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ANALYSIS

Assessment of land use and land use change and forestry (LULUCF) as CDM projects in Brazil

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ARTICLE INFO

Article history:
Received 11 July 2005
Received in revised form
16 December 2005
Accepted 19 December 2005
Available online 7 February 2006

Keywords:
CDM
LULUCF
Brazil
Emissions mitigation potential

ABSTRACT

Brazil is an active player in the CDM business, even playing host to the first CDM project ever registered. Although the majority of the CDM actions which have been developed to date in Brazil are in the energy sector, an analysis of Brazil's emissions profile demonstrates that the energy sector does not have a significant share of the country's emissions. Rather that 25% and 56% of the emissions stem from Agriculture and Land Use activities, respectively. In the light of this profile, this paper re-evaluates Brazil's national Green House Gas (GHG) matrix, and attempts to highlight the potential of the Land Use and Land Use Change and Forestry (LULUCF) CDM projects. An analysis of potential actions for improved penetration of LULUCF projects is presented, alongside key recommendations for future actions. This paper outlines how and why LULUCF projects can become the cornerstone of sustainable development policy in the North and North East region of Brazil, two of the main less developed regions in the country, totalling 62% of the country's land mass. A focus is made on three A/R projects recently development in Brazil. Through these case studies, an attempt is made to outline potential guidelines for future actions. This paper demonstrates that A/R projects have a significant potential impact on local and rural development in Brazil today. They have the potential to promote the sustainable use of forestry and soil resources. From the analysis it is clear that satisfying local community needs and commitments is a necessary prerequisite to achieving a situation where the risks associated with the issuing of the CER's (Certified Emission Reductions) could be better managed and also in line with enhanced support from the national authorities (as part of local development plans). The paper concludes that Brazil has significant potential to develop LULUCF CDM projects and that these projects can promote sustainable development through direct impact on the sustainable livelihoods of local communities over the long-term. It is recommended, in line with Brazil's current emission profile, that to realise this potential it is necessary to design a new relationship model between the key players involved in the CDM process: government agents, local stakeholders, national academia and private parties. Further it is necessary for the Federal Government to foster the LULUCF projects. Supporting actions include defining clear policies that minimise risk and/or reduce perceived risk and the promotion of multi-stakeholder involvement in the CDM project development process.

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doi:10.1016/j.ecolecon.2005.12.003

1. Introduction

When Climate Change was first discussed at the World Forum (WCED — World Commission on Environment and Development, 1987), it was clear to all, that although extremely important, the issue was poorly understood from a global perspective and scale. Today there is general consensus among the scientific community that the phenomenon of anthropogenic induced climate change is real and significant. Global efforts now focus on mitigating and adapting to climate change. However, there is no consensus as to the optimum strategy for addressing climate change. One of the main answers became in the form of the United Nations Framework Convention on Climate Change (UNFCCC), which was created to support the reduction of global Green House Gas (GHG) emissions.

This paper focuses on one of the three flexible mechanisms established by the UNFCC to assist Annex I countries to achieve their GHG emission reduction obligations, namely the Clean Development Mechanism (CDM). Expressed simply the CDM enables Annex I countries to invest in climate mitigation projects in non- Annex I countries and earn emission reduction credits in the Annex I from where the project was funded and originated.

The conceptual framework behind the CDM focuses on optimising GHG emission reduction efforts through the most cost-effective solutions, where possible through the use of "better" technologies and even through the creation of a whole new market in terms of CER's (Certified Emission Reductions) and or new technologies.

The rules and regulations for CDM were established at annual meetings hosted by the United Nations, called the Conference of the Parties (COP). This process is on-going with many issues remaining under discussion and debate. One key issue that continues to be discussed by the signatories at the COP meetings is the effectiveness of the CDM as a tool to address the sustainable development of small or communities at local level. As one first wave of initiatives, the Small Scale CDM projects lacked the critical mass to support the burden of their fixed costs (even with the simplified methodologies).

The second wave of most promising CDM projects consisted of those that focused on the transfer of appropriated technology to developing countries. However, these projects have been experiencing difficulties due to the burden of proving their "additionality", as the UNFCCC itself had defined. Non-Annex 1 countries typically lack the state of the art technologies and necessary associated infrastructure to achieve major industrial growth over the long-term that promotes sustainable development (Rusnok, 2004).

