

**CDM/JI Initiative**

**Country Study**

**Brazil**

**A CDM Market Overview**

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## Foreword

The country report presented here is part of the CDM/JI Initiative launched by the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to encourage the participation of German companies in the flexible mechanisms established under the Kyoto Protocol. At the same time, the Initiative aims to intensify bilateral co-operation with governments and institutions in the host countries for CDM and JI in order to support their respective national climate policies.

The initiative will help market players to maximize their use of the opportunities presented by the Clean Development Mechanism (CDM) and Joint Implementation (JI). It particularly targets small and medium-sized enterprises (SMEs) that participate in the EU emission trading scheme in Germany, but also technology providers. The SMEs often lack information about CDM and JI project implementation and relevant networks in host countries, which are needed to leverage investments for projects and to complete emissions-trading agreements. The activities conducted as part of the initiative take a long-term approach and pursue a clear objective of continuing cooperation efforts when the first Kyoto Protocol commitment period ends in 2012. Innovative instruments like the programmatic approach, with the potential to scale up the flexible mechanisms and to tap new sectors, are therefore also part of the scope of the Initiative.

On behalf of the BMU, GTZ aims to develop portfolios of CDM projects in India, China and Brazil that can be implemented before 2012. CDM projects in these countries operate in a very competitive environment, and specific market information provided by GTZ can facilitate the successful implementation of CDM projects. Other countries to be prioritized by the Initiative are in the Middle East and North Africa (MENA) Region, which has numerous sectors with considerable CDM potential.

As an initial step in its country activities, GTZ was assigned to prepare six CDM country studies in Brazil, China and India, as well as Egypt, Morocco and Tunisia in the MENA region.

The aim of the country studies is to identify information gaps and offer suggestions for overcoming these. The studies first present an overview of the national CDM market by analysing the CDM projects that have been submitted, approved and processed to date, together with the methodologies used. National institutions, international organisations and other relevant actors are taken into account, thereby providing a detailed picture of the national CDM market. Secondly, the study identifies untapped sectors and new potential for CDM projects. The studies provide a basis for developing a project portfolio that focuses particularly on high quality, innovative projects which still need support in order to gain market access.

We hope the reader finds this and the other five reports useful as an orientation for the CDM in the countries concerned.

  
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## Executive Summary

Brazil, the biggest country and strongest economy of Latin America, has a comparatively solid economic investment environment. Based on enormous natural resources like iron ore and other minerals, petroleum, natural gas and abundant water potentials, as well as an important industry, the country is the world's 10<sup>th</sup> economy. Favorable climatic conditions contribute to a prospering agriculture and offer big potentials on biomass, wind and solar energy.

Brazil participates in the CDM market since its beginning and has developed the first CDM project registered at the United Nations Framework Convention on Climate Change (UNFCCC).

In the global scenario, Brazil ranks third among the countries with major annual GHG emission reductions, behind China and India, with 7 % of the worldwide total emission reductions. In the Latin America context, Brazil leads the field in front of Mexico.

The Brazilian Designated National Authority (DNA) was already created in 1999 and is recognized as efficient and well-structured.

The Brazilian CDM market follows commercial market rules and has up to now produced 146 registered CDM projects. 169 projects are under validation and many other CDM projects are still in the pipeline of projects under development.

Despite a low emission baseline factor attributed to a relatively clean electric energy matrix, most CDM projects registered and in validation are in the field of electric energy generation by renewable energies mainly hydropower and biomass.

There are more than 50 CDM project consultant companies and 8 DOEs currently operating in the country.

Brazilian CDM projects have a good reputation in the market, being considered well-designed and of high quality. In comparison with Indian and Chinese CERs, Brazilian CERs are generally more expensive.

English, Japanese and Dutch buyers are dominating the CDM market. German participation is so far very limited.

There are interesting business opportunities for German companies for purchasing CERs and signing Emission Reduction Permission Agreement (ERPAs), investments in CDM projects and also in the field of technology transfer. Those opportunities have been continuously identified by BMU sponsored CDM/JI Initiative and a more active involvement of German companies in the Brazilian CDM market is expected as a result of this effort.



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## List of Abbreviations

|                      |  |
|----------------------|--|
| ABEMC                | Associação Brasileira das Empresas do Mercado de Carbono / Brazilian Association of CDM Market Companies       |
| AWMS                 | Animal Waste Management Systems  |
| BEF                  | Baseline Emission Factor   |
| BM&F BOVESPA         | Bolsa de Mercadorias & Futuro / São Paulo Future Stock Exchange  |
| BNDES                | Banco Nacional de Desenvolvimento Econômico e Social / Brazilian National Economic and Social Development Bank |
| BRIC                 | Brazil, Russia, India and China  |
| BRL                  | Brazilian Real   |
| BVRJ                 | Bolsa de Valores do Rio de Janeiro / Rio de Janeiro Stock Exchange   |
| CDM                  | Clean Development Mechanism  |
| CER                  | Certified Emission Reduction   |
| CH <sub>4</sub>      | Methane  |
| CIMGC                | Comissão Interministerial de Mudança Global do Clima / Interministerial Commission on Global Climate Change    |
| CO <sub>2</sub>      | Carbon dioxide   |
| CO <sub>2</sub> eq   | Carbon dioxide equivalent  |
| COP                  | Convention of Parties  |
| DNA                  | Designated National Authority  |
| DOE                  | Designated Operational Entity  |
| EB                   | Executive Board  |
| EE                   | Energy Efficiency  |
| EU                   | European Union   |
| EU ETS               | European Union Emissions Trading Scheme  |
| EUA                  | European Union Allowance   |
| EUR                  | Euros  |
| FCCC                 | Framework Convention on Climate Change   |
| FEMA                 | Fundo Especial de Meio Ambiente e Desenvolvimento Sustentável / Special Environmental and Development Fund     |
| GDP                  | Gross Domestic Product   |
| GHG                  | Greenhouse Gases   |
| ICERs                | Long term Certified Emission Reduction   |
| IPCC                 | Intergovernmental Panel on Climate Change  |
| kCER                 | Townsend CERs  |
| ktCO <sub>2</sub> eq | kilotons of carbon dioxide equivalent  |
| LULUCF               | Land Use, Land-Use Change and Forestry   |
| ONS                  | Operador Nacional do Sistema / Brazil's National Electric System Operator                                      |

|                  |  |
|------------------|--|
| MCT              | Ministério da Ciência e Tecnologia / Ministry for Science and Technology   |
| MERCOSUL         | Mercado Comum do Sul / Southern Common Market  |
| MF               | Ministério da Fazenda / Ministry of Finance  |
| MWh              | Megawatt hour  |
| N <sub>2</sub> O | Nitrous oxide  |
| NGO              | Non-Governmental Organization  |
| PDD              | Project Design Document  |
| PFCs             | Perfluorocarbons   |
| PIN              | Project Idea Note  |
| PNMC             | Plano Nacional de Mudanças Climáticas / National Plan on Climate Change  |
| PoA              | Programme of Activity  |
| PROINFA          | Programa de Incentivo às Fontes Alternativas de Energia Elétrica / Program of the Alternative Sources of Electric Energy |
| RE               | Renewable Energy   |
| SHP              | Small Hydro Power  |
| SIN              | Sistema Interligado Nacional / National Energy Grid  |
| UK               | United Kingdom   |
| UNCED            | United Nations Conference on Environment and Development   |
| UNCTAD           | United Nations Conference on Trade and Development   |
| UNFCCC           | United Nations Framework Convention on Climate Change  |
| USA              | United States of America   |
| USD              | US Dollars   |
| VERs             | Verified Emission Reductions   |
| YTD              | Year-To-Date   |

## 1. Introduction

Since the Kyoto Protocol entered into force on February 16, 2005, the interest in the “project-based” flexibility mechanism for countries that have binding greenhouse gas emission reduction targets, called “Clean Development Mechanism (CDM)”, has constantly increased. Through this mechanism, countries listed in Annex I of the United Nations Convention on Climate change (UNFCCC) are allowed to purchase emission reductions achieved in projects based in non-Annex I (developing) countries, to meet their emission targets.

In the global scenario of CDM projects, Brazil ranks third among the countries with most annual GHG emission reduction projects, behind China and India. Being the pioneer country hosting CDM projects, with seven years of experience, Brazil has a well established environment, facilitating project implementation.

Despite the substantial number of CDM project opportunities offered by the Brazilian CDM market, the participation of German companies is still very limited.

Therefore, the CDM/JI Initiative Brazil, a project commissioned by the German Federal Ministry of Environment Protection and Nuclear Safety (BMU) and implemented by GTZ (German Technical Cooperation), was established in order to facilitate German companies’ engagement in the Brazilian CDM market.

The objective of this study is to give German companies an overview of the structure and specific conditions of the Brazilian CDM market and indicate business opportunities.

After a brief analysis of Brazil’s current economic situation and investment climate, an overview about existing CDM-projects, CDM project developers and other relevant actors is given. The country’s particularities and special criteria for CDM-projects are also described. Finally, the study includes current CDM business models adopted in Brazil and provides information about actual business opportunities.

## 2. General Economic Environment

Considering its gross domestic product (GDP), Brazil is the 10<sup>th</sup> ranked country in the list of main worldwide economies. About 40 % of the GDP is generated by industry, almost 50 % by services and agriculture’s contribution to GDP is around 10 %.

Brazil is today the strongest economy in South America and is continuously gaining importance on the global market. The most important exports are coffee, cacao, tropical fruit, soybeans, sugar, alcohol, iron ore, cars, airplanes and other industrial goods. 40 % of Brazilian exports go to the European Union (EU) and 18 % to the United States (US). An increasing numbers of goods, mainly iron-ore and agricultural products, are exported to the Popular Republic of China.

Considering its huge natural resources, Brazil still has an immense economic growth potential. An advanced industrialization, political stability and a substantial internal market gives the country a very good position compared to its neighboring countries. The South American customs union *MERCOSUL* strengthens the Latin American market and also opens up far-reaching possibilities for the Brazilian economy.

In 2008, Brazil's economy is following up on the positive trend of 2007. The growth rate of 5.4 % in 2007 was twice the average of the last 10 years. In comparison to the previous year, growth rose in the first quarter of 2008 to 5.8 % ytd. In spite of the worldwide financial crisis, a growth of 4.5 to 5 % is estimated for 2008. On the other hand, the inflation rate and

trade balance will turn out slightly more unfavorable due to booming domestic demand and rising inflation.

