Mr. Mauro Meirelles as Deputy Coordinator

⁴⁰ FINEP: Financing Body for Studies and Projects (*Financiadora de Estudos e Projetos*) is an agency under MCT that made office space available to the team.

Table 3 Overview of planned and realized GEF financing and co-financing

| | Original GEF budget | | Main | Expenditures GEF financing | | | | | |
|------------------|------------------------|-----------|---------------|----------------------------|-----------|-----------|----------------|--------------|-----|
| | | | activity | Total GEF | 2006-2007 | 2008 | 2009 | 2010 | |
| Per outcome | | (USD) | (1) | (USD) | | | | | |
| Outcome 1 | Inventory | 1,988,000 | Inventory | 2,084,262 | | 737,968 | 968,448 | 378,316 | |
| Outcome 2 | National structure | 150,000 | M odelling | 92,850 | | | 95,450 | -2,600 | |
| Outcome 3 | Regio nal modeling | 420,000 | V&A | 36,154 | | 3,818 | 12,647 | 19,689 | |
| Outcom e 4 | V&A assessment | 440,000 | Other | 2,730 | | 3,049 | 448 | -767 | |
| Outcome 5 | Nat. Circumstances | 100,000 | Staff / M&r | 305,098 | | | 34,829 | 215,096 | |
| Outcom e 6 | Awareness and edu. | 100,000 | TOTAL | 3,350,843 | 829,749 | 744,885 | 1,111,822 | 609,734 | ~~~ |
| Outcome 7 | Prep. of Nat. Comm | 100,000 | | | | | | | |
| Outcome 8 | Monitoring / report. | 102,000 | | | | | | | |
| TO | TAL | 3,400,000 | 1 | | | | | | |
| | | | Budget revisi | ion H (2009) | | Expe | nditures GEF + | MCT (in USD) | |
| Per budget line | (2) | (USD) | GEF | МСТ | Total | 2006-2007 | 2008 | 2009 | ~~~ |
| | •• | | | | | | | | |
| Consultants | | 815,000 | 1,447,145 | 336,357 | 1,892,174 | 477,647 | 346,557 | 522,881 | |
| Travel | | 350,000 | 406,951 | 109,362 | 476,635 | 51,744 | 133,699 | 183,014 | |
| Subcontracts | | 1,648,000 | 859,090 | 352,916 | 854,440 | 175,508 | 227,106 | 305,994 | |
| Equipment, mat | terials & goods | 380,000 | 305,627 | | 306,102 | 120,361 | 31,804 | 97,962 | |
| Info tech. equip | / rental | | 151,811 | | 160,530 | 1,593 | | | |
| Misc / facilitie | s / curr. Loss / Other | 207,000 | 41,451 | | 52,570 | 2,896 | 5,669 | 1,971 | |
| Staff / salary / | insurance | | 212,220 | | 264,927 | | | | |
| то | TAI | 2 400 000 | 2 424 205 | 709 625 | 4 007 278 | 010 000 | 744 035 | 1 111 077 | |

Notes:

Data on expenditures have been compiled from a sources made available by the UNDP Brasília office, including excerpts from their ATLAS budget and monitoring system, annual progress reports (APR-PIRs), audit reports (2009), progress reports and budget revisions (notably revisions "F" and "H"). The data on the original GEF and co-financing budget are taken from the UNDP Project Document. Some deviations from these reports may occur due the following: a) rounding errors in the Excel spreadsheet used; b) differences in interpretation in certain budget lines originally and as later provided as in input in ATLAS. These differences, if any, are minor.

- More funds were necessary in order to carry out additional or more in-depth studies in the LULUCF area (for reasons explained in Section 2.3.1);
- Budget at time of project formulation was determined at USD 1 = BRL 3.15. However, the exchange rate oscillated during project implementation and went as low as USD 1 = BRL 1.71. This created several financial difficulties for the project to comply with its basic commitments, since all of its expense commitments were paid in Brazilian Reais (BRL).

Thus, additional funds needed to be leveraged which was done in two ways:

- Organizing additional contributions (in terms of efforts and in-house budget) from the main partner organizations, such as MCT, MME, E&E, CPTEC, CETESB, EMBRAPA, FUNCATE or ABCM. The value of these additional in-kind contributions are summarized in Table 2 and could be valued at 2010 exchange rates at USD 3.90 million (plus the original USD 4.175 million gives a total of USD 8.074 million);
- MCT cash co-financing of about USD 0.64 million in order to be able to finalize the studies for the inventory and vulnerability assessments (see Table 3).

Regarding effectiveness of financial plans, it should be noted that these were properly prepared (in the UNDP ATLAS system) and audited⁴¹. Given the size and complexity of the formulation of a National Communication in Brazil (e.g., the LULUCF inventory is extremely complex and Brazil has a big forested area) the GEF funding and the leveraged co-financing (cash and in-kind) has been well-used. The project has complied with the incremental criterion by actually securing more (cash) co-financing than originally planned.

2.3.3 Monitoring and evaluation; adaptive management

As the implementing agency, UNDP Brazil established a specific unit to serve the project. This unit was located at their office in Brasília and monitored activities developed and implemented related to the National Communications. The unit advised regarding applicable procedures and participated in the selection of institutions and organizations to be subcontracted. It evaluated the outputs to the project, whether from the subcontracted (national) consulting firms and institutions or from partnerships with public and private institutions. UNDP supported contracting of experts when MCT started ending contracting of experts as 'temporary staff' in 2009 to be able to bridge the period until the final formulation of the National Communication. Thus, UNDP did respond to this implementation issue, facilitating the presentation of the National Communication on time at COP in 2010 in Mexico.

In general, project monitoring and evaluation has been conducted in accordance with the UNDP and GEF procedures. The Project Document provides with a budgeted M&E plan and a logical framework of outcomes and outputs with project progress indicators. Regarding reporting, the project team has complied with the reporting requirements and schedule, producing annual progress reports, audit reports and monitoring reports (APR-PIRs⁴²) as well as minutes of relevant meetings (e.g. tripartite review meetings).

It is worth mentioning that the coordination team of the National Communications submitted the inventory sectoral reports to specialists in a peer review process. Moreover, the draft of the Second National Communication was submitted to public consultation for comments and validation, similar to the process under the IPCC. Documents were made available through the website of the Ministry of Science and Technology for an average of two months for comments.

⁴¹ The Evaluator checked the 2009 audit report as an example, as well as excerpts from the ATLAS system

⁴² The annual APR-PIR provide a table

2.3.4 Stakeholder involvement

The MCT engaged a broad-based network of partners to prepare the Second National Communication. This network started taking shape in the mid-1990s and became stronger during the preparation of the first National Communication. The Second National Communication showed a considerable increase in the number of institutions and experts involved; the Communication mentions that "over 600 institutions and 1,200 experts with recognized competence in their respective areas of expertise from a variety of sectors (energy, industry, forestry, agriculture/livestock, waste treatment, etc.) were involved, coming from the public and private sectors, as well as from the academia".

In 2007 the Brazilian Research Network on Global Climate Change (*Rede Clima*) was launched with the aim to generate and disseminate knowledge (to enable Brazil to face the challenges of climate change more adequately) and to integrating national experts and expertise on climate issues (to enhance the effectiveness of scientific research programs).

2.4 **Project design and relevance**

2.4.1 Relevance and ownership

A description of the institutional framework on climate change is given in Section 1.4. Apart from complying with international obligations under the UNFCCC, the preparation of the National Communication fits within the national climate-relevant programs of the Government.

Brazil adopted its National Plan on Climate Change in December 2009, which defines actions and measures aimed at mitigation and adaptation to climate change. Federal Law No. 12,144 (December 9 2009) established the National Fund for Climate Change to financially support mitigation and adaptation action using resources from the oil royalties. Federal Law No. 12,187 (December 29, 2009) provides the principles, objectives, guidelines and implementation mechanisms of the Brazilian Climate Change Policy. The Law establishes a voluntary goal to reduce Brazil's GHG emissions in the range of 36% to 39% in comparison with projected emissions for 2020. The national inventories reported in the Communication (to be updated under the Third National Communication) have helped in providing the input data required to calculate the projected emission levels, as well as the reductions that can be achieved by appropriate measures across the key sectors involved.

The 2007-2010 Action Plan of Science, Technology and Innovation for National Development – (PACTI) includes a specific "national program on climate change" in its Component three, entitled Research, Development and Innovation in Strategic Areas. Its purpose was to expand Brazil's scientific, technological and institutional capacity in the field of climate change so as to increase knowledge on the issue, identify the impacts on the country, and support public policies to address the problem both at national and international level. One action was to provide financial support for the preparation of the Second National Communication of Brazil (in addition to the GEF funding) and to promote additional activities such as publications and discussions on the results of the inventory with the relevant community, by means of seminars and broad dissemination and the publication (in Portuguese, English and Spanish) of the results of the studies⁴³. Under the Federal Government's 2008-2011 Multi-Annual Plan, the program called

⁴³ See <u>www.mct.gov.br/index.php/content/view/4009.html</u>. The first phase of the Program covered 2000-2003, followed by subsequent phases up to 2010

"Meteorology and Climate Change" aims to provide insight into the mechanisms of global climate change and to improve weather, climate, hydrological, and environmental forecasting capacities. In this program, specific actions in the area of climate change have been planned, such as the National Inventory of Greenhouse Gas Emissions, operationalization of the Clean Development Mechanism and R&D on global climate change.

Other related programs with links to climate change include⁴⁴:

- National Air Quality Control Program (PRONAR); Motor Vehicle Air Pollution Control (PROCONVE); National Logistics and Transportation Plan (PNLT);
- Measures (legal, administrative, economic) against deforestation in the Amazon; Monitoring by remote sensing; National system of protected areas (SNUC); Prevention of fires and burning (such as PROARCO⁴⁵, PREVFOGO⁴⁶; prohibition of sugarcane harvest burnings);
- Cities for Climate Protection (CCP)

These resources, directly or indirectly linked to climate change, have enabled Brazil to continue its efforts towards the implementation of the Convention, bridging the existing gap of funds since the end of the first Enabling Activity in December 2000, allowing for the continued implementation of some activities financed by the federal budget under the co-ordination of MCT, and especially keeping the climate change specialized staff. However, the funds available have been modest, e.g. the resources during 2000-2007 amounted to about USD 330,000 annually and hence GEF funding was requested for the National Communications to allow a comprehensive approach to climate change documentation.

Without GEF intervention, climate change reporting in Brazil would have been limited to the financial resources allocated in the Brazilian budget, which would not have been sufficient to allow the elaboration of the 500-page document the National Communication has become. The UNDP/GEF intervention can be considered as quite **relevant**, therefore.

2.4.2 Country eligibility

Brazil was the first signatory to the UNFCCC in June 1992. Ratification by the Congress followed in 1994. Brazil presented its Initial National Communication in December 2004 and the Second National Communication in November 2010.

UNDP provides assistance to Brazil under the Development Assistance Framework 2007-2011, which was prepared in cooperation with the Brazilian Cooperation Agency (ABC)⁴⁷, and published in December 2005. The project fits with in UNDAF Outcome 5 "More efficient use of available resources is ensured to promote an equitable and environmentally sustainable economic development". The Second National Communication has provided a wealth of necessary information on GHG emissions for all relevant sectors of the national economy. As such, it has established baseline information as input for initiatives within UNDP's and GEF's portfolio that aim at curbing GHG emissions, e.g. in the area of renewable energy and energy efficiency.