This paper focuses on Brazil as a non-Annex 1 country, attempting to highlight the problems and potential solutions that CDM attempts to deal with and can bring into the climate change debate. The analysis starts with an assessment of the current national emission profile and goes further to explore the potential opportunities for CDM projects specifically concentrating on LULUCF potentials.

2. Results

2.1. *Brazil GHG emissions profile*

Since the beginning, Brazil remains at the forefront of the development of the CDM framework in the UNFCCC where it has been since the start of the process. Brazil has adopted a significant leading role among the developing countries promoting the principle of common but differentiated responsibilities in the challenge of addressing climate change.

In 1992 at the United Nations Conference on Sustainable Development hosted in Rio de Janeiro, the government of Brazil was the first national body to sign the Convention on Climate Change. Further commitments to the Kyoto Protocol have since been reinforced by the approval of the first CDM projects in Brazil. These are as a direct result of a determined and conscientious effort from government, private companies, academia and civil society. The first national inventory was published in Brazil's "Initial National Communication" to the UNFCCC (Nov, 2004), by the Science and Technology Minister (MCT — Minister of Science and Technology/General Coordination on Global Climate Change, 2004), as part of the CDM commitments process.

The national inventory summarizes the Brazilian government's efforts towards promoting the implementation of CDM projects and is a key reference on the topic. The national inventory also acts as an official inventory of Brazil's GHG emissions. One important issue is that this inventory clearly outlines that the highest levels of GHG emissions are not associated with the energy sector (unlike global norms, especially those experienced in Europe) rather with areas that have not previously been addressed by the UNFCCC initiatives: the forestry and the agricultural sectors.

The Brazil national inventory lists up to 1.5 million tonnes of CO_2 equivalent (based on 1994 data, compared to a CO_2 equivalent non-official calculation), and the main sector that contributes to these emissions is not the energy sector, as is seen in developed or Annex I countries, rather the Land Use/Change and Forestry sector — this information can be viewed graphically in Fig. 1.

Upon more detailed review, the breakdown of Brazil's emissions reveals an interesting profile: 81% are not from energy related sectors, rather due to agriculture (25%) and Land Use Change and Forestry activities (56%). Clearly this is a very different emission profile from that previously considered in the CDM projects market standard national profile.

Land Use Change and Forestry is made up of four categories (MCT — Minister of Science and Technology/General Coordination on Global Climate Change, 2004):

a) change in forests and other woody biomass stocks,
b) forest conversion to other uses,
c) abandoned land management and,
d) CO_2 emissions and CO_2 removals from underground soil.

Also, highlighting the difference between Brazil and the other countries, it has a strong renewables sector in the nation's energy mix (see Fig. 2). Unlike the majority of countries that are heavily dependent on fossil fuels, in Brazil

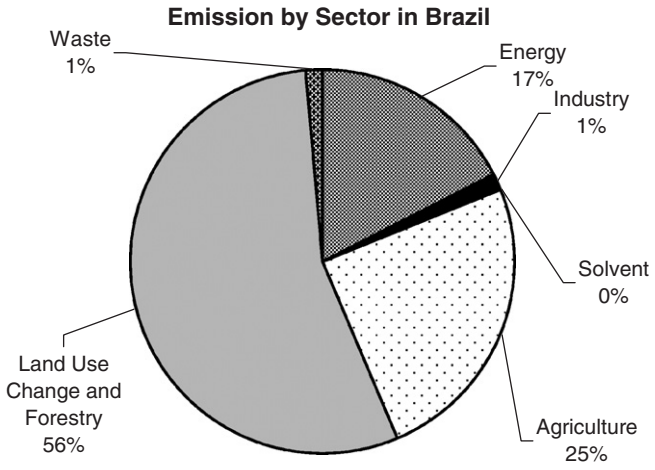

Fig. 1 – Distribution of Brazil GHG emissions by sector (personal compilation).