**Table 1: General economic data for 2007<sup>1</sup>**

|  |   |
|--|---|
| Population   | About 191.9 million inhabitants                 |
| GDP  | 1,314 bi USD<br>forecast for 2008: 1,621 bi USD |
| Per capita GDP                                     | around 6,938 USD                                |
| Real GDP growth                                    | + 5.4 % forecast for 2008: + 4.8 %              |
| Inflation rate                                     | 3.6 % forecast for 2008: 4.8 %                  |
| Exports  | 160.6 bi USD                                    |
| Imports  | 120.6 bi USD                                    |
| Foreign direct investments                         | presently: 209.9 bi USD<br>inflow: 33.7 bi USD  |
| Government debt                                    | 243.9 bi USD                                    |
| Monetary reserves                                  | 179.4 bi USD                                    |
| Exchange rates October 2008                        | 1 USD = 2.11 BRL; 1 EUR = 2.74 BRL              |
| Credit rating<br>(source: Institutional Investor ) | March 2008: position 60;<br>Credit Rating 60.6  |
| Investment grade (Fitch)                           | BBB-  |

In the last few years, Brazil's general economic conditions improved significantly. Both the political system and democracy are considered stable and the economy is seen as based on a solid grounding. Brazil, as the most important economy in Latin America, has attracted more and more the attention of foreign investors. Among the so-called BRIC countries (Brazil, Russia, India, China), Brazil is credited with the strongest growth potential for the next decades and the United Nations Conference on Trade and Development (UNCTAD) classified Brazil as one of the world's five most attractive investment locations.

Foreign direct investments comprise almost 35 billion USD in Brazil (2007) and that way established a new record, exceeding the money inflow during the country's infrastructure privatization phase at the end of the 90s. German companies took also part in this trend by almost doubling their Brazilian commitments in 2007. The German Federal Republic has a share of 5.2 % and is therefore one of the main foreign investors in 2007 along with the Netherlands (24.1 %), the U.S. (17.9 %), Luxembourg (8.5 %) and Spain (6.4 %).

<sup>1</sup> Bfai 2008: German Federal Agency for Foreign Trade (Publisher): Wirtschaftsdaten Kompakt - Brasilien. [https://www.bfai.de/ext/anlagen/MktAnlage\\_5981.pdf?show=true](https://www.bfai.de/ext/anlagen/MktAnlage_5981.pdf?show=true). Retrieval on 2008-09-09.

Brazil received investment grade “BBB-” in April/May 2008 by the international rating agency Fitch, which made the country even more attractive to foreign capital and especially to institutional investors. Like other emerging economies and oil producing countries, the Brazilian Ministry of Finance (MF) is currently planning to establish a state-owned fund for foreign investment (Fundo Soberano do Brasil) with a capital stock of R\$ 14 billion to be obtained from surplus of foreign currency (i.e., surplus from primary budgets).<sup>2</sup>

Barriers for business in Brazil commonly stated by foreign companies are: high tax burden, bureaucratic hindrances, corruption, excessive government spending for non-productive purposes, poor transportation infrastructure, delays in expansion of electric infrastructure and also the countries poor educational and health system. Further problems faced by companies with the intent to invest in Brazil are the critical safety situation, the low investment quota of only about 17.7 % of GDP, the high 13.75 % prime rate, as well as a cumbersome legal system.<sup>3</sup>

Detailed and regularly actualized information about the economic condition and investment-climate of Brazil can be provided by the Brazil-German Chamber of Commerce (AHK-São Paulo).

### **3. CDM Projects in Brazil<sup>4</sup>**

Brazil was the first nation that signed the Framework Convention on Climate Change (UNFCCC) on June 4, 1992 and ratified it in 1994. The Kyoto-Protocol was recognized only in August 2002. The Brazilian Project "NovaGerar - Landfill Gas to Energy" was the first worldwide CDM-Project that has been certified by the UNFCCC's CDM Executive Board (EB).

#### **3.1 Registered Projects**

By October 2008, 146 Brazilian projects have been registered. Brazil is one of the most outstanding countries for the development of CDM-projects besides China and India.<sup>5</sup>

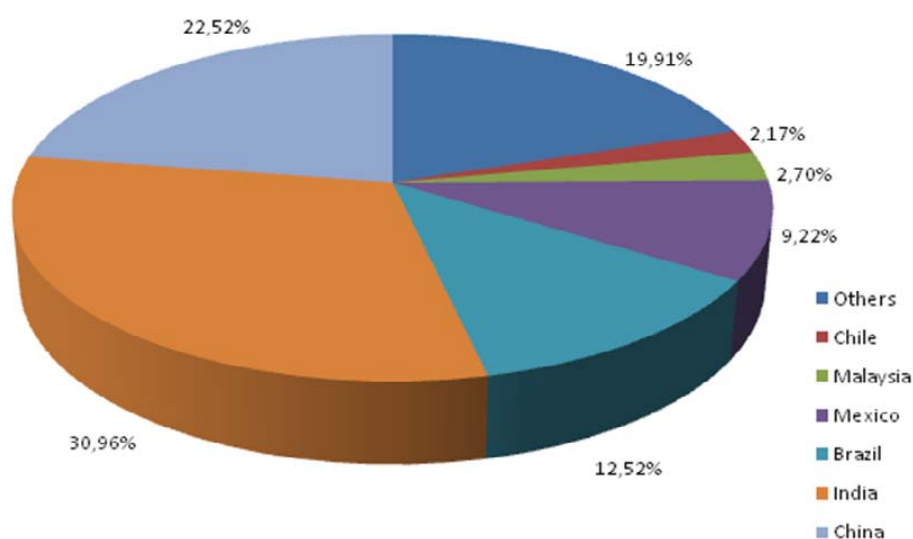
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<sup>2</sup> Correio do Brasil 2008: Correio do Brasil Aug. 27, 2008: Government wants to be sure of funds for the Fundo Soberano, says Minister. <http://www.correiodobrasil.com.br/noticia.asp?c=142768>. Retrieved on: 2008-09-22.

<sup>3</sup> Bfai 2007: German Federal Agency for Foreign Trade: Bundesagentur für Aussenwirtschaft: Investment Climate and Risks in Brazil. Cologne 2007

<sup>4</sup> Data under the following sections are updated almost on a monthly basis under the Brazilian DNA site, more precisely under <http://www.mct.gov.br/index.php/content/view/30325.html#>. Retrieval on: 2008-12-05.

<sup>5</sup> Executive Board 2008: United Nations Framework Convention on Climate Change. <http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>. Retrieval on 2008-08-26.



**Figure 1: Projects certified by the Executive Board per host country**

In the last two years, India and China strengthened their engagement in the CDM-market considerably and are now responsible for over 50 % of this activity. Brazil's participation decreased percent wise from 22.5 % in 2006 to 12.52 % in August 2008 due to the entering of China and India in this market. The number of registered CDM-projects from Brazil, however, increased in this same period 129 % in absolute terms. Furthermore another 2 projects are in the process of being certified at this point (October, 2008).

**Table 2: Brazilian projects registered at the Executive Board (Oct., 2008)**

| Registered | Requesting Registration | Review Requested | Correction Requested | Rejected | Withdrawn | Under review |
|------------|-------------------------|------------------|----------------------|----------|-----------|--------------|
| 146        | 2                       | 2                | 2                    | 18       | 1         | 0            |

36 or 25 % of the registered projects are unilateral projects, what means there is no Annex 1 country investing in those projects. British companies are involved as investors in 62 % of the 110 remaining projects, followed by Netherlands and Japan. German companies have participated only in five projects so far.

All 146 Brazilian projects registered are expected to generate approximately 19.550 ktCO<sub>2</sub>eq annually, which represents 8.74 % of expected worldwide emissions reduction achieved through CDM projects in 2008:<sup>6</sup> (Fig. 2). Taking into account the projects at validation stage,

<sup>6</sup> Executive Board 2008: United Nations Framework Convention on Climate Change. <http://cdm.unfccc.int/Statistics/Registration/AmountOfReductRegisteredProjPieChart.html>. Retrieval on 2008-08-26.

Brazil offers an amount of 317 projects that are expected to reduce annually 42.200 ktCO<sub>2</sub>eq on the first crediting period.

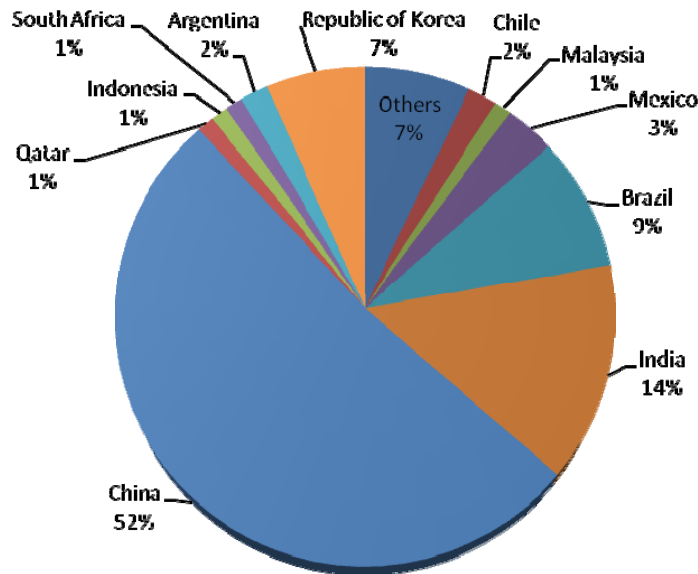


Figure 2: Annually expected CERs of all host country's projects

### 3.2 Projects by Type of Greenhouse Gas

Figure 3 shows the global contribution of CDM project activities in Brazil to GHG-reductions. It can be noted that the carbon dioxide is currently the most relevant gas, followed by methane and nitrous oxide, respectively. The majority of the project activities developed in Brazil is in the energy sector (Renewable Energies), which explains why CO<sub>2</sub> is preponderant in the Brazilian CDM projects.