2.4.3 Design

The main objective of the 'enabling activity' is simple, i.e. produce an acceptable National Communication within a reasonable period of time. Being an 'enabling activity', the structure of

⁴⁴ As mentioned in the Second National Communication, Part II

⁴⁵ Program for the Prevention and Control of Burning and Forest Fires in the Arc of Deforestation

⁴⁶ National System for Preventing and Combating Forest Fires

⁴⁷ Under the Ministry of Foreign Affairs

objectives and outcomes in the project's logical framework is more straightforward than in the case of a typical GEF-supported medium-sized or full size 'technical assistance' projects that often have a multiple set of objectives that aim to remove institutional-governance, financial, knowledge and informational and capacity barriers.

The logical framework (results framework) as given in the original Project Document is given in Table 4 below. Progress indicators in the logical framework are straightforward as well with simple baseline indicators ('zero', i.e. no document/report has been produced yet at the project's start) and target indicators ('one', i.e. the technical report or part of National Communication of that particular outcome or output has been finalized).

Table 4 Log Frame / Results framework (from the ProDoc of the enabling activity project)

| Project | Objectively verifiable indicators | | | | | | | | | | | |
|------------------------|---|--------------------------|---|--|---|--|--|--|--|--|--|--|
| Strategy | | | | | | | | | | | | |
| Goal | Ensure Brazil's continued participation in and progress towards the implementation of the UNFCCC, assisting the country in the preparation of its Second National Communication. | | | | | | | | | | | |
| Immediate Objective | To prepare the Second National Communication of Brazil to the UNFCCC and carry out studies on vulnerability and adaptation measures, develop regional modeling of climate and climate change scenarios, and build institutional capacity for implementing the Convention in Brazil. | | | | | | | | | | | |
| | Indicator | Risks and Assumptions | | | | | | | | | | |
| Outcome 1 | 1 (one) national inventory elaborated by the end of the project | 0 | 1 | GHG inventory published | Delay Existing capacity | | | | | | | |
| Outcome 2 | 1 (one) model conception finished and implementation running by the end of the project | 0 | 1 | First run report | Delay/Modeling problems Existing capacity/Time allocated for running | | | | | | | |
| | 1 (one) report elaborated by the end of the project | 0 | 1 | Report of studies of V&A published | Delay Existing capacity | | | | | | | |
| Outcome 3 | 1(one) report elaborated by the end of the project | 0 | 1 | Report of Description of steps taken or envisaged published | Delay Existing reports | | | | | | | |
| Outcome 4 | 1 (one) general public awareness and education strategy in place by the end of the project | 0 | 1 | <i>Website</i> updated, reports and booklets published | Delay Existing information | | | | | | | |
| Outcome 5 | 1 (one) Brazilian Second National Communication finalized by the end of the project | 0 | 1 | Brazilian Second National Communication published | Delay Existing reports | | | | | | | |

Regarding the project's assumptions and risks, the results framework already indicates the main risk factor, i.e. "delays". Delays are also mentioned as main risk factor in the project document of the Third National Communication. Given the fact these delays did occur in the 2^{nd} National Communication (as explained in Sections 2.3.1 and 2.3.3), the underlying reasons should be given attention (see also Sections 3.1.2 and 3.2).

3.1 Conclusions

3.1.1 Impacts and replicability

The publication of Brazilian emissions, which are proportional to the size of the economy of the country, its vast territorial expanse, and its large population, is important for the global climate change assessment.

The report meets the requirements for the preparation of national communications from Non-Annex I Parties, in accordance with the relevant UNFCCC COP decision⁴⁸. It is beyond the scope of this evaluation, to review the quality of data provided, ways of collection and methodological sturdiness of the National Communication. The UNFCCC facilitates "in-depth" reviews conducted by an international team of experts of National Communication; however, only non-Annex I countries are subject to such a review⁴⁹.

The evaluator has the opinion that the Second National Communication has been carried out in a transparent way and with scientific emphasis that sometimes goes beyond what was required from non-Annex I Parties to the UNFCCC. It is a highly valuable document both for Brazil and for the international community. Likely, the National Communication is in the top of non-Annex I reporting. One of the interviewees mentioned that "it is probably better than some of the Annex I Parties".

Regarding **longer-term impacts**, it should be stated that the objective of a National Communication is not to create national policy. Nonetheless, the Second National Communication of Brazil is the country's official report to the UNFCCC and has established several parameters upon which Brazil is basing (future) climate change related policies. The participation of multiple stakeholders from the public and private sectors in its elaboration has promoted the mainstreaming of climate change issues in Brazil. Thus, it has contributed to improvement of scientific understanding, influenced the formulation of national climate-relevant policies and enhanced national awareness on climate change. Ultimately, the SNC has been an essential instrument to define how Brazil can best contribute to climate change mitigation as well as how to adapt to the potential impacts of climate change without major economic and social impacts.

From the point of view of **replicability**, the project has generated improved approaches (in comparison with the Initial Communication), methodologies and tools, especially regarding inventory and vulnerability and adaptation assessment, which will prove useful to share with peer organizations, as well as important inputs for the scientific literature review periodically undertaken by IPCC. The general strategy was to use available information and, at the same time,

⁴⁸ Decision 17/CP.8 (Guidelines for the preparation of national communications from Non-Annex I Parties. The content of the Second National Communications follows the guidelines as suggested in this Guideline, namely 1) National Circumstances, 2) Greenhouse gas inventory, 3) Description of steps taken or envisaged to implement the Convention, 4) Other info considered relevant to the implementation of the objective of the Conventions (Technology transfer; Research and systematic observation; Education, training and public awareness; Capacitybuilding; Information and networking), 5) Constraints and gaps, and related financial, technical and capacity needs),

⁴⁹ Although they are considered by the expert group set up by the UNFCCC Subsidiary Body on Implementation to deal with issues relating to these communications.

put in place research programs to improve the knowledge of a particular problem and the data at hand. For example, because of the importance of the forest and grassland conversion and abandonment of managed lands in the LULUCF sector and the unreliability of default and international data, a large effort was undertaken to determine these based on the analysis of satellite images. These efforts will be replicated and continued to be deepened and expanded in the Third National Communication.

The participation of multiple stakeholders from the public and private sectors in the elaboration of the National Communication has promoted the **mainstreaming** of climate change issues in Brazil. This is part of an ongoing effort to improve scientific understanding, influence national policies, and enhance national awareness on climate change. For example, in agriculture extensive research program are normally carried out, but data gathering has not been particularly geared to climate change. Thus, the new issue of climate change has made institutions that do agricultural research to take new directions.

3.1.2 Ratings

GEF evaluation policy stipulates that ratings should be given to project relevance, effectiveness, efficiency and quality of the monitoring and evaluation system, as discussed in Section 1.3. The following Table 4 provides the ratings given by the Evaluator, based on the considerations presented in Chapter 2.

| Criteria | Rating | Rating | Item |
|---|--------|--------|---------------------------------|
| Achievement of objective and attainment of results (outcome and outputs) (sections 2.1 and 2.2) | HS | HS | Effectivenss and results |
| Conceptualization and design (section 2.3) | S | | |
| Relevance and ownership (sections 2.3 and 2.4.3) | S | S | Project design and relevance |
| Effectiveness of project management (section 2.4.1) | S | | |
| Monitoring and evaluation (section 2.4.1) | S | c | Project |
| Budget and co-financing (section 2.4.2) | S | 2 | efficiency |
| Involvement of partners and other stakeholders (section 2.4.3) | HS | | |

Table 5 Rating for project outcomes, design and implementation

The rating of the project *as a whole* is **satisfactory** (**S**), implying that the project had only minor shortcomings.

3.1.3 Sustainability and risks

Sustainability can be defined as the likelihood of continued benefits after the project ends. The assessment of sustainability considers the risks that are likely to affect the continuation of the project's outcomes. The main risk mentioned in the original documentation can be described as "delays in the delivery of outputs, i.e. the reports" (see also Section 2.4.3). Although with the

likelihood rated as 'low' at that time, this is nonetheless exactly what happened (for reasons described in Section 2.3.1). This section will address the risk for similar delays in future work (and other risks) now that Brazil should start the work on the Third National Communication.

Financial and implementation risks

The Brazilian Climate Change Fund is an important step forward but is targeted at direct investments to mitigate or adapt to climate change. Resources for activities, such as the National Communication, will therefore rely mainly on national R&D budgets, which are scarce under the circumstance of pressing social and development priorities. In other words, federal budget to for the activities needed to implement the Convention in Brazil is available, but funds are limited. The continuation of UNDP/GEF was sought therefore for the formulation of the Third National Communication. The Project Document has been approved with GEF support of USD 5.72 million and in-kind co-financing of USD 6.5 million.

The GEF amount is higher than in the case of the Second National Communication project (USD 3.4 million). The amount is justifiable, a) given the budget problems encountered in the elaboration of the Second Communication and b) given the fact that the Third National Communication will endeavor to acquire a more profound understanding of the driving forces behind the GHG emissions related to LULUCF as input for the design of adequate development policies and policy instruments. The Third Communication will look more into the dynamics of land conversion, i.e. not only report changes in year X in comparison to year Y, but how changes occurred and the reasons behind it Also, it further pursues to improve the performance and accuracy of downscaling methodologies for the global climate change models applied to Brazil, which will enable reducing uncertainties in V&A assessments in the different sectors. It is envisaged to operate an enhanced version of the ETA Model forced with at least 4 global climate models, including the new MBSCG⁵⁰. It is expected that the results will fill the gaps in the existing scenarios, reduce error margins and increase the spatial resolution from 40x40 km² to 20x20 km². This will improve the detail of projections for mountain regions and valleys needed for impacts assessments. Also, the Third National Communication is expected to enhance and extend the studies on activity data and emission factors related to these sectors, which will facilitate inventory preparation and ensure more reliable results in the future.

However, while the objective of having more and more accurate data is laudable, similar delays may occur as experienced with the Second National Communication, such as delays in gathering data from a large range of organizations and getting access to supercomputers; which then lead to that delays in generating the regional climate change scenarios. Another risk could be technical problems during the completion of the new MBSCG model. As happened with the 2nd National Communication, it is possible that such delays cause a need for additional cash co-financing.

Stakeholder ownership risks

Since the mid-90s, broad consultation processes have taken place among government, academic institutions, private sector and civil society organizations have ensured the input of state-of-the-art expertise and consensus to design climate change reporting. A large group of experts and institutions has been involved in the National Communications and national climate change discussion. Several institutions involved in the first two National Communications have already

⁵⁰ The Brazilian Global Model of the Climate System (MBSCG) is being developed at the National Institute for Space Research (INPE), in collaboration with climate centers in South America, South Africa, India and Europe. The purpose of the MBSCG project is to establish a global climate model suitable for long term climate change projections. The MBSCG is based on the main structure of the present CPTEC climate model (which is used for seasonal climate forecasts), but includes more realistic representations of phenomena acting on a larger time-scale: sea-ice transitions, aerosols and atmospheric chemistry, dynamic vegetation, CO2 variability, and other improvements. Progress on the MBSCG would allow the INPE to participate at future IPCCC assessments and perform climate change projections.

allocated own human and financial resources for the development of climate change-related activities, which demonstrates that climate change is increasingly included as a mainstream R&D area.

Coordination with stakeholders may cause delay since a large number of actors from different economic sectors of the society are involved. On the other hand, the *Rede Clima* may help towards integrating national experts and expertise on climate issues, to enhance the effectiveness of scientific research programs and to gather information and data from the participating members.