42% of energy supply comes from hydro and biomass (mainly sugar cane and charcoal). Compare this to a world average of close to 14% of total energy supply from renewables. Under further scrutiny it is important to point out that from 42% of total energy supply Brazil produces 75% of total electricity production. With such a small percentage of Brazil's GHG emissions coming from the energy sector there is very little scope for developing effective CDM projects in the energy sector (MME, 2003).

With this awareness, and after assessing the current emissions profile, the author decided to search for an innovative approach to better understand the needs and opportunities for CDM Project in Brazil. It is thought this will be more in line with the LULUCF sector projects than with energy related projects.

3. CDM projects and sustainable development goals

One important aspect is that CDM projects are tools designed to achieve a more sustainable form of development. They are also drivers for achieving better social and economical indexes and healthier relations between local communities and the environment. Achieving these sustainable development goals with business as usual is a difficult challenge. The complex rules of building up, registering and certifying a CDM project make this even more difficult. Within the Brazilian regional disparities, promoting sustainable development could also be understood at decreasing the gap in development indices between the South and Southeast regions and the other regions of the country.

Moving the focus for development away from the south and central west regions is partially inline with Brazil's emissions profile; Firstly, in adopting this change in geographical focus for CDM project implementation, the main focus of investments shifts from the South and Southeast regions (i.e.: Curitiba, Rio Grande do Sul, São Paulo and Rio de Janeiro states), to other areas. Such an action will bring with it more equitable development benefits for the populations (i.e. North and Northeast regions). Secondly, by moving the target implementation CDM areas to areas where the highest rates of deforestation and land use change are occurring, a concrete chance to achieve a direct impact on the country's emission profile is created.

Regarding the effects of the climate change phenomena itself, as noted by academic and climate science specialists, there are some reflexes of the global warming process that are already taking place, for what is clear that some environments are more sensitive than others, and per se would act as a thermometer of the changes already in motion. This is shown by the: shrinking of the Sahara desert, the melting of the Greenland ice sheet, the changes on the North Atlantic current, the effects on the Monsoon and also direct impacts on the Sustainability of the Amazon forest, as the climate change could lead to decrease in the rainfall (Sample, 2004). From where the CDM projects should also be in line with the adaptation actions to the reflex of the climate change phenomena, besides targeting the GHG emissions.

According to the evidence presented above there are clearly a number of parameters that advocate that it would be better to move the focus of CDM projects in Brazil to the North and Northeast regions of the country. However, the current situation in Brazil is that the majority of CDM projects are concentrated in South and Southeast regions. The CDM projects in Brazil also focus on energy related projects that have very limited potential to address the issues of sustainable development for local communities. Table 1 shows the current CDM projects in Brazil, grouped by project type.

Upon analysis of Table 1 one clear conclusion is that the opportunity to make better use of the Kyoto Flexible Mechanism as an effective tool to enhance the sustainability of the less developed and more vulnerable areas in Brazil is not being maximised. The current CDM projects are also not being used effectively to alter the country's emissions profile. This is a similar state of affairs as in other parts of the world, where key aspects on the political repercussions of the market options in the CDM projects has lead several organizations (such as WWF) (Salter, 2004) to call for a re-evaluation of attitudes towards CDM.

It is important to start to look more seriously at the other possible CDM potential projects in the other suggested two Brazilian regions that may provide an alternative to the

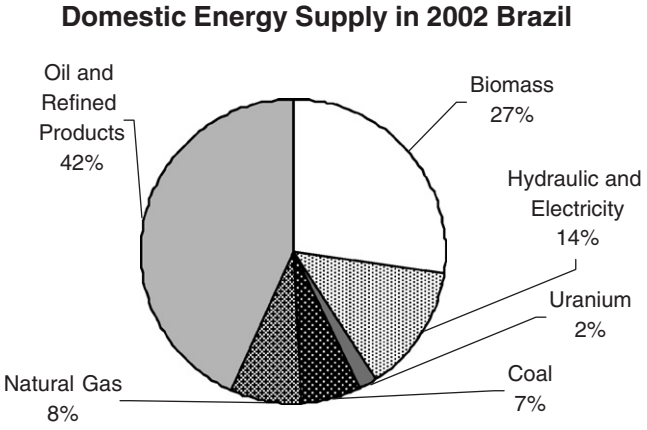

Fig. 2 – Energy matrix for Brazil (MME, 2003).