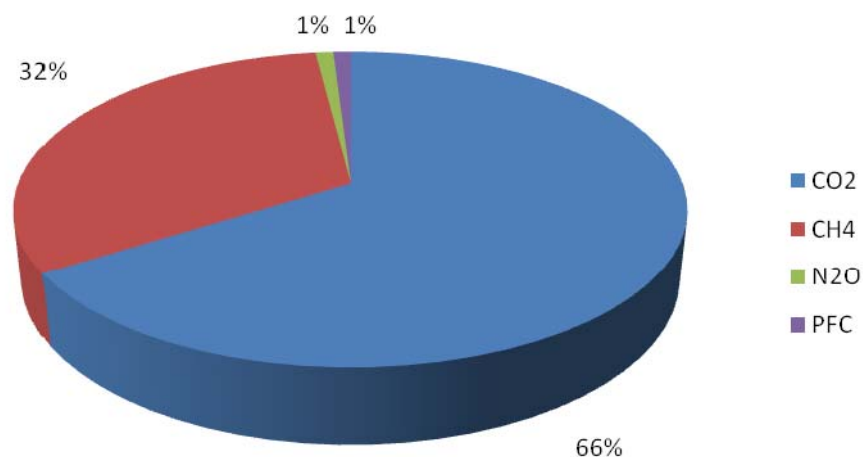


Figure 3: Number of Brazilian projects by type of greenhouse gas

### 3.3 Projects by Type and Size

According to the Marrakech Accords, project activities are divided into small and large scale in regards to their size. Small scale projects are defined as Renewable Energy project activities with a maximum output capacity of up to 15 megawatts; or energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 15 GWh per year; or project activities that reduce anthropogenic emissions by less than 60 ktCO<sub>2</sub>eq per year. More than 55 % of the Brazilian projects are large scale. (Fig. 4)

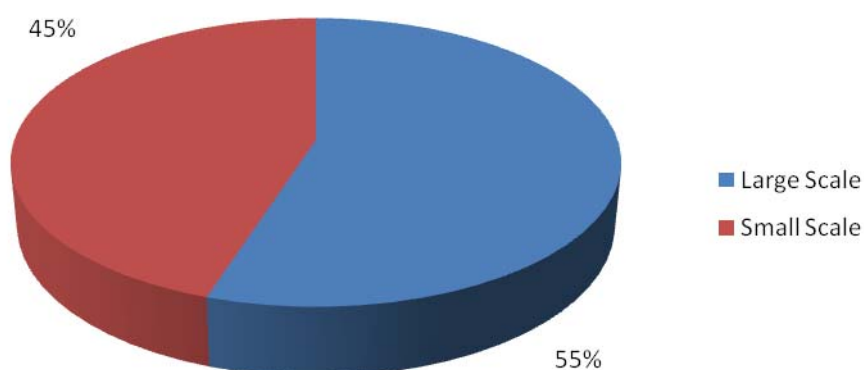


Figure 4: Project activities in Brazil by type of methodology

### 3.4 Projects by Technology and Methodology

An overall emissions reduction of 321,762,907 tCO<sub>2</sub>eq is expected from all the Brazilian projects, currently on the pipeline, for the first crediting period, which can be a maximum of 10 years for fixed period projects or 7 years for renewable period projects (the projects are renewable for a maximum of 3 periods of 7 years, with a total of 21 years).

Looking at the technological distribution among the projects at validation and registration stage, renewable energy is the most popular project type and accounts for 150 CDM projects which represents also the highest portion of annual emission reduction (39 %) (see Table 3). Most projects types are biomass energy (mainly energy generation from sugar cane bagasse), small hydro power plants (SHP) and greenhouse gas savings from livestock breeding and biogas production, mainly in swine farming and Landfills (Fig. 5)

Renewable Energy projects can be classified in biomass energy projects (56 %, in number of projects), hydro power projects (38 %) and wind power projects (6 %). When it comes to CO<sub>2</sub>eq emission reduction, the percentage-ratios are different. Hydro power projects are responsible for 49 % of emission reductions, followed by biomass energy with 45 %, and wind-projects with so far only 6 %.

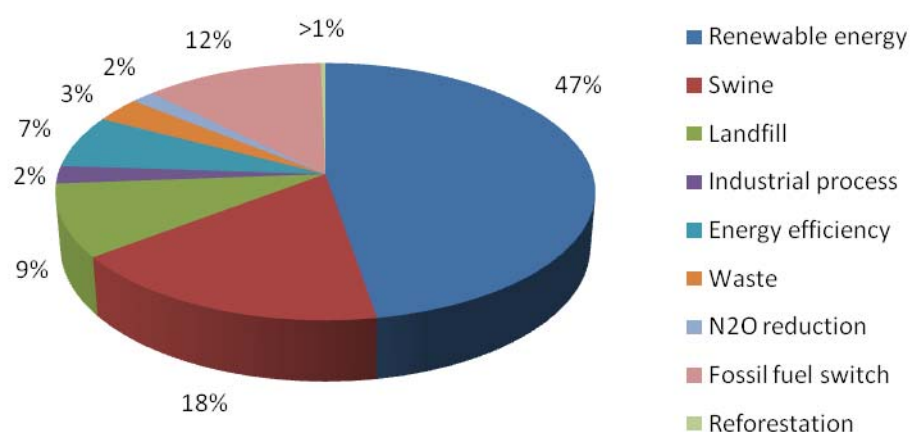


Figure 5: Brazilian CDM projects by activity type

Table 3: Distribution of project activities in Brazil by type

| Registered/<br>Under<br>Validation<br>Projects | Nr. of<br>projects | Annual<br>emission<br>reduction | Emission<br>reductions on the<br>1st crediting<br>period | Nr. of<br>projects | Annual<br>emission<br>reduction | Emission<br>reductions<br>on the<br>1st<br>crediting<br>period |
|--|--------------------|---------------------------------|--|--------------------|---------------------------------|--|
| Renewable<br>Energy                            | 150                | 16,431,099                      | 115,440,422  | 48 %               | 39 %                            | 35 %   |
| Swine  | 55                 | 2,737,322                       | 25,667,400   | 17 %               | 6 %                             | 8 %  |
| Landfill                                       | 29                 | 10,036,702                      | 73,855,179   | 9 %                | 23 %                            | 23 %   |
| Industrial<br>process                          | 7                  | 832,946                         | 6,131,592  | 2 %                | 2 %                             | 2 %  |
| Energy<br>efficiency                           | 21                 | 1,490,288                       | 14,535,192   | 7 %                | 4 %                             | 5 %  |
| Waste  | 10                 | 1,160,797                       | 9,360,545  | 3 %                | 3 %                             | 3 %  |
| N <sub>2</sub> O reduction                     | 5                  | 6,373,896                       | 44,617,272   | 2 %                | 15 %                            | 14 %   |
| Fossil fuel<br>switch                          | 39                 | 2,907,977                       | 24,284,745   | 12 %               | 7 %                             | 8 %  |
| Reforestation                                  | 1                  | 262,352                         | 7,870,560  | 0 %                | 1 %                             | 2 %  |
| <b>TOTAL</b>                                   | <b>317</b>         | <b>42,233,380</b>               | <b>321,762,907</b>                                       | <b>100,00%</b>     | <b>100,00%</b>                  | <b>100,00%</b>   |

A relatively small number of 29 landfills projects and only two N<sub>2</sub>O projects are responsible for 23 % and 15 % respectively of the annual CERs generated, making these two fields the most effective CDM projects.

Energy efficiency and reforestation are poorly represented considering their potential.

Brazil's energy matrix is mainly based on hydro power. Therefore, the energy sector faces the disadvantage of a low baseline emission factor of the national grid (find more information in the chapter 3.5). Power generation and energy efficiency projects are confronted with lower CER potential compared to countries with an energy matrix based on fossil fuels. Even though, an amazing 70 %, out of the 169 projects in the process of validation, refer to renewable energy and energy efficiency projects. This development is based on the optimal conditions for renewable energies in Brazil due to booming agriculture, huge water resources, intensive solar irradiation and excellent wind potentials. Brazil has also a long standing tradition and experience in biomass and hydro power projects.

An increasing number of projects from the industrial sector have been presented for validation - for instance, energy efficiency in the chemical, iron and steel industries as well as energy recovery of industrial waste.

Considering projects in registration and validation processes alongside already registered projects, 186,670 kCERs from Brazilian projects can be expected until 2012.<sup>7</sup>

**Table 4: Possible kCER's (in kilo ton) from Brazilian Projects by 2012 (as per August 2008)**

| Status                 | Number of projects | Total 2012 kCER's |
|------------------------|--------------------|-------------------|
| at Validation          | 169                | 57,524            |
| <b>at Registration</b> | <b>2</b>           | <b>1,273</b>      |
| Registered             | 146                | 127,873           |
| <b>TOTAL</b>           | <b>317</b>         | <b>186,670</b>    |

When it comes to regional distribution it can be observed that more than 60 % of all CDM projects are concentrated in the southern and the south-eastern parts of Brazil. This fact contrasts with the better opportunities in Northern Brazil. Due to fossil fuel based energy production in the north and the lack of connections to the National Electricity Grid (Interconnected System - SIN) of most states, this region has a much higher emission factor baseline.

### 3.5 Brazilian Clean Electric Energy Matrix

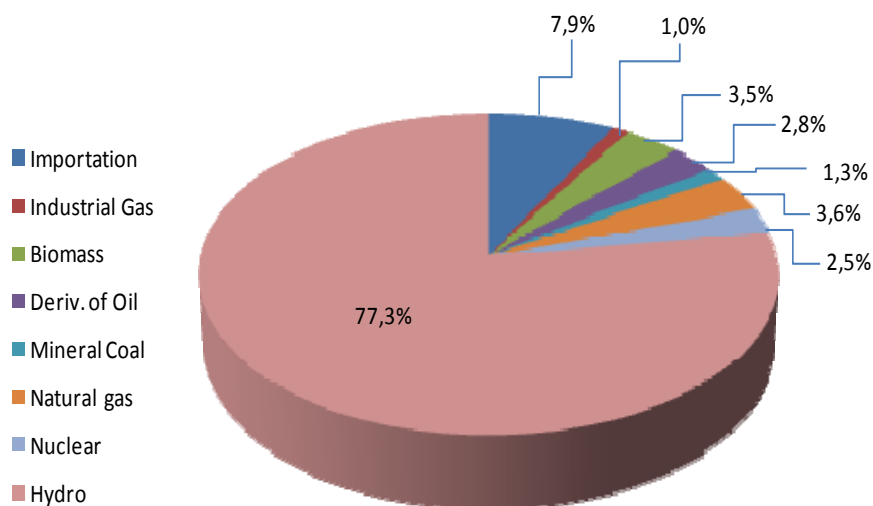
Based on huge potentials for hydroelectric power generation and substantial biomass resources, Brazil has, compared to other Non-Annex 1 countries, a relatively clean electric

<sup>7</sup> UNEP Risoe 2008: UNEP Risoe Center; Risoe National Laboratory Denmark: CDM Pipeline. <http://www.cdmpipeline.org/publications/CDMpipeline.xls>. Retrieval on 2008-11-24.

energy matrix, with more than 77 % of the electric energy generated based on hydroelectricity.

This makes CDM projects in power-generation and energy efficiency in Brazil less attractive compared to similar projects for instance in India or in China (energy supply based on fossil fuels - i.e. coal, diesel, etc).

Nevertheless, viewed on a regional scale, Northern Brazil offers great opportunities given that most cities are not connected to the SIN - National Interconnected System, and produce their energy mainly by fossil fuels.



**Figure 6: Brazilian Electric Energy Matrix (Ministry of Mines and Energy, 2007)**

The “clean” energy matrix crucially affects the baseline for the CO<sub>2</sub> emission factor for renewable energy generation projects interconnected to the national power system and thus the feasibility of CDM-projects.

By end of April of 2008, after more than 2 years discussing the revision on the estimation of the baseline emission factor (BEF), the Brazilian DNA decided to substitute the use of subsystems to determine this factor, for a single factor for all those primarily considered subsystems connected to the National Interconnected System. This decision was due to a new positioning of the Brazil's National Electric System Operator (ONS) that was based on results of simulations - taking into account recent infrastructure investments that enhanced the electricity exchange capacity between the subsystems - showing that today or in the very near future limitations of the connectivity can be neglected.