Institutional and governance risk

One concern of this evaluation is regarding staffing at MCT, responsible for elaboration of the National Communication. At the moment of the evaluation mission (June 2012), most of the people in the Second National Communications 'country team' had left. In fact, contracts (temporary) of staff have not been extended, starting in 2010. UNDP did collaborate with the Government of Brazil to define project hiring modalities to have sufficient human resources to achieve the objective of finalizing the National Communication. This is may be related to some of the government employment policies, which aims at utilizing public staff to coordinate cooperation projects. However, the additional work required for a project of this nature does require specialized core human resources that can provide continuation. Difficulties in getting such a core group of qualified people may cause delays.

Sustainability rating

The Government of Brazil is strongly committed to its obligations under the international agreements on Climate Change and in particular to the reporting under the UNFCCC, as evidenced by the previous reporting. As such, there is no doubt that the Third National Communication will be elaborated, but its formulation is likely to encounter delays, as discussed above, and may not be submitted in 2014, as planned. The rating regarding sustainability in this evaluation is therefore given as "**moderately likely**".

3.2 Recommendations

Institutionalization of National Communication reporting

Brazil is committed to fostering national capacity and utilizing public staff to coordinate cooperation projects rather than contracting specialized staff for project implementation. However, the additional work required for a project of this nature does require dedicated human resources. Future elaboration of the National Communication might benefit from having a core unit of staff working on National Communication institutionalized, rather than on a temporary project team, that is supported with short term consultancies on an as-needed basis.

This would also help to streamline data gathering which becomes an increasingly complex task as more data are required with higher accuracy. One problem mentioned by some interviewees was that gathering the right data sometimes took much longer than expected, when data is reported but in formats not suited for the National Communication or leaving gaps. This would require some staff dedicated at adopting surveys and organize data collection in such a way that these can be readily used in the National Communication (and other climate-relevant reporting) and that can provide training and advice to the specialized organizations that have to provide the input data.

ANNEX A. TERMS OF REFERENCE (TOR)

1 Introduction

UNDP/GEF Monitoring and Evaluation (M&E) policy

The Monitoring and Evaluation (M&E) policy at the project level in UNDP/GEF has four objectives:

- i) to monitor and evaluate results and impacts;
- ii) to provide a basis for decision making on necessary amendments and improvements;
- iii) to promote accountability for resource use;
- iv) to document, provide feedback on, and disseminate lessons learned.

A mix of tools is used to ensure effective project M&E. These might be applied continuously throughout the lifetime of the project- e.g. periodic monitoring of indicators-, or as specific time-bound exercises such as mid-term reviews, audit reports and final evaluations.

In accordance with UNDP/GEF M&E policies and procedures, all full and medium-sized projects supported by the GEF should undergo a final evaluation upon completion of implementation.

The current Terms of Reference for the Final Evaluation of the "Second Communication to the United Nations Framework Convention on Climate Change- UNFCCC" Project (PIMS # 2613 CC EA) outline what is expected from the Evaluation Team and briefly reflect key aspects of the project and its background. For any description on methodology, procedures and content of the evaluation report reference is made to the UNDP Evaluation Guidance for GEF Financed Projects (see document attached).

Brief project description

The Enabling Activity project aimed to assist Brazil in preparing the Second National Communication (SNC) to the UN Framework Convention on Climate Change (UNFCCC). According to the project document, the project would extend the coverage of the annual Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases to the 1990 to 2000 period, focusing on the sectors/gases that have either a significant share of the greenhouse gas emissions or present a large degree of uncertainty, or both. Downscaling of global circulation models for Brazil would be developed. Studies on vulnerability and adaptation would be undertaken, with a focus on the health sector; energy sector; water resources, floods, and desertification; agriculture, pasture and livestock sector; coastal zone management; and aquatic biodiversity. Brazil's description of national circumstances would be updated, as would the steps taken or envisaged to implement the Convention. Finally, the project would build institutional capacity for implementing the Convention in Brazil including undertaking activities related to climate change education, and awareness raising.

Regarding the Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases, the project of the Second-National Communication-considering the capacity acquired by the institutions and specialists involved- was designed to enhance and extend the studies on activity data and emission factors related to the sectors that were believed to require intensive country specific research, as the Land-Use Change and Forestry and the Agriculture sectors, as well as sectors that involve a high degree of uncertainty, considering the lack of emission factors and/or activity data (savanna burning, waste, soil carbon emissions and, planted forests emissions/uptake).

Priorities for the Second National Inventory were then set taking in consideration these results together with an assessment of the feasibility and cost/benefit of each research activity proposed. It is worth mentioning that a limited amount of resources will be assigned to activities related to N₂O emissions in the SNC, taking into consideration that decreasing the uncertainty of N₂O emissions is very difficult.

Moreover, in the SNC, special attention was given to studies on vulnerability to climate change impacts. Initial studies on strategic areas, in accordance with Brazilian national circumstances, were be emphasized. Another relevant aspect was the development of activities regarding climate change education, and awareness raising.

The project was envisaged comprising five objectives with related outcomes, outputs, activities and subactivities. Objective **1** was entitled "Preparation of National Inventory Refinement". The objective of the second phase was to refine the Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases and to extend its overage to the 1990 to 2000 period in an annual basis, as well as the strengthening of the national structure established for the estimation of GHG. It focused on the sectors/gases that have either a significant share of the emissions or present a large degree of uncertainty, or both, taking in consideration the efforts required to improve the estimates. The development of a national inventory is a resource-intensive undertaking and priorities were established for refining estimates of emissions only for the main sectors and gases, because the estimation methodology and data quality can improve with time. In this sense, the preliminary results of the First Brazilian Inventory helped in selecting the priority research studies that were carried out in this second phase.

Objective 1 had two Outcomes: Inventory Improvement and Extension carried out (Outcome 1.1) and Strengthening of the National Structure Established for the Estimation of Greenhouse Gas Emissions (Qutcome 1.2).

Objective 2 was entitled "Methodological Approach regarding Vulnerability Assessment and Adaptation Measures Elaborated" and has two Outcomes: Outcome 2.1 - Regional Modeling of Climate and Climate Change Scenarios Elaborated; and Outcome 2.2 -Vulnerability and Adaptation Research and Studies Concerning Strategic Sectors that are Vulnerable to the Impacts Associated with Climate Change in Brazil Carried Out.

Objective 3 was entitled "Description of the Brazilian National Circumstances and the Steps Taken or Envisaged to Implement the Convention prepared" and had two related Outputs: Output 3.1-Elaborate a Report on National Circumstances and Output 3.2- Describe the Steps Taken or Envisaged to Implement the Convention in Brazil.

Objective 4 was entitled "Public Awareness and Education Strategy in place" and aimed at building institutional capacity in Brazil for promoting and cooperating in education, training and public awareness related to climate change. This Objective had one related Outcome: Outcome 4.1-Spread of information, publications of documents, organization and participation in events related to climate change issues.

Objective 5 was entitled "Preparation of the Second National Communication" .The objectives previously described, especially the objectives 1, 2 and 3, were related to the components of the national communication. Therefore, the envisaged outcome for this objective included translating, editing and publishing the final report of the Second National Communication, in order to submit it to the UNFCCC. This Objective had one Outcome 5.1- Publish Brazilian Second National Communication in English and Portuguese.

These were the two main reasons why the project was extended. When the negotiations on the project document were concluded, it was established that project duration would be 3 (three) years (cf. Decision 8, adopted by the 11th Conference of the Parties of the UNFCCC, entitled "Submission of second and, where appropriate, third national communications from Parties not included in Annex I to the Convention"). However, Paragraph 3 of Decision 8/CP. 11 states that "non-Annex I Parties shall make all efforts to submit their second and, where appropriate, third national communication, within four years of the initial disbursement of financial resources for the actual preparation of the national communication, in accordance with Article 4, paragraph 3, of the Convention, under the expedited procedures or standard approved procedures, on an agreed full-cost basis". Therefore, the deadlines of the project were revised in accordance with Decision 8/CP. 11 and in the light of the need for more time to finalize their studies, mainly given by the fact that LULUCF inventory is extremely complex and Brazil has a big forested area. The Second National Communication of Brazil to the UNFCCC was deposited in its Secretariat on the 30" November, 2010.

2 Objectives of the evaluation

The Terminal Evaluation (TE) will be conducted according to guidance, rules and procedures for such evaluations established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects (see document attached). A key principle of the evaluation is that it must provide clearly documented evidence and analysis, and unbiased assessment.

The overall objective of the TE is to analyze the implementation of the project, review the achievements made by the project to deliver the specified objectives and outcomes. It will esablish the relevance, performance and success of the project, including the sustainability of results. The evaluation will also collate and analyze specific lessons and best practices pertaining to the strategies employed, and implementation arrangements, which may be of relevance to other .projects in. the country and elsewhere in the world.

The main stakeholders of this TE are:

- CETESB- Environment Sanitation Agency of the State of Sao Paulo (Companhia de Tecnologia de Saneamento Ambiental do Estado de Sao Paulo)
- CPTEC Center for Weather Forecasts and Climate Research (Centro de Previsao do Tempo e Estudos Climaticos)
- E&E- Economy & Energy (Economia & Energia)
- EMBRAPA- Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuclria)
- FUNCATE Foundation)for Space Research, Application and Technology (Funda<;ao da Ciencia, Aplica<çao e Tecnologias Espaciais)
- INPE- National Institute for Space Research (Institute Nacional de Pesquisas Espaciais)
- MCT- Ministry of Science and Technology (Ministerio da Ciencia e Tecnologia)
- MMA- Ministry of Environment (Ministerio do Meio Ambiente)
- MME- Ministry of Mines and Energy (Ministerio das Minas e Energia)

Note: The personnel directly involved in this project at the time of its implementation should be interviewed.

3 Scope of the evaluation

The evaluation will cover the five major criteria which are relevance, effectiveness, efficiency, results and sustainability. These five evaluation criteria should be further defined through a series of questions covering all aspects of the project intervention, broken out in three main sections:

- a) Project Formulation: Logical framework, Assumptions and Risks, Budget (co-finance) and Timing
- b) Project Implementation: IA/EA supervision and support, monitoring (including-use of tracking tools) and evaluation, stakeholder participation, adaptive management.
- c) Achievement of Results: Outcomes, Impacts, Catalytic effect, Sustainability, Mainstreaming (e.g. links to other UNDP priorities, including related support programs set out in the UNDAF and CPAP, as well as cross cutting issues)

The UNDP Evaluation Guidance for GEF Financed Projects (see document attached) details which of the project components need to be rated as well as a definition of the six point rating scale (from Highly Satisfactory to Highly Unsatisfactory).

4 Products expected from the evaluation

The evaluation team is expected to deliver three products as described in the UNDP Evaluation Guidance for GEF Financed Projects (see document attached).

- A Draft Report
- Oral presentation of main findings of the evaluation to UNDP CO and Project Team before the mission is concluded in ord.er to allow for clarification and validation of evaluation findings
- Evaluation Report which is to be in line with the Report Outline described in the UNDP Evaluation Guidance for GEF Financed Projects (see document attached).

5 Methodology of evaluation

approach

The methodology is to follow the UNDP Evaluation Guidance for GEF Financed Projects (see document attached) and the Evaluation Team is to present a fine-tuned proposal in the Inception Report which is to be discussed with the UNDP-Brazil Country Office and the projects Coordination Unit.

A-list of documents to be reviewed by the Evaluation Team is attached in Annex 3.

6 Evaluation team

One international consultant/evaluator will be selected for this evaluation. The consultant should meet the ORs requirements already revised by CO Brazil and RSC UNDP GEF. The evaluator should have at least 10 years expertise with climate change related issues. Specific experience in the preparation of a National Communication to the UNFCCC of a Non-Annex I Party is an asset. The evaluator should have technical knowledge on the estimation of greenhouse gases and on mitigation options. The evaluator should be able to work in English or Spanish. Capacity to work in Portuguese is an asset.

The consultant in charge of the TE will be held to the ethical standards referred to in the UNDP Evaluation Guidance

for GEF Financed Projects (see document attached) and are expected to sign the Code of Conduct (Annex 3) upon acceptance of the assignment.

NOTE: If the team has more than 1 evaluator, one of them should be designated as the team leader and will be responsible for finalizing the report. Evaluators can be national or international. Experience indicates that it is best to have one national and one internatiOnal evaluator, in the case of having more than one evaluator, as this enhances complementation of functions and knowledge.

7 Implementation arrangements

Management Arrangements

The TE is a requirement of UNDP and GEF and solicited and led by the UNDP Brazil Country Office as project Implementing Agency. The UNDP Brazil CO has overall responsibility for the coordination and logistical arrangements of the evaluation as well as day-to-day support to the evaluation team (travel, accommodation, office space, communications, etc) and timely provision of per diems and contractual payments. The UNDP Brazil CO will also organize the site missions (travel arrangements, meetings with key stakeholderS and beneficiaries, interviews, field trips). The evaluation team will be briefed by the UNDP Country Office and the RCU upon the commencement of the assignment, and will also provide a terminal briefing. Other briefing sessions may be scheduled, if deemed necessary.

<u>Payment modalities and specifications</u>: The evaluators will be contracted directly from the project budget. Payment will be 50% at the submission of the first draft to the UNDP-CO, UNDP-GEF RCU and PT, and the other 50% once the final report has been completed and cleared by both the UNDP-CO and UNDP-GEF RCU. The quality of the evaluator's work will be assessed by the UNDP-CO and UNDP-GEF-RCU. If the quality does not meet standard UNDP expectations or UNDP-GEF requirements, the evaluators will be required to re-do or revise (as appropriate) the work before being paid final installments.

These Terms of Reference follow the UNDP-GEF policies and procedures, and together with the final agenda will be agreed upon by the UNDP-GEF Regional Coordination Unit, UNDP Country Office and the Project Team. The final report must be cleared and accepted by UNDP before being made public, therefore, the UNDP-CO and UNDP-GEF-RCU will have to formally clear the report (please see Annex 4).

7.1 Timeframe, resources and logistical support and deadlines

The total duration of the evaluation will be (maximum) 50 days according to the following plan: <u>Preparation before field work</u>: (3 days including travel time)

- Acquaintance with the project document and other relevant materials with information about the project (PIRs, TPR reports, Mid term Evaluation report and other evaluation report, etc);
- Familiarization with overall development situation of country (based on reading of UNDP-Common Country
- Assessment and other reports on the country).
- Detailed mission program preparation, including methodology, in cooperation with the UNDP Country office and the Project team.
- Initial telephone discussion with UNDP-GEF Regional Technical Advisor
- Mission: (5-7 days)
 - Meeting with UNDP Country office team;
 - o Meetings with key stakeholders in country
- Joint review of all available inaterials with focused attention to project outcomes and outputs
- Visit to Project site

- Observation and review of completed and ongoing field activities, (capacity development, awareness
- o /education, sustainable use demonstration activities, community development, etc)
- Interviews with key beneficiaries and stakeholders, including representatives of local authorities, local environmental protection authorities, local community stakeholders, etc.

Draft report (7 days):

- Final interviews / cross checking with UNDP CO, UNDP RCU and Project team. Drafting of report in proposed format
- Telephone review of major findings with UNDP CO and UNDP-GEF RTA
- Completing of the draft report and presentation of draft report for comments and suggestions within 2 weeks.

Final Report (2 days) Presentation affinal evaluation report within 2 weeks.

8. Annexes

Annex 1: UNDP Guidance on Evaluation of GEF-Financed Projects (Version for external evaluators) Annex 2: List of Documents to be reviewed by the evaluators

Annex 3: Evaluation Consultant Code of Conduct Agreement Form

Annex 4: Evaluation Report Clearance Form to be completed by CO and RCU and included in the final document

Outline as suggested in UNDP Guidance for Conducting Terminal Evaluations of UNDPsupported, GEF-financed Projects (2012)

Note: The reference in italics (e.g. Section X.Y) has been added to guide the reader where the item can be found in this report

i. Opening page

- Title of UNDP supported GEF financed project
- UNDP and GEF project ID#s.
- Evaluation time frame and date of evaluation report
- Region and countries included in the project
- GEF Operational Program/Strategic Program
- Implementing Partner and other project partners
- Evaluation team members
- Acknowledgements

ii. Executive Summary

- Project Summary Table
- Project Description (brief)
- Evaluation Rating Table
- Summary of conclusions, recommendations and lessons

iii. Acronyms and abbreviations

1. Introduction

- Purpose of the evaluation (Section 1.3)
- Scope & Methodology (Section 1.3)
- Structure of the evaluation report (*Section 1.3*)

2. Project description and development context

- Project start and duration (Section 1.2)
- Problems that the project sought to address (Section 1.2)
- Immediate and development objectives of the project (*Section 1.2*)
- Baseline Indicators established (Sections 3.1 and 2.4.3)
- Main stakeholders (Section 1.4)
- Expected Results (Section 1,2)

3. Findings

- 3.1 Project Design / Formulation (Section 2.4.3)
 - Analysis of LFA/Results Framework (Project logic /strategy; Indicators)
 - Assumptions and Risks
 - Lessons from other relevant projects (e.g., same focal area) incorporated into project design
 - Planned stakeholder participation
 - Replication approach
 - UNDP comparative advantage
 - Linkages between project and other interventions within the sector (Section 3.1.1)
 - Management arrangements (Sections 1.4 and 2.3.4)

3.2 Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation) (*Section 2.3.1*)
- Partnership arrangements (Sections 1.4 and 2.3.4)
- Feedback from M&E activities used for adaptive management (n.a.)
- Project Finance (Section 2.3.2)
- Monitoring and evaluation: design at entry and implementation (Section 2.3.3)
- UNDP and Implementing Partner implementation / execution, coordination, and operational issues (*Sections 1.4 and 2.3.1*)

3.3 Project results

- Overall results (attainment of objectives) (Section 2.1)
- Relevance (Section 2.4.1)
- Effectiveness & Efficiency (Sections 2.1 and 2.3.2)
- Country ownership (Section 2.4.1)
- Mainstreaming (Section 3.1.1)
- Sustainability (Section 3, 1, 3)
- Impact (Section 3.1.1)

4. Conclusions, recommendations & Lessons (Sections 3.1 and 3.2)

- Corrective actions for the design, implementation, monitoring and evaluation of the project
- Actions to follow up or reinforce initial benefits from the project
- Proposals for future directions underlining main objectives
- Best and worst practices in addressing issues relating to relevance, performance and success

5. Annexes

- ToR (Annex A)
- Itinerary (Annex B)
- List of persons interviewed (Annex B)
- Summary of field visits (Annex B)
- List of documents reviewed (Annex B)
- Evaluation Question Matrix (*n.a.*)
- Questionnaire used and summary of results

ANNEX B. ITINERARY OF THE EVALUATION TEAM AND LIST OF DOCUMENTS

B.1 Mission schedule and list of people

| Fri 08/06 | • UNDP (Rosely Diegues Peixoto; Haroldo de O. Machado Filho ¹⁾) |
|-----------|---|
| Mon 15/06 | CPTEC (José Marengo) |
| | • FUNCATE (Chlotilde Ferri) |
| Tue 16/06 | • MCT (Marcio Rojas) |
| Wed 17/06 | • CETESB (Josilene Ferrer) |
| Thu 18/06 | • Newton Paciornik ²⁾ |
| Fri 19/06 | • CPTEC (Sin Chan Chou) |
| | • Mauro Meirelles de O. Santos ³⁾ |
| Sat 20/06 | • José D. Gonzalez Miguez ⁴⁾ |
| Mon 21/06 | • E&E (Olga Mafra) |
| | • UNDP (Rosely Diegues Peixoto; Haroldo de O. Machado Filho ¹⁾) |

Note: Evaluator stayed in Brasília (08-16/06), São Paulo (17/06) and Río (18-21/06). The evaluation mission coincided with the preparation period of the Rio+20 Conference, but people were able to make time available during the Rio+20 to meet in person, or where not possible, to have discussions over the phone or Skype.

- ¹⁾ Ex Technical Coordinator
- ²⁾ Ex Technical Coordinator
- ³⁾ Ex Deputy Coordinator; continues working on Third National Communication
- ⁴⁾ Ex Coordinator of the National Communication

B.2 List of documents reviewed

APR-PIR (UNDP-GEF progress and performance reports), 2008, 2009, 2010

UNDP Project Document

Second National Communication of Brazil to the UNFCCC, available **in** five Parts and two Volumes (see www.mct.gov.br/index.php/content/view/326984.html)

18 Sectoral Reports for the Inventory; www.mct.gov.br/index.php/content/view/330034.html

Funcate Shapefile Data for Inventory of Land Use Change and Forests www.mct.gov.br/index.php/content/view/329000.html

Final Report on Regional Modelling of Climate Change Future (only available in Portuguese); <u>www.mct.gov.br/index.php/content/view/330437.html</u>

Executive Summary

Submission of this Second National Communication of Brazil to the United Nations Framework Convention on Climate Change - UNFCCC (hereinafter Convention on Climate Change, or simply the Convention) confirms the importance Brazil attaches to the commitments it undertook under this treaty, which is the adequate institutional framework through which the international community should combat climate change. Moreover, it is a clear signal that Brazil will make every effort to enhance understanding of the global problem and to advance the science of climate change based on the national circumstances described in this Communication by means of the actions and programs developed in the country.

Even with the lessons learned with the Initial Communication, the preparation of a National Communication is extremely complex in a continent-sized country such as Brazil, and requires considerable effort. An ongoing challenge is to increase the number of experts on the subject in Brazil. Despite the paucity of human and financial resources to develop more comprehensive studies, an extensive network of partnerships was put in place for the completion of this work. A significant number of institutions and authors and/ or contributors with recognized competence in their respective areas of expertise were engaged in its preparation in a wide range of sectors (energy, industry, forestry, agriculture/livestock, waste treatment, etc.) from both the public and private sectors.

Following the "Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention" (Decision 17/CP. 8), the Second National Communication of Brazil to the UNFCCC is comprised of five parts. The first part introduces the national circumstances and special arrangements of Brazil, and it is intended to provide an overall picture, taking into account the complexity of this vast country, as well as its development priorities. The second part comprises the Brazilian Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases not Controlled by the Montreal Protocol, which covers the period 1990-2005, although according to the guidelines contained in Decision 17/CP. 8 and to the GEF project signed by the Brazilian government the Inventory should only cover the period 1990-2000. Nevertheless, it has sought to present the preliminary data for 2005, which will be reviewed in the next National Communication. The Inventory is the culmination of the consolidation of 18 reference reports from different sectors developed by institutions renowned for their excellence in the country, as well as by experts of great distinction, and additional information obtained from various organizations. The third part presents the steps taken or envisaged to implement the

Convention in the country, and it is divided into two subparts: A) Programmes containing measures to mitigate climate change, and B) Programmes containing measures to facilitate adequate adaptation to climate change. These measures contribute directly or indirectly to the achievement of the objectives of the Convention. The fourth part provides other information considered relevant to the achievement of the objective of the Convention, including transfer of technologies; research and systematic observation; education, training and public awareness; capacity building at national and regional level; and information and networking. Finally, the fifth part describes the financial, technical and capacity needs associated with the implementation of activities related to the elaboration of the Second National Communication.