Most project developers are satisfied with this new regulation. Besides the southern region, where the energy matrix is heavily based on thermoelectric power plants, the rest of the country was beneficiated with the unique BEF. Usually the emission factor adopted by the project developers for the full period of credit issuance is the average factor for the last three years.

Information's about the emission factors can be found on the Brazilian's Ministry of Science and Technology homepage<sup>8</sup>. This page contains, among other information, the CO<sub>2</sub> emission factors for the build margin (annually basis) and the operational margin (monthly basis) according to the dispatch analysis used in the calculation of the BEF. They are

<sup>8</sup> MCT 2008: Ministry for Science and Technology: Fator Médio Mensal. <http://www.mct.gov.br/index.php/content/view/74692.html>. Retrieval on 2008-09-23.

calculated from generation records of plants dispatched in a centralized manner by the National Electric System Operator (ONS).

The variation on the baseline is caused by seasonal fluctuations of the hydropower plants. In the rainy season, hydroelectric power plants are fully used, which results in a lower emission factor. In the dry season, however, more thermal electric plants are used, resulting in a higher baseline emission factor.

### 3.6 CDM CER Issuance Success

The successful performance of a CDM Project is measured by the ability to deliver as many certifiable and effective emissions reductions as estimated, known by the expression "Issuance Success". This section shows the issuance success performance of the CDM projects in Brazil, by type of project

85 CDM projects have already issued CERs (58 % out of the registered project). The average of issuance success is 79 %, with a maximum of 191 % and a minimum of 8 %. An overview of the issuance success for the main CDM activities in Brazil can be seen at Table 5.

**Table 5: Issuance success by project type**

| Type                                | Issuance Success [%] |           |           |           |
|-------------------------------------|----------------------|-----------|-----------|-----------|
|                                     | Amount               | Average   | Maximum   | Minimum   |
| AWMS                                | 16                   | 29        | 75        | <b>15</b> |
| Biomass Energy                      | 31                   | 98        | 191       | <b>24</b> |
| <i>Bagasse Cogeneration</i>         | 25                   | 104       | 191       | <b>52</b> |
| Fossil fuel switch (to Natural Gas) | 6                    | 98        | 153       | <b>49</b> |
| Hydro Power                         | 16                   | 101       | 168       | <b>43</b> |
| Landfill Gas                        | 9                    | 47        | 110       | <b>8</b>  |
| Wind                                | <b>3</b>             | <b>85</b> | <b>96</b> | <b>78</b> |

- AWMS – The numbers reflect the problem imposed by a review of the methodology and changes in the calculation of emission reductions. Most projects affected were developed by AgCert, market leader in developing AWMS CDM projects in Brazil. These changes led to a significant decrease in the amount of certified emissions and expected emissions. In this sector, the new projects opt for a fixed 10 years baseline.
- Biomass energy – The best performances on biomass based CDM projects can be found in the sugar cane sector. The reason might be the use of an already dominated technology (Steam Cycle) for the generation of energy in this sector. The other biomass residue based projects had huge variations in performance (from 105 to 24 %).
- Fossil Fuel Switch – This sector has a high performance index, with only one project showing an issuance success under 85 %. The main difficulty related to this technology is securing the supply of natural gas.

- Hydro Power – It is necessary to make a clear distinction between the run-of-river units and the existing dams – as the latter (3 existing dams) have the lowest performance – average of 69 % against 108 % for the run-of-river (all above 70 %).
- Wind – This is a very uniform performing sector, probably reflecting the fact that the windiest periods in the country coincides with the time hydro power dams are at the lowest level. This technology, then, is heavily used to save water for non energy uses.

In general terms, the biggest issuance successes are related to activities implemented as part (or in) industrial facilities and are related to renewable energy generation projects.

#### 4. Project Cycle for CDM Projects

Figure 7 provides a brief description of the common project cycle for CDM projects and the responsibilities for the different phases:

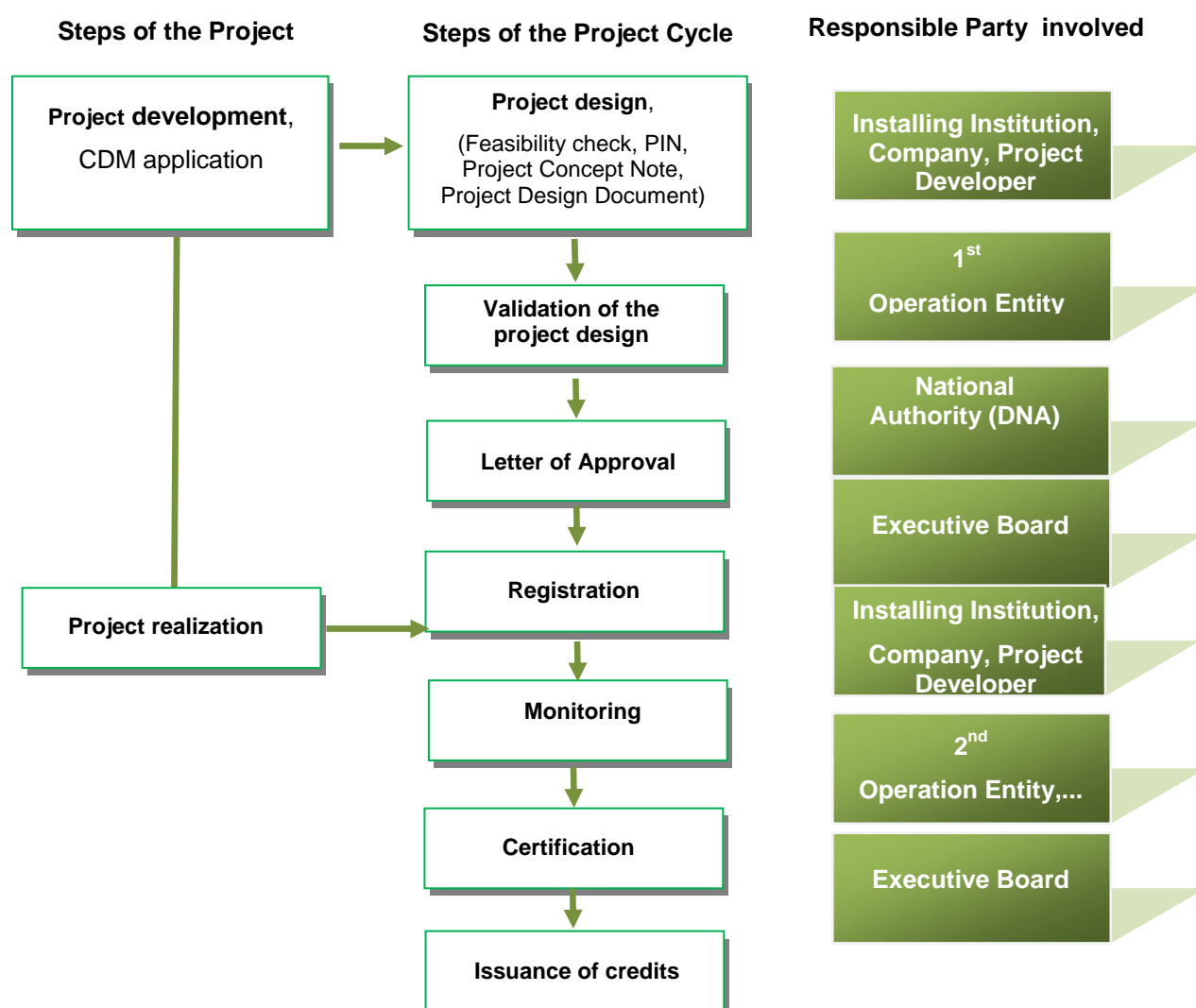


Figure 7: Flowchart and responsible parties<sup>9</sup>

<sup>9</sup> CDM Brazil 2008: German Chamber of Commerce São Paulo (Publisher.) – with adaptations. <http://www.ahk.org.br/cdmbrasil/infowindow.htm>. Retrieved on 2008-09-05.

## 5. Structure and Particularities of Brazilian CDM Market

The Brazilian CDM market follows commercial market rules. Governmental influence is limited to guarantee the UNFCCC regulative framework, with a broad view of the prerequisites for sustainable development that include e.g. that projects must fit to national labor and environmental laws before receiving the Approval Letter. The market development is subject to well-known market forces: offer and demand.

In this section, the most important actors and some particularities of the Brazilian CDM market are introduced.

### 5.1 Brazilian Designated National Authority (DNA)

Country-specific peculiarities occur mainly at the stage of approval by the Brazilian public authorities. In Brazil, different than in other countries, the DNA only checks and approves projects already validated. The DNA does not accept PIN (Project Idea Notes) or other preliminary documents for analysis. Approval is only referred to the Project Design Document (PDD), what has to be submitted in English and Portuguese, accompanied by the respective Validation Report, also in both languages.

The Brazilian DNA is the Interministerial Commission on Global Climate Change (CIMGC), designated as such in 1999. This set an early cornerstone in terms of an organizational basis for the approval of CDM projects. Resolutions Nr 1, dated Sep. 11, 2003 and Nr. 2 dated Aug.2, 2005 secure general legal conditions for the development of CDM projects in Brazil.

The Commission members are representatives of eleven ministries, chaired by the Minister of Science and Technology and vice-chaired by the Minister of the Environment. Its Executive Secretariat is the General Coordination on Global Climate Change (CGMGC) from the Ministry of Science and Technology (MCT).

The Commission has the purpose of articulating governmental actions resulting from the UNFCCC and its subsidiary instruments in which Brazil takes part<sup>10</sup>. Its most important attribution is the emission of the Approval Letter demanded by the UNFCCC for registering projects. The Brazilian DNA is known for its strict analysis of projects before emitting the Approval Letter, fact that reflects on a high proportion of early registered projects over rejected or revised projects at the UNFCCC's CDM Executive Board, and also on the reliability of Brazilian CDM projects in general.

For Host Country approval, Brazilian projects have to submit the following documents, together with an official application-letter to the DNA as hard-copy and an electronic version<sup>11</sup>:

1. Project Design Document (in English and Portuguese);
2. Annex III - document containing the description of how project contributes to sustainable development. It is so called because it is defined in Annex III of Resolution no. 1. of the Commission. It must emphasize project activity contributions for each of the five aspects: local environmental sustainability, development of working conditions and the net generation of jobs; income distribution; training and technological development; and regional integration and articulation with other sectors. It is important

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<sup>10</sup> Federal Decree of July 7, 1999, amended by Decree of January 10, 2006

<sup>11</sup> It is strongly recommended that proponents read the submission manual available in the webpage of the Brazilian DNA (<http://www.mct.gov.br/clima>) before submitting their projects.

to emphasize the contributions that can indeed be attributed to implementation of project activity, clearly separating them from other possible benefits that stem from other activities by project proponent companies. It is worthwhile noting that reductions in greenhouse gas emissions do not configure a contribution only to local, but also to global environmental sustainability;

3. Letters of Invitation to Comment for stakeholders (it is necessary to verify the list of minimum stakeholders that must be invited in the DNA website, because of different lists depending on the project activity's boundaries<sup>12</sup>;
4. Validation Report (in English and in Portuguese);
5. Declaration concerning person responsible for communication and contact data (standard form can be obtained from the submission manual available under [http://www.mct.gov.br/upd\\_blob/0025/25269.pdf](http://www.mct.gov.br/upd_blob/0025/25269.pdf));
6. Declaration concerning compliance with environmental legislation;
7. Declaration concerning compliance with labor legislation;
8. Declaration concerning the situation of the Designated Operational Entity – DOE (showing it is duly accredited at the CDM Executive Board under the Kyoto Protocol to the UNFCCC, and that it is fully established in national territory, with the capability to ensure compliance with requirements pertinent to Brazilian legislation forms for all cited declarations available under [http://www.mct.gov.br/upd\\_blob/0025/25269.pdf](http://www.mct.gov.br/upd_blob/0025/25269.pdf)).

All documents have to be sent to the Executive Secretariat of the Interministerial Commission:

**Dr. José Domingos Gonzalez Miguez**  
**Secretaria Executiva da Comissão Interministerial de Mudança Global do Clima**  
**Coordenação Geral de Mudanças Globais de Clima**  
**Ministério da Ciência e Tecnologia**  
**Esplanada dos Ministérios – Bloco E – Sala 268**  
**70067-900 – Brasília – DF / Brazil**

The Commission meets every sixty days, and projects submitted five working days before a meeting will be considered for perusal. The commission's members have to analyze the project proposal until the next following meeting. In this second meeting the Commission has to decide if the project will be set under revision, approved or approved with exceptions. Considering about five days for the emission of the Letter signed by the Minister and additional few days for delivery by mail, it takes at least 70 days from project submission to issuance of the Approval Letter. This time frame is still reasonable in the international context.

In most cases a project is put under revision if it does not comply with the sustainability criteria at all or because of legal issues.

In this case the project proponent has sixty days to comment on the question raised by the commission and undertake corrections in the project activity or its documentation. The Commission evaluates the corrected project and the comments on the questions raised before approval. This process takes about three times of the normal approval cycle to receive the Approval Letter, foreseen the corrections are convincing. Therefore, the project participant has to ensure that his response arrives at the Executive Secretary ten working days before the next meeting (minimum time for technical staff to analyze the response), otherwise it will be forwarded to the next meeting.

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<sup>12</sup> [http://www.mct.gov.br/upd\\_blob/0025/25269.pdf](http://www.mct.gov.br/upd_blob/0025/25269.pdf)

Approval with exceptions means that the Commission identifies only corrections of minor importance. In this case, technical staff in the Executive Secretariat will confirm the corrections and the Approval Letter can be sent a few days after proponent's response, without having to be submitted to approval of the Commission's members. Even being a relative rapid process, project proponents can avoid this unnecessary time consumption by attempting to hire a trustworthy translator (translation's fidelity is always confirmed, once the Portuguese version is the document that is legally valid for the Commission to justify its decisions nationally), double check document list to be submitted<sup>13</sup> and check if the PDD is clearly written.

No possibility of project rejection is foreseen, and the overall policy of the Brazilian DNA is directed to the project participants achieving their CERs. Rigorousness of the Brazilian DNA shall be understood as a cost-free review of the project before it is submitted for registration and as almost a guarantee that project realization will not be interrupted by any kind of national legal problems.

During the approval process, the Brazilian DNA gives great importance to local social impact and economic development. – These sustainability criteria have to be taken into account in a separated document, item 2 of the list of documents necessary to be presented to the Brazilian DNA (Annex III).

To assure an evaluation of public stakeholder group's opinion and especially the assessment of local groups, their comments have to be documented and considered in the CDM project, and its proponent has to prove that these groups were properly informed, providing in a written form their statement and comments. However, according to representatives of the executive secretary of the DNA, less than 5 % of projects receive any kind of written comment. Furthermore, in most cases, the comments do not really refer to the projects themselves but are limited to rather general comments such as: "We assure that this project is very welcome in our region, etc." This is partially due to the fact that local NGOs, or other local groups, do not have the technical knowledge to provide specific statements on CDM issues.

Another problem is how to take into account the local population directly affected by the project as they often are not involved in stakeholder groups, institutions and organizations. The result is rather diverging, especially regarding the assessment of working conditions and job creation. The DNA therefore recommends, besides the written information required by the standard procedure, to invest more efforts on public meetings, in order to create better awareness and acceptance among the population.

## **5.2 Designated Operational Entities (DOEs)**

The Brazilian market for validation and verification of projects is dominated by Det Norsk Veritas Certification AS (DNV/Norway), TÜV-Süd Industrie Service GmbH (Germany) and Societá Generale de Surveillance (SGS/Switzerland), followed by Bureau Veritas Quality International (BVCert/ France) and TÜV Nord Cert GbmH (Germany). All of them are presently active DOEs in Brazil. AENOR (Spain), Rina (Italy) and TÜV-Rheinland (Germany) are still new in the Brazilian Market; however, due to the high number of CDM projects in validation, the trend is that those companies become soon active in this market.<sup>14</sup>

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<sup>13</sup> Project submitted with incomplete documentation may even be considered "not submitted" by the Executive Secretariat of the DNA. (Article 6 of the Resolution 3 of the CIMGC)

<sup>14</sup> List of contacts and addresses of accredited Certifiers in the appendix.

**Table 6: Certifications made by accredited CDM Certifiers in Brazil**

| DOEs     | Number of Registered Projects | Number of Projects at Registration | Number of Projects at Validation | Rejected Projects | Total |
|----------|-------------------------------|------------------------------------|----------------------------------|-------------------|-------|
| DNV      | 62                            | 3                                  | 45                               | 12                | 122   |
| TÜV-Süd  | 51                            | 1                                  | 34                               | -                 | 86    |
| SGS      | 24                            | 3                                  | 44                               | 3                 | 74    |
| BVCert   | 5                             | -                                  | 7                                | 1                 | 13    |
| TÜV-Nord | 2                             | -                                  | 8                                | -                 | 10    |
| AENOR    | 0                             | 0                                  | 3                                | -                 | 3     |
| RINA     | 0                             | 0                                  | 1                                | -                 | 1     |

Individual DOEs are accredited by the Executive Board for the following areas (Main DOEs):<sup>15</sup>

**Table 7: Sectors of accredited Certifiers**

| Sector   | Major DOEs accredited for validation |
|--|--------------------------------------|
| Energy Industries  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Energy Distribution  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Energy Demand  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Manufacturing Industries   | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Chemical Industries  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Construction   | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Transport  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Mining/Mineral Production  | DNV, TÜV Süd                         |
| Metal Production   | DNV, TÜV Süd                         |
| Fugitive emissions from fuels (solid, oil and gas)   | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Solvent Use  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Waste Handling and Disposal  | DNV, SGS, BVCert, TÜV Nord, TÜV Süd  |
| Afforestation and reforestation  | SGS, TÜV Süd, BVCert                 |
| Agriculture  | DNV, SGS, TÜV Süd                    |

The validation process is one of the bottlenecks pointed out by almost all CDM-project developers. Besides the general criticism of the high costs involved in the validation process, most companies complain about the long duration and the delays in the validation process, deriving from a high number of projects at validation and lack of personnel capacity at the DOEs.

<sup>15</sup> Executive Board 2008: United Nations Framework Convention on Climate Change. <http://cdm.unfccc.int/DOE/scopes.html>. Retrieval on 2008-09-23.

It is expected that this situation will stabilize with more DOEs entering in the Brazilian CDM market.

### 5.3 CDM Project Developers

In Brazil, most project owners tend to concentrate on their core-business and do not get involved actively in the development of CDM-projects, which is usually carried out by a CDM consultant. Nevertheless, the Brazilian DNA encourages projects owners to implement their projects themselves, offering extensive informational material on its website for this purpose.

At the present time, there are more than 50 consultancies acting as CDM-project developers in Brazil.<sup>16</sup> This includes a rather large number of small companies that are just in the start-up phase. The biggest companies working as project-developer in the Brazilian CDM market are: Econergy, Ecosecurities, Ecoinvest (these companies are mostly engaged with renewable energy projects), and Agcert (specialized in biogas projects). 77 % of the registered projects (up to 112 projects), were developed by the four mentioned consulting firms. Table 8 shows the most important market players, that already have projects registered CDM-projects with UNFCCC.

**Table 8: Top project developers active in Brazil**

| Consultant                    | Number of Registered Projects | Number of Projects at Validation | kCER's issued | kCER's expected until 2012 |
|-------------------------------|-------------------------------|----------------------------------|---------------|----------------------------|
| AgCert                        | 34                            | 1                                | 849           | 11,560                     |
| Econergy                      | 32                            | 16                               | 4,801         | 26,113                     |
| Ecoinvest                     | 31                            | 23                               | 4,711         | 22,169                     |
| Ecosecurities                 | 15                            | 14                               | 1,113         | 18,081                     |
| Ecologica Assessoria          | 3                             | 5                                | -             | 4,479                      |
| Green Domus Desenvolvimento   | 2                             | 2                                | -             | 1,328                      |
| Rhodia                        | 2                             | 0                                | 11,917        | 36,214                     |
| Conestoga-Rovers & Associates | 2                             | 1                                | -             | 8,539                      |
| First Climate                 | 2                             | 0                                | 333           | 4,890                      |
| MGM International             | 2                             | 11                               | -             | 2,125                      |
| PricewaterhouseCoopers        | 2                             | 3                                | 214           | 1,880                      |
| ICF Consulting                | 1                             | 5                                | 46            | 11,926                     |
| PTZ Bioenergy + BTG Biomass   | 1                             | 5                                | 261           | 1,263                      |

<sup>16</sup> Please find a list of contact addresses of Project Developers mentioned in the list below, in the appendix.

Two of the projects developed by ICF Consulting are implemented in cooperation with the German company Thyssen-Krupp AG. Both projects are under validation and deal with the utilization of industrial gas in the context of the construction of a new blast-furnace in the state of Rio de Janeiro.

There is a great number of small consulting firms however, none of them has a project registered at the UNFCCC. The following table lists some important project developers, which have projects at the validation phase. Among these companies is also the German based Perspectives GmbH with headquarters in Hamburg.

**Table 9 : Consultants with Projects at Validation**

| Consultants                        | Number of Projects at Validation | kCER's expected until 2012 |
|------------------------------------|----------------------------------|----------------------------|
| Instituto Totum + Key Associados   | 8                                | 883                        |
| BrasCarbon Consultoria             | 6                                | 1,127                      |
| Enerbio Consultoria                | 6                                | 2,113                      |
| Ativos Técnicos e Ambientais       | 4                                | 847                        |
| Max Ambiental                      | 4                                | 881                        |
| MundusCarbo                        | 4                                | 230                        |
| Persepctives GmbH                  | 4                                | 560                        |
| Fortunity Energia Brasil           | 3                                | 450                        |
| Arcadis Tetraplan                  | 2                                | 3,507                      |
| Sol Coqueria Tubarão               | 2                                | 3,158                      |
| RAETCH – Energy Conversion Systems | 1                                | 1,777                      |
| WB-CF                              | 1                                | 3,148                      |

The ownership of CERs obtained from CDM activities is often shared between the project owner and the project developing company responsible for the PDD. The sales negotiation is usually done, or at least initiated by the PDD consultant company.