National Circumstances

The Federative Republic of Brazil is divided into 26 states, 5,565 municipalities – according to the Brazilian Institute of Geography and Statistics (IBGE, 2009a) – and the Federal District, where the capital of the Republic, Brasília, seat of the government and the Executive, Legislative and Judicial Branches, is located. The country has a Presidential system and is governed under the 1988 Federal Constitution.

With an area of 8,514,876.6 km², Brazil is the largest country in South America. It has 186 million inhabitants, according to data from the 2008 Demographic Census. The country had an average population growth of 1.15% per year over the 2000-2008 period. In 2008, most of the population (84.4%) lived in urban centers.

Brazil is also home to an extremely rich flora and fauna. In addition to harboring over a third of the Earth's tropical forests - the Amazon Forest -, there are ecological regions of great extent in the country, such as the Cerrado, the Atlantic Forest, the Caatinga, and the Pantanal wetlands. The country has extremely varied vegetation and flora resources, and contains one of the richest flora in the world with 41,123 known and registered species (FORZZA *e t al.*, 2010). The Brazilian fauna is also quite rich, although knowledge about its diversity is still incomplete. It is estimated that less than 10% of the existing total is actually known.

Since Brazil is a country with large territorial extensions, it has differentiated rainfall and temperature regimes. From north to south, a great variety of climates with distinct regional characteristics can be found, which has shaped the occupation of its territory and partly justifies socioeconomic differences. Brazil has abundant water resources. Endowed with a vast and dense river watershed network, many of its rivers stand out due to their extension, width or depth. As a result of the nature of the relief, plateau rivers predominate, whose characteristics give them high potential for electric power generation, although these very characteristics, however, make navigation difficult. Although only 36% of the country's estimated hydroelectric power has been harnessed, 84% of Brazil's power was generated by hydroelectric power plants in 2009.

Brazil is a developing country with a complex and dynamic economy, which is ranked eighth in the world. It is an urban-industrial country, with food exports as its main connection to global capitalism. Brazil is the main exporter of several agricultural products: sugarcane, beef, chicken, coffee, orange juice, tobacco, and alcohol. Also, it comes second in soy bean and corn exports, and is ranked as the fourth largest exporter of pork. However, it is not the biggest food exporter in the world, as is widely believed. Brazil is also among the largest and most efficient producers of various manufactured products, including cement, aluminum, chemicals, petrochemical feedstock, and oil.

Regarding the share of economic sectors in the Gross Domestic Product - GDP, in 2006, the distribution was as follows: 65.8% for the service business, 28.8% for industry and 5.5% for agriculture.

In 2008, Brazil's GDP was US\$ 1,406.5 billion, and the GDP per capito was US\$ 7,420.00. Between 1990 and 2005, Brazil's economic growth exceeded population growth, and the population grew at an annual rate of 1.5% during this period, while GDP reported an annual growth rate of 2.6% during the same period.

It should be recognized that a significant portion of its population (about 30 million people) is still in poverty, lacking access to quality healthcare services, water supply and education, despite efforts by the government and society to reverse this situation. Great regional disparities still exist. Thus, the national priorities are to meet the pressing social and economic needs, such as eradicating poverty, improving health conditions, combating hunger, ensuring decent housing, among others. These elements are fully consistent with the Convention on Climate Change, which recognizes that mitigation of global climate change and adaptation to its effects are possible without compromising those actions to address socioeconomic growth and poverty eradication, which remain as first and overriding priorities for developing countries.

Despite improved social and economic indicators, especially over the past decade, the country still has a long way to go. Brazil is a country with a growing population, where most of the population's basic needs have yet to be met, infrastructure is still incipient and substantial improvements are required. All this justifies the fact that Brazil is still a developing country.

National Inventory of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases not Controlled by the Montreal Protocol

Estimates for 1990-2005

Brazil, as a Party to the Convention on Climate Change, assumed, based on its Article 4, paragraph 1 (a), the commitment to "develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties."

This inventory covers carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆). The emissions of so-called indirect greenhouse gases such as nitrogen oxides (NO_x), carbon monoxide (CO) and other non-methane volatile organic compounds (NMVOC) have also been estimated. The emissions or removals of above gases were estimated according to the sources, which are called sectors: Energy, Industrial Processes; Use of Solvents and Other Products; Agriculture; Land-Use Change and Forestry; and Waste.

The preparation of the Inventory was based on the following technical guidelines of the Intergovernmental Panel on Climate Change (IPCC): "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories", published in 1997; "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories", published in 2000; and "Good Practice Guidance for Land Use, Land-Use Change and Forestry", published in 2003. Some of these estimates already take into account information found in "2006 IPCC Guidelines for National Greenhouse Gas Inventories", published in 2006.

Preparation of the inventory involved a significant portion of the Brazilian business and scientific community, and various government sectors. The results of this effort are shown in Table I, which summarizes the estimates of anthropogenic greenhouse gas emissions, for four years – 1990, 1994, 2000, and 2005 –, thus covering the year 2000, as required by Decision 17/CP.8 for the Second National Communication. With regard to 1990 to 1994, this Inventory updates the information presented in the Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases not Controlled by the Montreal Protocol (BRASIL, 2004) - the Initial National Inventory.

Table I - Estimates for greenhouse gas emissions in Brazil - 1990, 1994, 2000, and 2005

| Sector | Year | Unit | co₂ | сн, | N,O | HFG-23 | HIC-125 | HFC-134a | HFC-143a | HFC-152a | œ, | C₂F₄ | SF ₆ | NO, | co | NMVOC | |
|--------------|--------------|--------------------------------------|-----------|----------|--------|---------|-----------|------------|----------|------------|----------|-------|-----------------|-------|--------|--------|-----|
| | 1990 | | 179,948 | 427 | 8.5 | | | | | | | | | 1,781 | 14,919 | 1,022 | |
| | 1994 | Gg | 206,250 | 382 | 9.0 | | | | | | | | | 1,996 | 14,438 | 974 | |
| Energy | 2000 2005 | 2000 | | 289,958 | 388 | 9.6 | | | | | | | | | 2,334 | 11,415 | 860 |
| 87 | 2005 | | 313,695 | 541 | 12.1 | | | | | | | | | 2,388 | 11,282 | 958 | |
| | Var. 90 / 00 | % | 61 | -9 | 14 | | | | | | | | | 31 | -23 | -16 | |
| | 1990 | | 45 265 | 5.1 | 10.7 | 0 120 | | 0.0004 | | | 0.302 | 0.026 | 0.010 | 27 | -24 | -0 | |
| | 1994 | 1994 2000 2005 /ar. 90 / 00 | 48 703 | 6.5 | 16.3 | 0.120 | - | 0.0685 | - | | 0.302 | 0.028 | 0.014 | 11 | 510 | 382 | |
| Industrial | 2000 | | 63,220 | 8.9 | 19.9 | - | 0.0071 | 0.4713 | 0.0075 | 0.0001 | 0.147 | 0.012 | 0.015 | 14 | 542 | 474 | |
| Processes | 2005 | | 65,474 | 9.2 | 22.8 | - | 0.1249 | 2.2819 | 0.0929 | 0.1748 | 0.124 | 0.010 | 0.025 | 18 | 626 | 599 | |
| | Var. 90 / 00 | | 40 | 73 | 87 | -100 | NA | 108,876 | NA | NA | -52 | -56 | 54 | 69 | 48 | 47 | |
| | Var. 90 / 05 | 2 | 45 | 79 | 114 | -100 | NA | 527,498 | NA | NA | -59 | -61 | 153 | 128 | 71 | 86 | |
| | 1990 | | | | | | | | | | | | | | | 350 | |
| Solvent | 1994 | Gg | | | | | | | | | | | | | | 435 | |
| and Other | 2000 | | | | | | | | | | | | | | | 473 | |
| Productilise | 2005 | | | | | | | | | | | | | | | 595 | |
| FIGURE OBC | Var. 90 / 00 | - % | | | | | | | | | | | | | | 35 | |
| | Var. 90 / 05 | | | 0.530 | 224 | | | | | | | | | 240 | 0.540 | 70 | |
| | 1994 | | | 7,537 | 369 | | | | | | | | | 217 | 2,343 | NE | |
| | 2000 | Gg | | 10,772 | 393 | | | | | | | | | 181 | 2,131 | NE | |
| Agriculture | 2005 | | | 12,768 | 476 | | | | | | | | | 237 | 2,791 | NE | |
| | Var. 90 / 00 | | | 12.9 | 17.6 | | | | | | | | | -17 | -, | | |
| | Var. 90 / 05 | - 5 | | 33.9 | 42.7 | | | | | | | | | 8 | | | |
| | 1990 | ~ | 766,493 | 1,996 | 13.7 | | | | | | | | | 496 | 17,468 | NE | |
| Land-Use | 1994 | | 830,910 | 2,238 | 15.4 | | | | | | | | | 556 | 19,584 | NE | |
| Change and | 2000 | Gg | 1,258,345 | 3,026 | 20.8 | | | | | | | | | 752 | 26,476 | NE | |
| Change and | 2005 | | 1,258,626 | 3,045 | 20.9 | | | | | | | | | 757 | 26,641 | NE | |
| Forestry | Var. 90 / 00 | - % | 64 | 52 | 52 | | | | | | | | | 52 | 52 | | |
| | Var. 90 / 05 | | 64 | 53 | 53 | | | | | | | | | 53 | 53 | | |
| | 1990 | | 24 | 1,22/ | 9.0 | | | | | | | | | | | | |
| | 2000 | Gg | 97 | 1,307 | 10.0 | | | | | | | | | | | | |
| Waste | 2005 | | 110 | 1,030 | 14.0 | | | | | | | | | | | | |
| | Var. 90 / 00 | | 276 | 35 | 37 | | | | | | | | | | | | |
| | Var. 90 / 05 | % | 349 | 42 | 54 | | | | | | | | | | | | |
| | 1990 | | 991,731 | 13,195 | 376 | 0.120 | - | 0.000 | - | - | 0.302 | 0.026 | 0.010 | 2,504 | 35,296 | 1,693 | |
| | 1994 | - | 1,085,925 | 14,233 | 421 | 0.157 | - | 0.068 | - | - | 0.323 | 0.028 | 0.014 | 2,797 | 37,273 | 1,791 | |
| TOTAL | 2000 | Gg | 1,611,615 | 15,852 | 455 | - | 0.007 | 0.471 | 0.007 | 0.0001 | 0.147 | 0.012 | 0.015 | 3,280 | 40,563 | 1,807 | |
| IOIAL | 2005 | | 1,637,905 | 18,107 | 546 | - | 0.125 | 2.282 | 0.093 | 0.175 | 0.124 | 0.010 | 0.025 | 3,399 | 41,339 | 2,152 | |
| | Var. 90 / 00 | - % | 63 | 20 | 21 | -100 | NA | 108,876 | NA | NA | -52 | -56 | 54 | 31 | 15 | 7 | |
| | Var. 90 / 05 | | 65 | 37 | 45 | -100 | NA | 527,498 | NA | NA | -59 | -61 | 153 | 36 | 17 | 27 | |
| | | | Memo Ite | ems (for | inform | ation o | nly – emi | ssions not | included | l in the i | nventory | d) | | | | | |
| | 1990 | | 5,231 | 0.01 | 0.15 | | | | | | | | | 23 | NE | NE | |
| Interna- | 1994 | | 4,339 | 0.01 | 0.12 | | | | | | | | | 19 | NE | NE | |
| tional | 2000 | Gg | 14,627 | 0.60 | 0.23 | | | | | | | | | 201 | 118 | 24 | |
| Buchan | 2005 | | 15,759 | 0.66 | 0.24 | | | | | | | | | 221 | 132 | 26 | |
| Bunkers | Var. 90 / 00 | % | NA | NA | NA | | | | | | | | | NA | NA | NA | |
| | Var. 90 / 05 | ^ | NA | NA | NA | | | | | | | | | NA | NA | NA | |
| 0 | 1990 | | 187,962 | | | | | | | | | | | | | | |
| Emissions | 1774 | Gg | 190,896 | | | | | | | | | | | | | | |
| from | 2005 | | 243,606 | | | | | | | | | | | | | | |
| ni | Var. 90 / 00 | | 4 | | | | | | | | | | | | | | |
| Biomass | Var. 90 / 05 | % | 30 | | | | | | | | | | | | | | |

Emissions of the Main Greenhouse Gases

Brazil's emissions profile is different from that of developed countries, where emissions from fossil fuel combustion are the most significant. In most relevant sectors in Brazil, such as agriculture and land-use change and forestry, there are no methodologies that could be straightforwardly applied to the country, given that IPCC's default emission factors largely reflect the conditions of developed countries and countries with a temperate climate and do not necessarily fit Brazilian reality. Therefore, a great effort has been undertaken to collect data corresponding to Brazilian circumstances, making possible to apply higher tier IPCC methodologies and obtain more accurate and precise results.