#### **5.4 CDM Market Association ABEMC**

The Brazilian Association of CDM Market Companies (ABEMC) was founded in October 2008. The objective of ABEMC is to raise awareness for CDM projects within the Brazilian society and act as a speaker of the companies in the sector, representing their interests. Today's 30 companies associated are basically CDM project developers (80 %), others are project owners and CDM related institutions. The membership to the association is also open for foreign companies.

## 5.5 BNDES Investment Fund

The Brazilian National Economic and Social Development Bank (BNDES) has recently created an investment fund, Fundo Brasil Sustentabilidade (Brazilian Sustainability Fund - FBS), that is addressed to CDM projects.

Assets of this Fund - are between 250 and 400 million BRL, limited to eight years and renewable for another two years maximum<sup>17</sup>. Investment period is four years, extendable to a maximum of five years.

The Fund, envisioned to support investments in CDM projects, will be managed by Latour Capital do Brasil Ltda., an independent investment company. For the administration the company BEM DTVM Ltda. and for the technical structuring Sustaincapital Ltda. will be in charge.<sup>18</sup>

## 5.6 CDM-Stock Exchange

With the objective of promoting CDM trading, the Brazilian government in 2005 created the Brazilian Emission Reduction Market (MBRE) and also installed an internet project database accessed via the websites of the stock exchanges "Bolsa de Mercadorias e Futuros - BM&F BOVESPA" [www.bmf.com.br](http://www.bmf.com.br) and the "Bolsa de Valores do Rio de Janeiro - BVRJ" [www.bvrj.com.br](http://www.bvrj.com.br)

The internet platform provides a market place where CER sellers and interested buyers can expose their respective interests. In 2007, a system was implemented enabling direct electronic carbon credit auctions via the internet.

Advantages of this platform are easy worldwide access, transparency, lower transaction costs, as well as competitive trading. Presently efforts are being made to enable a special area for online-trading of emission certificates from projects not yet approved.

The stock exchange is particularly important for the CDM-projects of public institutes/companies that require public auctioning.

Interested buyers must be registered at the BM&F BOVESPA or BVRJ to participate on the auctions.

## 5.7 CDM Projects of Public Companies

Because of Brazilian public law, CERs of projects owned by the government or public entities must be sold by a public bidding process or can be traded in the stock market (auctioning).

As a recent example of a public CERs trade at the stock exchange, it can be mentioned the auctioning of 713,000 CERs from the landfill gas projects Bandeirantes and São João at BM&F BOVESPA (São Paulo Stock & Futures Exchange) in September 2008.

Mercuria Energy Trading, from Geneva, purchased the lot at 19.20 EUR per metric ton of carbon. The São Paulo Municipal Government received an equivalent of 13,689 million EUR for the carbon credits (approximately 37 million BRL), representing a premium of 35.21 % in

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<sup>17</sup> Reference February 2008

<sup>18</sup> BNDES 2008: Banco Nacional de Desenvolvimento Econômico e Social: BNDES establishes FBS - the first investment fund in Brazil for the development of environmental projects.  
[http://www.bndes.gov.br/noticias/2008/not024\\_08.asp](http://www.bndes.gov.br/noticias/2008/not024_08.asp). Retrieved on 2008-09-08.

comparison to the minimum bid of 14.20 EUR per ton. Ten institutions were authorized to take part in the auction – eight of them placed bids.

The profits were shared between the city government and landfill operators. On the city's part proceeds will be applied to the FEMA fund (Special Environmental and Development Fund). One idea, among others is that such funds promote new public parks.<sup>19</sup>

On August 2007, the city of São Paulo for the first time issued climate certificates for the Bandeirantes and São João Landfills. At the time 808,000 Carbon offsets were sold. The Dutch bank Fortis received the award and purchased the certificates for a price of 13.09 million Euro. (at a unit price of 16.20€).<sup>20</sup>

The CDM-projects developed within the state-aided program PROINFA are considered exceptions in the public CDM projects market.<sup>21</sup> In this case, according to the Federal Decree No. 5,882/2006, the ownership of earned carbon credits should go to the Brazilian Federal energy holding group - ELETROBRÁS upon the purchase of generated energy. However, due to legal loopholes on the first Decree (No. 5,025/2004), the ownership of those credits is being disputed in court by the participants of CDM Projects within the PROINFA program, reason why ELETROBRÁS cannot move ahead with those credits selling process.

## **6. Business Practices Adopted in the CDM Market**

In the CDM market, a variety of business models can be adopted. This section describes the most frequent models and concepts used by actors in the Brazilian CDM market. In addition it shows the pictures of the set of players and their roles in the CERs commercialization process.

### **6.1 Consulting and Consulting for CER Shareholding**

Project consultant companies offer interested project owners a wide range of consulting services. They structure and control CDM projects normally during the whole project cycle starting with the issue of PDD all the way to the distribution of the CERs. Most often, the project owners do not like to engage (not its core-business), or do not have the capacities/know-how to develop a CDM-project on their own and contract an experienced project-developer. As the responsible party for all project steps, instead of a consulting-fee, the project development companies negotiate with their clients a participation in the CDM-projects and consequently a shareholding of emission reduction certificates. This is a very common business model practiced by big project developing companies in the Brazilian CDM-market. The project developer overtakes the development costs of the CDM part of the project as well as part of the issuance risk of CERs and can generate profit by selling CERs at a higher price. In this concept the consultancy does not participate in the project investment.

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<sup>19</sup> Valor Econômico 2008: Valor Econômico: Leilão de crédito de carbono em SP deve render R\$ 30 milhões. São Paulo, Aug. 27, 2008.

<sup>20</sup> 2006 and 2007 the KfW conclude an agreement for the KfW-Climate Protection Fond purchasing a total of 5 million Certified Emission Reductions (CER's) from the projects of landfill gas recovery in Bandeirantes and in São João from the privat project partner.

<sup>21</sup> In 2004 the Brazilian government created the PROINFA federal program to promote electricity generation from renewable energies (biomass, wind and small hydropower).

## 6.2 Investments in CDM Projects

Another concept practiced in the CDM-market is the participation through direct financial investment in CDM-projects and its development. For the investor, the greatest advantages and best conditions can be obtained by getting into the project at an earlier stage.

Given the rigorousness of the approval process at the Brazilian DNA, projects approved or approved with exceptions are viewed as reliable investment opportunities by players.

Usually the interested investor approaches a project developer or directly a project owner who is in the process of initiating a new project or is offering a participation in an existing project. Owing to the heavy financial commitments assumed during the CDM project cycle, the implementation of a CDM-project often requires more than one company (usually less than four) participating in its realization. The CERs are divided among the participating companies according to their contributions to the project.

The investment in CDM-projects in exchange for the generated emission credits is an attractive possibility for primary market players like big energy-companies and energy producers, involved in the EU ETS.

Other players in this segment are international operating CDM-investment-funds.

## 6.3 Direct selling of CERs and ERPA's

In principle, the direct selling of CERs and ERPA's is possible through two channels. They can be sold directly by the project owner or via broker-agencies to interested buyers.

Some of the Brazilian project consultants act also as brokers. They operate as the most important connecting agent between carbon credit project owners and interested buyers. This, however, implies additional costs in brokerage fees.

Another possibility is trading at the stock exchange.

CER Sellers and Buyers have the chance to expose their interests in the internet auctioning platform. Auctions are organized by the BM&F and BVRJ stock exchanges and take place in the internet. Besides CDM-projects already approved by the executive board, emission certificates under the approval process can be traded as well.

In Brazil, about 59 % of the CDM-projects have their CERs purchased before first issuance.

## 7. Buyers of Brazilian CDM Certificates

Companies from the United Kingdom, the Netherlands and Japan are the major participants/ buyers (primary market) with a 65 % market share. German companies, with less than 2 %, have a very small participation.<sup>22</sup>

Nonetheless, it is important to mention the presence of many international CER brokers and investment funds operating in the Brazilian Market who further offer Brazilian CERs in the European secondary market. After entering this market, those CERs are no longer traced, making it hard to identify their final buyers.

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<sup>22</sup> UNEP Risoe 2008: UNEP Risoe Center; Risoe National Laboratory Denmark: CDM Pipeline. <http://www.cdmpipeline.org/publications/CDMpipeline.xls>. Retrieval on 2008-10-01.

**Table 10: Buyer countries of Brazilian certificates**  
(Note that for some projects there are more than one country buyer)

| Buyer Country     | Number of Projects (primary market) |
|-------------------|-------------------------------------|
| 1. United Kingdom | 52                                  |
| 2. Netherlands    | 21                                  |
| 3. Japan          | 20                                  |
| 4. Sweden         | 5                                   |
| 5. Switzerland    | 5                                   |
| 6. Canada         | 3                                   |
| 7. France         | 3                                   |
| 8. Germany        | 2                                   |
| 9. Spain          | 2                                   |
| n.a.              | 58                                  |

The following table presents the top buyers of Annex-I countries registered as buyers in more than one Brazilian project:

**Table 11 : Top buyers of Brazilian certificates<sup>23</sup>**

| Authorized Buyer                    | Nationality    | Organization Type | Number of Projects* |
|-------------------------------------|----------------|-------------------|---------------------|
| EcoSecurities                       | UK/Netherlands | Carbon Market     | 16                  |
| Chugoku Electric                    | Japan          | Utility           | 12                  |
| AgCert                              | UK             | Carbon Market     | 11                  |
| EDF Trading                         | UK             | Carbon Market     | 9                   |
| Noble Carbon                        | UK             | Carbon Market     | 6                   |
| Shell Trading                       | UK/Netherlands | Oil               | 5                   |
| BHP Billiton Marketing              | UK             | Carbon Market     | 4                   |
| Showa Shell Sekiyu                  | Japan          | Oil               | 3                   |
| Swedisch Energy Agency              | Sweden         | Public            | 3                   |
| KfW                                 | Germany        | Bank              | 2                   |
| Essent Energy Trading               | Netherlands    | Carbon Market     | 2                   |
| Natixis                             | UK/France      | Carbon Market     | 2                   |
| Carbon Capital Market               | UK             | Carbon Market     | 2                   |
| CAF                                 | Netherlands    | Development Bank  | 2                   |
| ABN Amro Bank                       | Netherlands    | Bank              | 2                   |
| Mitsubishi UFJ Securities Co., Ltd. | Japan          | Finance           | 2                   |

\*Projects bought in the primary market.

<sup>23</sup> The table includes Buyers who acquired Certificates of at least two Brazilian projects.

Studies indicate that projects with a high sustainable development component are preferred by buyers. As the demand side is still greater than the supply side, such a preference is irrelevant at the present time. But the high quality of Brazilian CDM projects can be a differentiating factor in the long term.

Considering the success of CER generation, one can say that, to date, most Brazilian projects achieved the expected result or went beyond expectations. Differences arise in some cases in biogas projects, especially in the area of swine farming and landfill biogas projects. This is mainly due to far too optimistic estimates made in swine farming facilities. Difficulties occur also with some landfill projects because of the complexity of the methodologies and problems during the monitoring phase (see also chapter 3.6 – Issuance Success).

## **8. Identified Project Opportunities**

Since the start of the CDM/JI Initiative Brazil in August 2008, several business opportunities which may be interesting for German market participants have been identified.

Projects were identified by contacting Brazilian project developer and project owners directly.

All projects were compiled in overview lists and posted at the Latin American Internet Platform: [www.cdm-cooperation.de](http://www.cdm-cooperation.de) – CDM/JI Initiative – Focus Brazil.

Because of the dynamic development of the market, these lists are updated once in a month.

Also a short description of each identified project is being elaborated and available to interested German companies.

## **9. Potentials for CDM related Technology Transfer**

In many cases, potential CDM projects cannot be implemented because the appropriate technology is not available or only in poor quality. This offers market opportunities for German companies in the supply of special equipments and technology.

Experts estimate the Brazilian market potential in energy efficiency to be around 8-10 billion Euro per annum. Since some energy saving equipment, such as efficient electric- motors, pumps, boilers, co-generating-equipment and energy management systems have to be imported; this field represents a great chance, especially for German companies considered a worldwide benchmark for energy efficient equipments.

Potentials for technology transfer in the context of CDM projects are also not yet developed in the fields of wind energy and solar energy equipments.

CDM/JI Initiative is engaged in the identification of these potentials in order to facilitate the transfer of German CDM related technologies.

## **10. Challenges of the Brazilian CDM Market**

As already mentioned, the major challenges in developing a CDM project in Brazil are the difficulties of dealing with the extensive bureaucracy, corruption, complicated juristic system, facts that at the other hand are worse in other CDM target countries, as Egypt and India, but also high interest rates, high tax burdens and, in some areas, the lack of qualified manpower.

In some cases, the challenge can be the absence or the low quality of local available equipments on the one hand and the high importation taxes for imported equipment on the other hand.

Substantial delays in the validation process by the DOEs, is another big challenge for the Brazilian project developers.

For German companies, the competitive Brazilian CDM market may be a challenge. There are a number of foreign companies of the primary market (primary market buyers, broker, agents, and representatives of international investment funds) acting in the market. Some foreign companies are also entering by purchasing established local project consultancies in order to gain market segments.

At this stage, no German company has chosen Brazil as a central target for their CDM business acquisitions.

In spite of a lot of cultural links between Germany and Brazil, especially in the south of Brazil, the Latin business culture and the different languages may form a barrier.

Technical risks exist in the correct estimation of CERs production numbers mainly in projects depending on general market fluctuations. At this moment, there are many CDM projects developed based on biomass utilization in the sugar/alcohol production. Also, there are several projects in the swine farming and some in the utilization of furnace gas developed.

The generation of certificates depends on the operational outline and at last, but not least, on the demand of the product produced. This demand may vary depending on the global economic situation, thus influencing negatively the projected certificates generated.

A general problem is the insecurity felt among market participants about the outcome of the international negotiations regarding a global Climate Agreement after 2012. As long as no positive result of such negotiations is forthcoming, and no assurance for a medium or long term demand of CDM Certificates is in sight, many potential CDM project developers and investors are reluctant engaging in new CDM projects.

## **11. Outlook and Future Potentials**

This chapter gives a brief overview about sectors not yet tapped for CDM project development in Brazil which, depending on the general development of the CDM, may enter into the market.

Also a brief overview about the opinion regarding the post 2012 market and some remarks about the VER market and PoA development in Brazil is given.

### **11.1 Not tapped CDM Sectors**

#### **Renewable Energies**

More than 48 % of all CDM projects developed in Brazil are renewable energy projects. The largest fractions, 94 %, however, are concentrated in the area of biomass, biogas and hydropower. Actually only 6 % of the renewable energy projects are classified as wind energy and none as solar energy projects.

Considering Brazilians great natural potential for these two technology sectors, more CDM projects should be expected in the future.

## **Bio Fuel Sector**

Switching from fossil fuels to renewable fuels in the Biodiesel sector is an alternative to be explored in the CDM Framework. In this case, the CERs would be generated from projects in which the percentage of biodiesel added to the diesel was above the National Program for Biodiesel parameters (above 5 %).

## **Transport**

In most Brazilian big cities, public transportation is not efficient. Projects with more efficient systems, like rapid bus transportation, could be considered eligible for the CDM market, working as an incentive for investments in this sector. For this activity, there is already a methodology approved for both the baseline and the monitoring by the CDM Executive Board (UNFCCC).

## **Solid Waste Sector**

In the case of methane avoidance projects – the majority of the big landfills are already operating within the CDM framework (located in the big cities). Nevertheless, due to a continuous huge lack of solid waste management infrastructure, especially in medium and small-sized cities, there is still a vast market potential for these types of projects. In this case, the generation of CERs could be an important incentive for the construction of new landfills.

## **Pyrolysis**

The pyrolysis can be used for waste treatment in association with the landfills. In this case, the biogas from the landfill would be burned in the furnace of pyrolysis reactors. The pyrolysis process can reduce significantly the volume of the waste and up to 90 % of its weight. The sub product of this treatment is rich in carbon and can be use in the industry as a solid fuel in boilers and furnaces. Pilot projects are already initiated.

## **Waste Water Treatment Plants**

The biogas generated in an anaerobic waste water treatment plant is normally flared. By improving the technology to capture the biogas, making the flaring more efficient, these projects could be developed as CDM-projects. The generation of energy and thermal power using this gas is also an alternative for obtaining CERs. In the case of small plants with a low methane emission, the plants could be grouped in a PoA.

Depending of the treatment process there is no obligation for biogas capture (i.e. Anaerobic Lagoons).

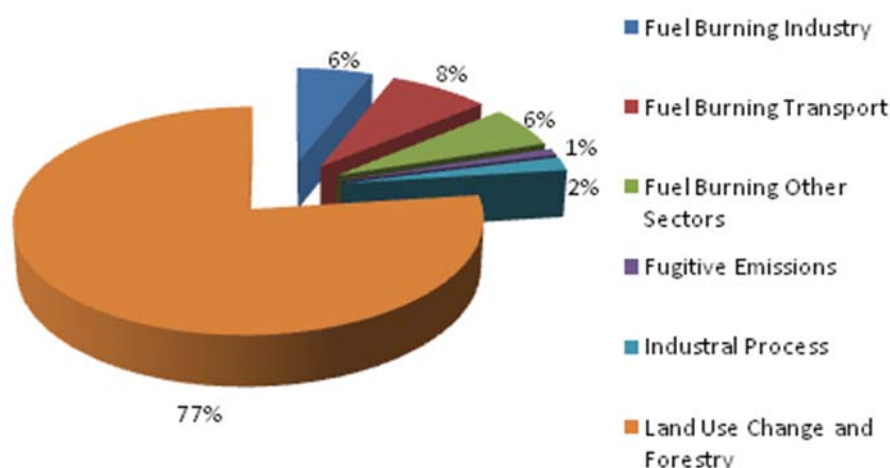
## **Energy Efficiency**

A so far untapped potential on the Brazilian market is energy efficiency in the industrial sector. Industry is responsible not only for 44 % of total energy consumption in Brazil, but also for the highest waste of energy. The Brazilian state energy-holding ELETROBRÁS believes there is a huge energy savings potential mainly in electromechanical drives, responsible for over 50 % of the energy consumption in the country's industrial sector.

The potential of Energy Efficiency measures could be fully tapped under the CDM by the programmatic approach (PoA). PoAs offer an interesting solution to support the insertion of new technologies in specific industrial sectors (i.e. solar power), where an initial set of facilities would be committed in the registration and further units could be incorporated into the PoA at a later stage.

## LULUCF

Regarding the profile of the Country CO<sub>2</sub> emissions, represented at Figure 8, it can be noticed how strong Land use, Land use change and forestry (LULUCF) is in the country emissions profile (77%). Once this kind of projects gets into the mainstream on the International market, they are expected to play a significant role.



**Figure 8: Country Emissions profile**

LULUCF projects are at the very beginning and temporary CERs are still cheap, but the projects development itself is neither cheap nor quick to design and implement. Therefore – at least for the first commitment period – they are not expected to play a significant role in the Brazilian CDM market. On the other hand, on the voluntary market they play a quite important role, specially related to compensation of company emissions and corporate social responsibility measures (not directly related to the CDM market, but yet a strong and growing market in Brazil).

## 11.2 Post 2012 CDM Market

The position of the Brazilian government within the Kyoto process can be summarized as conservative. Brazil does not accept any cap on emissions for Developing Countries and underlines the responsibility of industrialized countries. After 2012, actions focused on commitments for developing countries should be based on voluntary action or targets and financial incentive mechanisms. At the same time, Annex I countries should contribute even more to emissions reductions by taking actions at home.

Brazil is strongly in favor of the principle of *common but differentiated responsibilities and respective capabilities* adopted by the UNFCCC and reinforced by the Kyoto Protocol, which recognizes that developing countries have the necessity of enhancing their emissions till they achieve the infrastructure and economic development that is necessary for ensuring health, food and education for its inhabitants. In addition, the government states that effective measures to mitigate climate change in developing countries can only be achieved through technology transfer and financial incentives, useful for declining the angular

coefficient of the sigmoid curve of the greenhouse gas emissions during the economic development phases.

During the Accra Meeting (Ghana, August 2008) the country's position towards forestry became very clear. In this event, Brazil accepted the financial incentives for avoided deforestation, in opposition to its position on COP 12 and established the Deforestation Reduction Pact to curb deforestation in Amazonian to zero until 2025. As part of the Pact an "Amazon" Fund was created to manage all the funds used to pay for the "Environmental Services" of the forest and keep it financially productive, avoiding the need to remove the forest to generate income.