Year 2000

The analysis of results is presented in two sections: the first one covers the year 2000, pursuant to the guidelines of the Convention on Climate Change for the Second National Communication; the second covers 2005, where the most up-to-date data for all sectors are considered.

In 2000, CO₂ emissions were estimated at 1,612 Tg, with the Land-Use Change and Forestry sector as the major contributor, accounting for 78% of emissions, followed by the Energy sector, with a share of 18% of total emissions.

Also in 2000, CH₄ emissions were estimated at 15.9 Tg, with the Agriculture sector accounting for 68% of total emissions, followed by the Land-Use Change and Forestry sector, with 19% of emissions, and the Waste sector, with 10%. The two most important sub-sectors were enteric fermentation in livestock, accounting for 61%, and forest conversion to other uses in the Amazon biome, accounting for 13%.

N₂O emissions were estimated at 455 Gg, basically because of the Agriculture sector, which accounted for 86% of total emissions. Within this sector, emissions from soils contributed with 83%, including, among others, grazing animal manure emissions, which accounted alone for 40% of the total.

Estimates by sector are analyzed below.

Energy Sector

This sector encompasses estimates of anthropogenic emissions caused by energy production, transformation, transportation, and consumption. It includes both emissions resulting from fuel combustion and fugitive emissions resulting from leaks in the production, transformation, distribution, and consumption chain. The most relevant emissions refer to CO_2 , with 290 Tg, driven by the road transport (38%) and the industrial subsector (24%). CH₄ emissions totaled 388 Gg, and were primarily released by the energy sub-sector (32%), which includes charcoal plants, and by fugitive emissions from oil and natural gas activities (27%). N₂O emissions were estimated at 9.6 Gg, primarily due to the road transport (23%) and the food and beverage sub-sector (19%).

Industrial Processes Sector

This sector entails estimates of anthropogenic emissions resulting from production processes in industries that do not result from fuel combustion.

The most relevant emissions also refer to CO₂, totaling 63 Tg, basically as a result of pig iron and steel (56%), cement (25%) and lime production (8%). N₂O emissions were estimated at 20 Gg, primarily due to adipic acid production (88%). CH₄ emissions were estimated at 8.9 Gg, caused by the chemical industry.

Solvent and Other Product Use Sector

For this sector, direct greenhouse gas emissions were not estimated.

Agriculture Sector

In this sector, CH_4 emissions totaled 10.8 Tg, driven by the enteric fermentation of ruminant herds (89%), which includes cattle herd, the second largest in the world. N₂O emissions totaled 393 Gg and derived from various sources, especially grazing animal manure (46%) and indirect soil emissions (32%).

Burning of sugarcane was responsible for indirect greenhouse gas emissions in this sector, given that the burning of cotton crop residues was virtually suspended in 1995.

Land-Use Change and Forestry Sector

Because of Brazil's vast territory, estimating figures for this sector was one of the most complex tasks in preparing the Inventory; it involved extensive survey and processing of remote sensing, statistical and forest inventory data.

The entire national territory was subdivided into spatial units in the form of polygons that resulted from the integration of various data sources: biome, municipal boundaries, vegetation profile, type of soil, land use in 1994, and land use in 2002. 75 possible transitions and their corresponding changes to carbon stock were analyzed, with changes being observed in 14.2% of the country's surface between 1994 and 2002. Based on the results of anthropogenic emissions and removals for 1994-2002, the emission factors for the Initial Inventory were updated for the years 1990 to 1994 and a preliminary estimation for the years 2003 to 2005 was conducted, based on activity data for *Prodes* and *PPCerrado*.

According to IPCC's latest guidelines, and in order to improve comparability between the various countries, only the emissions and removals occuring in managed areas were considered, i.e., the areas included in the planning process and where implementation of land-use management practices, with a view to performing important ecological, economic and social functions, is undertaken. In Brazil, these managed areas include all forest and native non-forest vegetation areas (Grassland) contained in Indigenous Lands and in the National System of Protected Areas - SNUC (Law nº 9,985/2000). Private Reserves of Natural Heritage - RPPNs were not considered due to insufficient adequate information. This option is different from the one used for Brazil's Initial Inventory, where all areas under natural forests (primary forests) were not considered to estimate average CO₂ removals.

Net emissions for this sector totaled 1,258 Tg CO₂, driven by the Amazon biome (65%) and Cerrado biome (24%). Emissions related to application of limestone to soils, which was responsible for 8.7 Tg CO₂, were also accounted for in this sector total emissions. CH_4 emissions were estimated at 3.0 Tg, and N₂O emissions were estimated at 21 Gg. In both cases, emissions derived from burning of the biomass left in the field after forest conversion. 68% of which were produced in the Amazon biome and 22% in the *Cerrado* biome.

Waste Sector

Waste disposal in landfills or open dumps generates CH₄. The emission potential for this gas increases the better the landfill control conditions are and the greater the depth of open dumps. Waste incineration, like every combustion, generates CO₂ and N₂O emissions, depending on the composition of the waste. However, this practice is not widespread in Brazil.

Treatment of wastewater with high degree of organic content, such as those from the residential and commercial sectors, from the food and beverage industries and those from the pulp and paper industry have significant potential for CH₄ emissions.

 CH_4 emissions for this sector were estimated at 1.7 Tg. The majority of CH_4 emissions is generated by waste disposal (64%). CO_2 emissions in this sector were estimated at 92 Gg, due to the incineration of non renewable waste.

In the case of household sewage, as a result of nitrogen content in human food, N₂O emissions also occur, which were estimated at 12 Gg.

Description of Steps Taken or Envisaged to Implement the Convention in Brazil

Each non-Annex I Party shall, pursuant to Article 12, paragraph 1(b) of the UNFCCC, submit to the Conference of the Parties a general description of the steps taken or envisaged by the Party to implement the Convention, taking into account its common but differentiated responsibilities and its development priorities, its objectives and specific national and regional circumstances.

Decision 17/CP.8 divided this part into two large subsections. Non-Annex I Parties may provide information about programs containing measures to mitigate climate change, either by reducing anthropogenic emissions by sources or by increasing removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, in addition to measures to facilitate adequate adaptation to climate change, including information on specific concerns arising from adverse effects.

Programs Containing Measures to Mitigate Climate Change

According to the principle of common but differentiated responsibilities, only countries included in Annex I to the United Nations Framework Convention on Climate Change have undertaken quantified commitments for reducing or limiting their anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol.Under the Convention, countries not included in that group (Parties not included in Annex I), including Brazil, have no quantified emission limitation or reduction commitments for these emissions. After all, the Convention reflects the recognition that the relative contribution of these countries to global emissions of these gases will grow to meet their social and development needs.

Despite the fact that Brazil is a developing country, however, there is an array of programs in the country that promote a significant reduction in such emissions. Some of these programs are responsible for the fact that Brazil has a relatively "clean" energy mix, specifically in terms of low levels of greenhouse gas emissions per unit of energy produced or consumed. Many other initiatives that are being implemented also contribute to the inflection in the growth rate of the greenhouse gas emissions curve in the country.

Programs and Actions Related to Sustainable Development

Some of the programs and actions related to sustainable development are related to the use of renewable energy and energy conservation and/or efficiency. These programs contribute towards Brazil having a "clean" energy mix, with low greenhouse gas emissions in the energy sector, to stabilize the concentrations of these gases in the atmosphere and for long-term sustainable development.

Major programs related to sustainable development include use of ethanol as vehicle fuel. The National Alcohol Program Proálcool was originally developed to avoid increasing dependence on foreign oil and foreign currency evasion during the oil price shocks. Although the program had great success in the 1970s and 1980s, the ethanol supply crisis in the late 1980s, together with the reduction of incentives for its production and use in the following years, led to a significant decrease in demand and, therefore, a drop in the sales of cars running on this fuel. Over the past few years, the technology for flex fuel motors has breathed new energy into domestic ethanol production. Vehicles running on gasoline, ethanol or any mixture of the two fuels were introduced in the country in March 2003, and they quickly attracted consumers. Their sales took over the sales for vehicles running on gasoline in the domestic market. It is important to point out that reduction of direct emissions from ethanol fuel use in Brazil has been approximately 600 million tons of CO, since 1975.

In the beginning of the 2000s, the Federal Government started viewing incorporation of biodiesel to Brazil's energy mix as strategic since this fuel was proving to be an alternative for reducing dependence on oil products and as a driving force for a new market for oilseeds. In addition, the intention was to add it to the domestic offer of fuels in a sustainable manner (socially, environmentally and economically), in order to make production of this feedstock a development driver, generating jobs and income, especially in the neediest regions of the country. Thanks to Probiodiesel, a program supported by the government, Brazil is among the largest producers and consumers of biodiesel in the world, with an annual production of 1.6 billion liters in 2009, and an installed capacity for nearly 4.7 billion liters in January 2010 (ANP, 2010a), thus increasing its share in Brazil's renewable energies.

Other important programs aim at reducing losses and eliminating wastage in energy production and use, in addition to adoption of enhanced energy-efficient technologies, and they help postpone investments in new power plants or oil refineries. Major programs include the National Electric Energy Conservation Program - Procel, a government program that has been developing a series of activities to combat electricity wastage since 1985. Moreover, the National Program on the Rationalization of the Use of Oil and Natural Gas Products - Conpet was established in 1991 in order to develop and bring together actions to rationalize the use of oil and natural gas products.

In Brazil, it is always important to bear in mind the contribution of hydroelectric power generation for the reduction of GHG emissions. In 2009, the Brazilian electric energy market required production of 466.2 TWh in public service and self-producing electric power plants. Of this production, 391 TWh, or 84%, was from hydroelectric sources. As a result of these figures, the Brazilian electrical sector takes on special characteristics, not only as one of the largest hydroelectric power producers in the world, but also for the exceptional participation of hydroelectric power in meeting its electric power needs. If the electricity generated by the non CO_2 emitting sources were produced by fossil fuel sources, emissions in the electricial sector would be much higher.