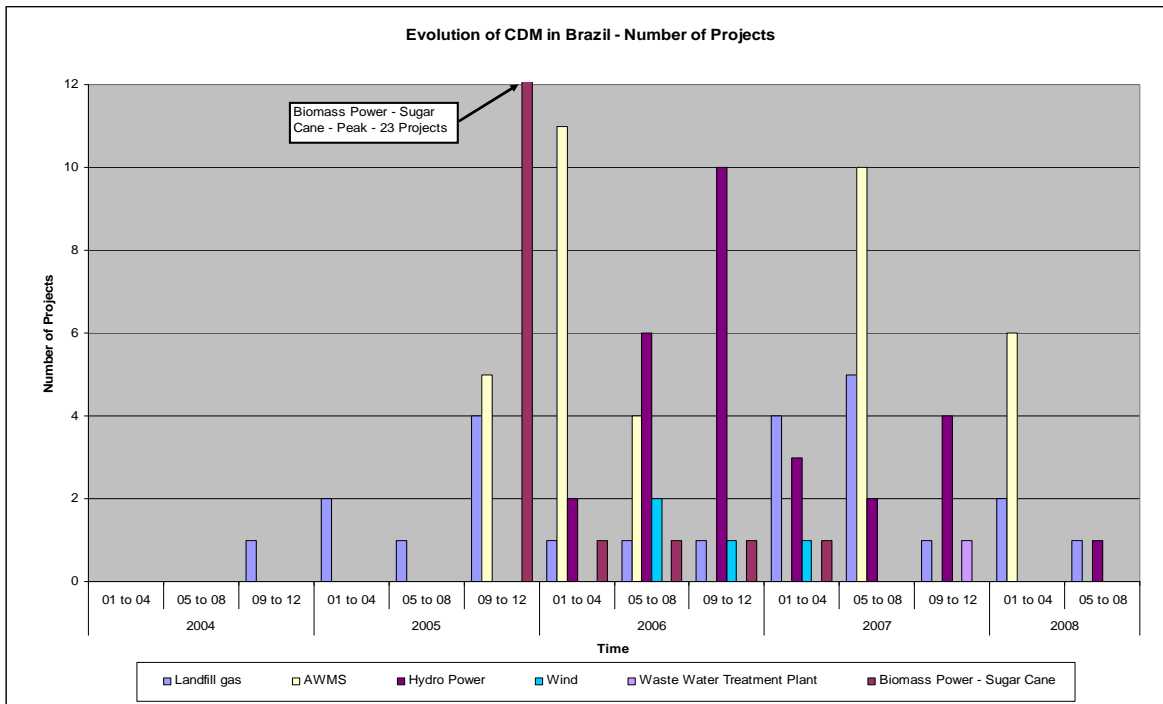
Another key aspect is the need to manage an energy infrastructure that responds to the growing electricity demand. Brazil's energy matrix is already strongly renewable. In 2007 46 % of the primary energy matrix was renewable and more than 77 % of the produced electricity came from renewable sources. The inherent characteristics of the Brazilian electrical market are a hindrance to increased generation using more expensive renewable generation, such as wind and solar (despite huge country potential); for what Brazil is expected at least in middle terms to rely on fossil sources to secure safety of supply.

To understand the future behavior of the CDM market in Brazil, it is interesting to have a look at the past. The characteristics of the Brazilian CDM project market can be seen at figures 9 and 10 (with the main representative projects, besides N<sub>2</sub>O based projects, which were removed from the figures).

Looking at the graphs, two main aspects can be noticed; the "wave" and the "low hanging fruit" effect. The "wave" effect is clearly noticeable on the sugar cane based projects, with 85 % of the projects been developed at the end of 2005, when all major mills put forward CDM initiatives. It shows that one project type entered the market with only a few projects. These projects gained interest with their good performance and the numbers of projects augmented in a very short time frame.

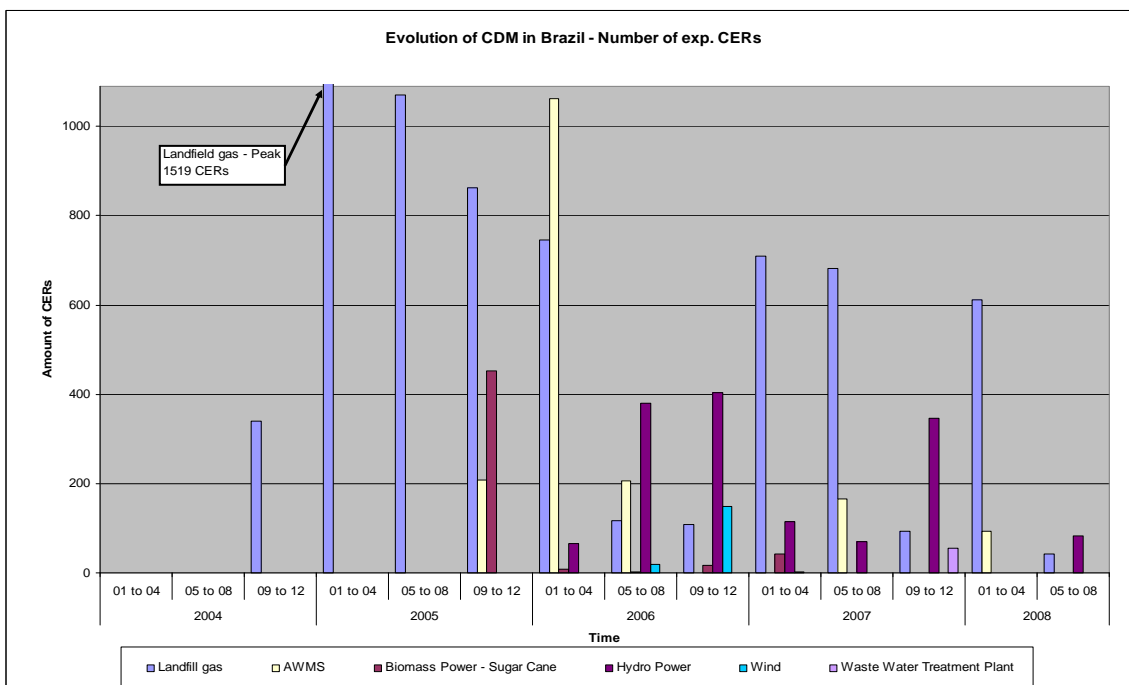
The same can be seen – with a little less intensity - on the hydro power sector, where a combination between the need to expand the electricity generation led to a wide spread of run-of-river hydro power plants. At the moment, the majority of the potentials, near the main consuming centers have already been developed.

The other aspect, the "low hanging fruit", can be noticed on the landfill gas projects, typically a sector with low revenues that saw the possibility to – adding a marginal set of actions – aggregate additional revenues to improve the balance on the cash flow.



**Figure 9: Evolution of the CDM market in the country based on number of projects, in the main CDM project areas, by its registration request date**

Similar to this sector, one can point to the Animal Waste Management Systems – AWMS, where one single company (AgCert), dominated the market in a rush to gather as many swine farms as possible, with the necessary promises to reach a commitment, but at the very end, due to a revision on the methodology, was not able to deliver the already negotiated CERs (big amount of expected CERs that flowed the market in the beginning of 2006).



**Figure 10: Evolution of the CDM market in the country, based on amount of expected CER, in the main CDM project areas, by its Registration request date.**

Those two cases are examples for the most frequent characteristics of the Brazilian market: Market participants are used to an extremely high speed of market changes and the need to adapt under dynamic changes in the set of conditions (political and economic conditions – i.e. monetary reforms, instability periods). The two most prevailing forces in the Brazilian CDM market in the near future are the eager to cease an opportunity and the need to secure additional gains.

In addition, the future Brazilian CDM market development will be influenced by the further expansion of electricity supply, the need to address the country's specific emissions profile (LULUCF) and the willingness to switch from already proven technology to new sectors (to seek for additional economical gains).

The possibility that the Federal Government agrees on emission reduction targets and by so, Brazil enters the Annex I countries, would have a significant impact on the future CDM market in Brazil. This would imply that all CDM projects should be developed as JI (Joint Implementation – another flexible mechanism foreseen in the Kyoto Protocol).

### **11.3 Voluntary Market**

The voluntary market in Brazil is growing, however with some difficulties. Major problems are the lack of uniformity, quality issues and governmental recognition.

General problems encountered in the voluntary market are the difficulty in quantifying and qualifying the emission reductions. There is sometimes a lack of transparency in the diverse levels of project development evidence.

There is a “local” and an “export” market for voluntary emission reduction projects which differ in the strict handling of quality criteria.

In the local market, where the clients are mostly big Brazilian enterprises, the emission neutralization is the driving motivation. These projects are, because of the “green image” mainly reforestation projects.

They do not follow pre-established criteria and are quite flexible when it comes to additionality questions.

For the voluntary “export market”, the projects respect the criteria's of CDM projects also regarding additionality and furthermore the Voluntary Carbon Standard (VCS) or Gold Standard criteria's, applying strict conditions on social and socioeconomic development.

Because of difficulties entering in the CDM market, and due to competitive prices paid in the volunteer market (often received upfront), when compared to the UNFCCC's temporary and long terms CERs, particularly reforestation projects are developed under the voluntary market.

Various national and international NGOs working in the field of forest conservation see the voluntary market as an efficient instrument in order to realize reforestation projects. An example for such initiative is the “Juma Sustainable Development Reserve Project”. Implemented by Fundação Amazonas Sustentável, the project was positively validated by TÜV-Süd in Sept. 2008 (Report Nr. 11772777 CCBA). In this project a protected area of 472.677 hectare will generate an estimated 3,611,733 tCO<sub>2</sub>eq in a 10 year period.

## 11.4 Program of Activity (PoA)

PoA activities are not well registered and documented within the Brazilian CDM market.

However, almost all Brazilian project developers have at least one PoA project in the pipeline. PoA are interesting in the field of energy efficiency, solar energy (solar water heating), small scale afforestation/reforestation projects and other activities where in one single activity will not be feasible enough in order to justify a CDM process.

So far, only one Brazilian PoA has been approved by the UNFCCC and two are in the evaluation process.

The approved project is implemented by SADIA, an exporter of meat products based on swine farming. One thousand small swine producers jointed this PoA, each one of them expecting to generate about 389 CERs out of methane avoidance in their waste water treatment.

Stakeholders claim difficulties in developing PoA because of the required minimal distance of one kilometer and the required similar methodology which has to be applied for all activities.

The complexity and extension of documents required in order to register a PoA is also commented by the project developers as a negative factor.

Nevertheless, these are characteristics of the UNFCCC roles for PoA, and not a peculiarity of the Brazilian market. The Brazilian DNA has not published a special resolution for PoA, and till now uses directly the resolutions of the CDM Executive Board.

PoA is seen by many stakeholders as one of the future alternatives for the expansion of the Brazilian CDM market after 2012.

## 11.5 Other related Aspects

During the visit of Chancellor Angela Merkel in May 2008, an extensive cooperation program between Germany and Brazil in the field of renewable energies and energy efficiency was agreed upon. Part of the cooperation program under the new energy agreement is based in the development and promotion of technology transfer according to the Clean Development Mechanism (CDM) under the Kyoto Protocol.<sup>24</sup>

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<sup>24</sup> BMU 2008: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: Gabriel welcomes energy agreement with Brazil. [http://www.bmu.de/erneuerbare\\_energien/downloads/doc/41446.php](http://www.bmu.de/erneuerbare_energien/downloads/doc/41446.php). Retrieved on 2008-09-22.

## Appendix

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