Significant growth is expected for the share of new renewable energy sources in Brazil's energy mix in the coming years. The new sources of renewable energy include the "modern use of biomass," small hydroelectric plants - SHPs, wind energy, solar energy (including photovoltaic energy), tidal power, and geothermal power. The "modern use of biomass" excludes the traditional uses of biomass, such as wood, and includes the use of agricultural and forest residues, as well as solid waste (garbage), for generating electricity, producing heat and liquid fuels for transportation. There is a great expectation especially in relation to cogeneration and use of agricultural residues. For example, it is estimated that agricultural residues - not including those from sugarcane - accounts for an energy availability of around 37.5 million toe per year, which is equivalent to 747 thousand barrels of oil per day, and this is virtually untapped.

Brazil is one of the few countries in the world that maintain the use of charcoal from planted forests in the metallurgical sector's production process, especially in the steel industry, with a focus on pig iron and steel. It is important to highlight the environmental gain resulting from mitigation of greenhouse gas emissions through emission reductions and net removals (during the 2001-2006 period, emission reductions of approximately 100 thousand tons of CO₂e were reported), as it creates a buffer that prevents pressure to deforest native forests.

Programs and actions that contain measures to mitigate climate change and its adverse effects

Brazil's demand for electricity has been growing much faster than the production of primary energy and the country's economy, a trend that should persist over coming years, thus calling for new energy planning strategies. While emissions tend to grow, because of the priority the country places on its development, several programs are underway in Brazil that seek to replace fossil fuel-based energy sources, with high carbon content per unit of energy generated, by other sources with a lower content, or by sources that generate greenhouse gas emissions with lower global warming potential. These programs and activities are designed to assist climate change mitigation and contribute towards achieving the Convention's ultimate objective. This is the case of natural gas, whose conversion efficiency is better than that for other fossil fuels. This results in lower CO, emissions per unit of energy generated. Compared to burning fuel oil, the option for natural gas enables a 27% reduction in total CO, emissions in plants designed with generation technology based on the conventional steam cycle, a 31% reduction in gas-powered turbines, and a 28% reduction in thermal power generation from combined cycle.

With regard to nuclear energy, from 1984 (the year the first nuclear power plant in operation in the country began to generate electricity) to 2009, 152 TWh were generated, which is equivalent to 32.7 million toe, considering a thermal efficiency of 40%. If this energy had been generated by coal, the use of nuclear energy in Brazil would have avoided the emission of 127 million tons of CO₂, which corresponds to 37% of total emissions for 2009 from energy use.

Integration of Climate Change Issues to Mid- and Long-Term Planning

Raising awareness of environmental issues in the medium and long terms is essential to sustainable development. Cognizant of this, in the process of preparing the national Agenda 21 the Brazilian government sought to establish strategies to ensure sustainable development in the country, recommending actions, partnerships, methodologies and institutional mechanisms for its implementation and monitoring.

Recently, several official measures have been pursued, which is an indication of the importance of the combat against climate change in Brazil. Early in this process, in 2008, the National Plan on Climate Change was approved with a view to identifying, planning and coordinating actions and measures that can be undertaken to mitigate greenhouse gas emissions generated in the country, as well as those necessary for the adaptation of society to the impacts arising from climate change.

On December 29, 2009, the National Policy on Climate Change was put in place, which established its own principles, objectives, guidelines, and instruments. The National Policy aims, inter alia, at the reconciliation of social and economic development with protection of the climate system; reduction of anthropogenic greenhouse gas emissions in relation to their various sources; strengthening of anthropogenic removals by sinks of greenhouse gases in the country; and implementation of measures to promote adaptation to climate change by the three levels of government, with the participation and collaboration of the economic and social stakeholders, particularly those especially vulnerable to its adverse effects.

As announced by the President of the Republic during the High Level Segment of the 15th Conference of the Parties to the Convention - COP-15 and the 5th Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol - CMP-5, held in Copenhagen, the text of the law that established the National Policy on Climate Change provides that the country will adopt voluntary actions to mitigate greenhouse gas emissions at national level with a view to reducing its projected emissions by 36.1%-38.9% by 2020. The measures to implement the Policy have been launched, with a view to establishing sectoral plans to achieve the goal expressed in the Policy regarding mitigation actions. This is one of the most ambitious national voluntary mitigation actions in the world.

The Policy on Science, Technology and Innovation - ST&I is also being strengthened with regard to climate change. Examples include the fact that the 2007-2010 Action Plan (entitled Science, Technology and Innovation for National Development) has encompassed the National Program on Climate Change, and the fact that there is a program entitled Meteorology and Climate Change under the Federal Government's 2008-2011 Multi-Annual Plan with a view to providing insight into the mechanisms that determine global climate change and to improving weather, climate, hydrological, and environmental forecasting capacities.

Many of the programs implemented in the country do not directly intend to reduce greenhouse gas emissions, but they will have impacts on emissions originating from different sources. One of the most important factors is the finding that not only the federal government is involved, but also states and municipalities. At the federal level, the National Air Quality Control Program – Pronar seeks to control air quality by establishing national emission limits. There is also the Motor Vehicle Air Pollution Control Program – Proconve, which has the same goal, but covers specifically air pollution by automotive vehicles. This is certainly one of the most successful environmental programs ever implemented in Brazil.

Article 4.1 (d) of the United Nations Framework Convention on Climate Change provides that the Parties shall "(p)romote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems."

Much progress has been made in recent years regarding the combat against deforestation, particularly in the Amazon. Administrative, economic and legal measures have been adopted, according to a political action strategy (among such instruments is the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon - PPCDAM). With the series of measures adopted, the deforestation area was significantly reduced by 73%, from 27,772 km² in 2004 to 7,464 km² in 2009.

Much of the success in the implementation of these measures is due to the fact that Brazil has one of the most modern systems for monitoring forest areas in the world, such as is the case of the remote sensing-based monitoring system for the Amazon by the National Institute for Space Research - INPE, which has four operating and complementary systems: Prodes, Queimadas, Deter, and Degrad.

Brazil has also been a pioneer in the use of meteorological satellite data to monitor burning in the country, which culminated in the creation of the Program for the Prevention and Control of Burnings and Forest Fires – Proarco, implemented by the Brazilian Institute of the Environment and Natural Resources – Ibama in collaboration with the National Institute for Space Research - INPE, with a view to preventing and controlling fires burnings in the country, thus avoiding forest fires.

In addition, there is a large number of Federally Protected Areas - PAs in the country to protect and conserve the existing flora and fauna. These PAs cover 44,835,960.84 hectares (448.35 thousand km²) in total. Adding up all Protected Areas in Brazil – federal and state PAs, full protection and sustainable use PAs, in addition to indigenous lands –, the total is 238,627,268 ha, which accounts for 27.98% of the country's territory. This figure does not include Municipally Protected Areas; Permanent Preservation Areas; Private Natural Heritage Reserves and military areas, plus a large area of native forest (mainly in the Amazon) that is not included as protected areas.

Financial and tax measures (the Green Protocol, environmental responsibility of banks, rural credit restrictions on environmental offenders, ecological ICMS, among others) have also proven to be of great importance in promoting sustainable development.

The National Fund on Climate Change and the Amazon Fund are recent examples of attempts to find financial resources in innovative ways to address challenges posed by climate change.

Clean Development Mechanism Project Activities in Brazil

The success of Clean Development Mechanism - CDM which is an instrument under the Kyoto Protocol - in Brazil is unquestionable and it has undoubtedly contributed to mitigating greenhouse gas emissions in the country. In August 2010, the potential of annual greenhouse gas emission reduction from 460 CDM project activities in Brazil under validation or in a subsequent stage in the CDM pipeline represented 8% of emissions from sectors other than land use, land use change and forestry -LULUCF (only afforestation and reforestation are eligible for CDM as LULUCF activities), which accounted for about 59% of Brazil's emissions in 1994. Two relevant examples of significant results from CDM in terms of reducing greenhouse gas emissions in Brazil are the following: five CDM project activities related to the production of adipic acid and nitric acid alone have reduced N₂O emissions virtually to zero in the Brazilian industrial sector, and 25 registered CDM project activities accounted for a reduction of approximately 47% of methane emissions in landfills in 1994.

Regarding CDM Programme of Activities - PoA, the first Brazilian PoA is another relevant example in terms of greenhouse gas emission reduction. This programme promotes CH₄ capture and combustion from Animal Waste Management System in swine farms in Brazil. 961 small-scale CDM programme activities have been included in the registered PoA by the coordinating/managing entity. The inclusion of these small swine farms in this PoA clearly indicates the relevance of the CDM to make feasible initiatives that would not occur in the absence of the Kyoto Protocol. In terms of number of CDM project activities, Brazil ranks third, corresponding to 7% of the worldwide total. In terms of expected greenhouse gas emission reduction, CDM project activities in Brazil are responsible for a reduction of 393 million tons of carbon dioxide equivalent during the first crediting period. This period could vary between 7 and 10 years. On an annual basis, the expected greenhouse gas emission reduction is around 50 million tons of carbon dioxide equivalent. Considering US\$ 15/tCO₂e, the amount of external financial resources to flow into the country during the first crediting period is approximately US\$ 5.8 billion or US\$ 750 million per year. In 2009, Certified Emission Reductions - CERs (known as "carbon credits") from CDM project activities would be ranked 16th if considered as part of the Brazilian export portfolio.

Programs Containing Measures to Facilitate Adequate Adaptation to Climate Change

One of the main objectives of the Second National Communication project was to "elaborate a methodological approach regarding vulnerability assessment and adaptation measures," which contained two results: elaboration of regional modeling of the climate and climate change scenarios; and vulnerability and adaptation research and studies concerning strategic sectors that are vulnerable to the impacts associated with climate change in Brazil.

The first result is related to the need for downscaling methods (scale reduction, that is, improved resolution) for Brazil, applicable to global climate change impact studies that require more detailed climatic projections, i.e., with better spatial resolution than that provided by a global climate model.

Hence, the Regional Climate Model - RCM, which is called Eta-CPTEC, was validated and then used to produce regional scenarios for future climate change for the Second National Communication of Brazil to the Convention. The Eta-CPTEC regional model featured new lateral conditions of the coupled ocean-atmosphere global model HadCM3 kindly provided by the Hadley Centre, UK. The study related to downscaling methods for Brazil was applied to climate change scenarios from the global model HadCM3 to obtain more detailed climate projections (2010-2040, 2040-2070, 2070-2100) with improved spatial resolution under scenario A1B. According to the model runs, the annual projections for 2010-2100 for temperature and rainfall derived from the Eta-CPTEC model for South America show increases in rainfall in Brazil's South region, and reductions in rainfall in the Northeast region and the Amazon, while temperatures rise throughout Brazil, and they are higher in the mainland area (MARENGO et al., 2010).

The second result aims at developing a preliminary analysis of the impacts associated with climate change in the main areas in accordance with Brazil's national circumstances, especially in those areas where vulnerability is influenced by physical, social and economic factors. The initial goal was to analyze the areas considered to be strategically relevant, where impacts associated with climate change may be important for Brazil, and which could be studied in an independent manner, while future climate scenarios for Brazil had not yet been concluded. However, additional development of some studies from this result would depend on future results obtained from regional climate models, which would provide more reliable scenarios for South America in relation to the impacts of climate change on average surface temperature or on rainfall patterns.

Thus, studies were conducted on the semi-arid region, urban areas, coastal zones, human health, energy and water resources, forests, agriculture and livestock, and prevention of disasters, under the coordination of the Center for Strategic Studies and Management in Science, Technology and Innovation - CGEE, in collaboration with the Ministry of Science and Technology - MCT. Renowned Brazilian scientists in the area were mobilized for this task, each responsible for addressing specific issues. These studies were comprised of papers and debated by representatives from public and private organizations, in workshops for each of the thematic areas held in 2008 and 2009.

Additionally, with the runs of the regional model and with the availability of regionalized climate change scenarios until 2100, it was possible to conduct in-depth studies in the areas of health, energy and water resources, agriculture, and coral bleaching.

Other Information Considered Relevant to the Achievement of the Objective of the Convention

Transfer of Technologies

It must be recognized that a quick and effective reduction in greenhouse gas emissions and the need to adapt to the adverse effects of climate change require access to and diffusion and transfer of environmentally sound technologies.

Brazil considers the expression "transfer of technology" to have a more comprehensive meaning, encompassing the different stages of the technological cycle, including research and development - R&D, demonstration, increase in scale (deployment), diffusion and the transfer of technology per se, in relation to both mitigation and adaptation.

Brazil believes that the development and transfer of technologies related to global climate change should support mitigation and adaptation actions in order to achieve the Convention's ultimate objective. In the quest for this objective, identification of technological needs must be determined at national level, based on national circumstances and priorities.

Brazil has been seeking to identify the country's technological needs in relation to energy in a manner that reconciles meeting growing demands with the use of sources that emit fewer greenhouse gases. However, the intention is not merely to seek to identify the technologies the country needs to receive, but also the great potential for endogenous technologies that could be diffused and/or transferred to other countries, especially developing countries, through South-South (especially with Portuguese-speaking and/or African countries) or triangular cooperation. Ethanol produced from sugarcane is one of these examples, as well as technological advances achieved in the agriculture sector.

Research and Systematic Observation

Various research studies and systematic observation activities related to the global climate change problem have been carried out in the country. In this context, teams of Brazilian researchers are participating in the international effort of research programs related to global climate change, such as the Global Climate Observation System - GCOS, Global Oceanic Observation System - GOOS and the Pilot Research Moored Array in the Tropical Atlantic - Pirata, among others.

Among the research initiatives led by Brazil, the Large Scale Biosphere-Atmosphere Experiment in Amazonia - LBA deserves special mention. It aims at expanding understanding of the climatological, ecological, biogeochemical and hydrological functioning of the Amazon region; of the impact of land use changes on this functioning; and of the interactions between the Amazonia and the global biogeophysical system of the Earth. In 2007, the LBA became a government program and refreshed the research agenda launched in 1998, when it was under international cooperation agreements.

A major scientific contribution by Brazil to the negotiations of the international regime on global climate change was the so-called "Brazilian Proposal", put forward by the country in response to the "Berlin Mandate", and submitted in May 1997. The proposal intends to promote a change in paradigm by defining objective criteria to evaluate each country's responsibility for global climate change. It is based on each country's historical and differentiated contributions towards the increase in global mean surface temperatures caused by the accumulation of anthropogenic greenhouse gases since the Industrial Revolution.

Thus, the country is promoting and cooperating in scientific research and in systematic observations aimed at explaining, reducing or eliminating uncertainties that still exist regarding the causes, the effects, the magnitude and the evolution of climate change over time.

Education, Training and Public Awareness

Although the issues related to climate change are complex and difficult to be understood by lay persons, and in the light of the limited reading material on the subject available in Portuguese, an effort has being made to expand education, public awareness and training on issues related to climate change.

Several educational programs implemented in Brazil are in accordance with the Convention's objectives. In particular, the following should be highlighted:

- The Brazilian Internet site on climate change of the Ministry of Science and Technology - MCT (http://www.mct.gov.br/clima) has contributed towards an increase in public awareness on the matter, as it provides information about the entire negotiation process under the Convention, the main references about climate science and the preparation of the National Communication. On September 27, 2010, the total number of pages available exceeded the figure for 2000 more than tenfold, since the website had 35,363 pages online, in four languages (Portuguese, English, Spanish, and French). Furthermore, it is worth noting that, according to Google, the Ministry homepage's PageRank is 8, i.e., every ten searches conducted on the Internet on the topic of global climate change, eight are directed to the Brazilian homepage. Also, publications in Portuguese (such as the official version of the Convention and Kyoto Protocol), articles from newspapers, magazines and journals, radio and TV shows, as well as the organization of seminars and debates, have helped in generating awareness of an issue that was relatively unknown in the country in 1994.
- Established in 2000 and chaired by the President of the Republic, the Brazilian Climate Change Forum - FBMC has helped to promote awareness and engagement of the society regarding the issue of global climate change,

together with numerous other public and private organizations.

 The Procel nas Escolas (Procel at Schools) and Conpet nas Escolas (Conpet at Schools) programs are especially geared towards children and adolescents through partnerships with learning institutions, and they are also of great importance. They aim at expanding teacher and student awareness about the importance of using electric energy, oil byproducts and natural gas in the most sustainable way possible and to broadly promote such attitudes. It is estimated that between 1990 and 2008, thanks to the achievements by the Procel project, an accumulated savings of energy of 2,841,912 MWh was achieved.

National and Regional Capacity Building

Brazil has special needs related to the institutional structure required to deal with climate change related issues. Building national and regional capacity is one of the primary objectives of developing countries, considering that climate change is a new field of study and there are few specialized courses on the subject.

At regional level, the work of the Inter-American Institute for Global Climate Change Research - IAI, an intergovernmental organization dedicated to research, deserves special mention. In relation to research at national level, activities by the Brazilian Research Network on Global Climate Change - Climate Network, established at the end of 2007, and the National Institute of Science and Technology for Climate Change are to be highlighted. Another aspect to be pointed out is the increasing participation of Brazilian scientists in the IPCC process, as well as the recent creation of the Brazilian Panel on Climate Change, based on the IPCC. Efforts are being made in the country in relation to the improvement of future climate change scenarios on the part of the Center for Weather Forecasting and Climate Studies - CPTEC/INPE and the newly created Earth System Science Center - CCST/INPE.

There are also cooperation initiatives in relation to national and regional capacity building with other developing countries (South-South cooperation) and triangular cooperation initiatives, involving both developed and developing countries (North-South-South cooperation). Training on modeling future regional scenarios of climate change for Latin American and Caribbean countries is reported as an example of regional capacity building. As far as national capacity building is concerned, Brazil has also collaborated with other developing countries in building capacity related to the Clean Development Mechanism and the preparation of National Communications.

Financial, Technical and Capacity Needs Difficulties Associated with the Preparation of the National Communication

The appreciation of Brazil's currency – the real – was a major concern in executing the project of the Second National Communication of Brazil. The dollar exchange rate at the time the project was negotiated with the GEF was R\$ 3.15. Under those circumstances, the approved budget for the project (US\$ 3,400,000 from GEF plus the original national contribution of US\$ 4,175,600) would certainly be sufficient for carrying out all the planned basic studies, and the expansions and details, that is, the additional activities that would be implemented, at the expense of the contributions that would be negotiated during the project execution, with each partner.

However, the dollar exchange rate, according to the official United Nations exchange rate for October 2010, was at R\$ 1.71, having oscillated throughout execution of the project (2006-2010) at rates lower than those considered when the project was proposed. This caused several financial difficulties for the project to comply with its basic commitments, since all of its expense commitments were paid in *reais*.

In the specific case of the Second National Communication of Brazil, the executing agency of this project, i.e., the MCT, had to make additional efforts in relation to financial execution of the project, since besides those contributions that are normally expected for expanding and detailing results, additional funds were necessary to make it possible to carry out some studies, given the real's appreciation in relation to the dollar.

The efficient completion of the Second National Communication of Brazil, with the proper expansions and details of those studies deemed necessary by the technical area, as well as the solution of the difficulties faced with the exchange appreciation, demanded funds worth US\$ 10,604,222.

Of these funds, US\$ 3,400,000 were provided by GEF and US\$ 7,204,222 came from national contributions. Initially, this contribution was US\$ 4,175,600. However, given the exchange rate appreciation and the determined need for additional activities during the execution of the project, this contribution was not sufficient, which forced the MCT to work with several of the Ministry's institutions and entities in order to obtain additional funds, without which the work would not be finalized.

Through active participation and thanks to a solid construction of partnerships by the MCT, it was possible to leverage additional contribution funds of US\$ 3,028,622 to complete the project in an efficient manner, maintaining the expected quality of the results.

In addition, another major concern in relation to the permanent arrangements for the preparation of National Communications is the lack of a stable team with expertise in global climate change, dedicated to the planning and supervision of actions that is not outsourced or hired as consultants for the delivery of products.

The acquisition of sophisticated equipment for processing data derived from interpretation of satellite imagery and auxiliary data (cartographic maps, etc.) was a concern in the project due to the delay in hiring and lack of experience in the preparation of this type of bidding by the United Nations agency.

Summing up, the contents of this document are an indication that Brazil has been doing its fair share to combat climate change, and is prepared to sustain this leading role in the context of the overall effort needed to address the problem, pursuant to the Convention's objective and principles.

ANNEX D. SUMMARY SHEET

I. Project Identification

GEF Project ID: GEF Agency Project ID: 2613, ATLAS project nr. 47864 Countries: Brazil Project Title: Second National Communication of Brazil to the UNFCCC GEF Agency (or Agencies): UNDP

II. Dates

| Milestone | Expected date | Actual date |
|--------------------------------|---------------|------------------|
| Pipeline entry | | 21 April 2005 |
| CEO endorsement/approval | | 19 October 2005 |
| Agency approval date | | 20 December 2005 |
| Implementation start | | 02 March 2006 |
| Midterm evaluation | | |
| Project completion | | 31 December 2010 |
| Terminal evaluation completion | | 30 June 2012 |
| Project closing | | 30 June 2012 |

III. Project Framework

| Project component | Activity | G | EF financing (in \$) | Co-financing (in \$) | | | |
|------------------------------|----------|-------------|----------------------|----------------------|------------------|--|--|
| | type | Approved | Actual | Promised | Actual | | |
| | | | (until 31-12-11) | | (until 31-12-11) | | |
| 1. Administrative | | 426.721 | 508.061 | | | | |
| 2. Policy and regulations | TA | 776.396 | 790.799 | 1.520.000 | 2.397.331 | | |
| 2. Training (and investment) | TA | 572.839 | 614.106 | 5.345.000 | 6.162.523 | | |
| 3. Dissemination | ТА | 404.044 | 221.380 | 200.000 | 200.000 | | |
| | | | | | | | |
| Total | | \$2.180.000 | \$2.134.346 | \$7.065.000 | \$8.759.854 | | |

Activity types are investment, technical assistance (TA), or scientific and technical analysis. Promised co financing refers to the amount indicated at the point of CEO endorsement/approval. Co-financing breakdown per component It should be noted that the Project Document does not gives details on co-financing per project component, only per contributing party. Also, project progress reports do not provide co-financing details per component.

IV. Co financing

| | | Project | preparation | Project im | plementation | Tota | | |
|-------------------|-------|-------------|-------------|------------|--------------|-------------|-------------|--|
| Sources of Co- | | Expected | Actual | Expected | Actual | Expected | Actual | |
| financing | Туре | | (31-12-11) | | | | | |
| Contribution of | Grant | 1.720.000 | 2.597.331 | | | 1.720.000 | 2.597.331 | |
| national, local | | | | | | | | |
| government and | | | | | | | | |
| agencies | | | | | | | | |
| Private sector | | 5.345.000 | 6.162.523 | | | 5.345.000 | 6.162.523 | |
| NGO | | | | | | | | |
| Other | | | | | | | | |
| Total Cofinancing | | \$7.065.000 | \$8.759.854 | | | \$7.065.000 | \$8.759.854 | |

Expected amounts are those submitted by the GEF Agencies in the original project appraisal document. Co-financing types are grant, soft loan, hard loan, guarantee, in kind, or cash