Table 1 – Distribution of CDM projects in Brazil per type of project

Type of CDM Project	Number of projects	% of the total
Biomass energy	38	42
Hydro	15	17
Agriculture[a]	16	18
EE industry	3	3
Fossil fuel switch	4	4
Landfill gas	12	13
Fugitive emissions	1	1
N20	1	1
Total	90	100

Source: UNEP Risø Centre (2005).
[a] All related to AWMS (Advanced Waste Management System), in its majority, manure treatment on confined cattle raising facilities in the states of South, Central and Southeast regions.

current situation. It is suggested that to start a valorisation of the CDM initiatives in these two regions, that besides generating CER, can also address sustainable development and climate change mitigation. One type of project in Brazil capable of achieving this are the LULUCF (Land use and Land Use Change and Forestation) project types.

4. Main challenges for LULUCF CDM project

There are many challenges imposed on CDM projects. In the case of LULUCF projects, one of the main challenges is to secure a sustainable development model that can lead to long lasting effects on the way-of-life for the population at local level. Is it possible to design a new relationship with the environment that will lead to a less carbon intensive level of activities and possible economic and social growth at the same time? All this at the same time is incorporating the necessary adaptation to the imminent changes imposed by climate change today.

The Brazilian government, is aware of this challenge, and has started a series of strategic studies focusing the climate change issue (NAE — Núcleo de Assuntos Estratégicos da Presidência da República, 2005). These studies make a series of recommendations. The following have been highlighted:

- Need to elaborate on the "National Map on the Vulnerability and Threats related to the Climate Change";
- Need to acknowledge that the country is poorly prepared in the field of climate change, and the degree of knowledge on the subject is insufficient, especially in the agricultural sector. In general, the national research and development sector is aware of the relevance of climate change issues to the sustainable development of the country;
- The National government wants the international community to recognise that the country is not prepared to assume limits to the emissions, as they would have a direct impact on the relation between capital and internal product, and the availability of capital is a critical issue in the internal market with unbearable consequences in the job and personal incomes;
- The theoretical estimated potential for CDM projects in the Forestry and in Brazil is enormous. More then half of it (57%) is concentrated on Forestry projects. But 94% of this forestry potential is yet in a theoretical study stage, not even considered in the short or medium terms action plans;
- Many of the current CDM initiatives are focused in the energy sector (such as the POINFA and PROCEL programmes). There is also some confusion in defining suitable parameters for the calculation of the baseline.

Keeping in mind Brazil's emission profile, the national strategy to reduce GHG emissions, and the need to achieve sustainable development targets, must urgently address the issue of land use and land use change.

One of the main environmental impacts of a forest carbon project is the decrease in the GHG emissions; this is measured in terms of the amount of carbon sequestered. Under CDM the level of carbon sequestered is the investor's prime motivation, as the project justification must include a detailed presentation of net carbon additionality. Yet it is fundamental that designated national authorities (DNAs) when approving CDM projects must screen the projects in order to ensure that they have the dual capacity to offer both carbon sequestration and sustainable development benefits. Further these benefits exist in a complementary and consistent fashion, enhancing the credibility of this new market.

Each CDM project is reviewed by the relevant DNA to evaluate environmental, social and economic impacts and potential contribution towards the local sustainable development. Each project will also be assessed in relation to achieving the national long term emissions reductions scenario. Both of these tasks should fall under the responsibility of the DNA. In Brazil the selection process used by the DNA currently does not allow for different treatment for energy sector based CDM projects than for LULUCF projects, even though the country's emissions profile clearly indicates that a greater impact can be made with a preference for forestry and agricultural focused projects.

Forestry and land use projects can be classified into three main categories (May et al., 2003):

- Commercial projects — these prioritise the generation of CERs for commercial reasons. They are:
  - led by national and/or international enterprises
  - may be implemented directly by trans-national corporations with intensive emissions
  - or by a national industrial sector such as the lumber industry or the biomass energy sector to obtain CERs and/or enhance sector competitiveness
- Conservation projects — these prioritise secondary environmental benefits such as local forest and biodiversity conservation. It is important to note that this project type was undermined by Marrakech COP. CDM projects that would avoid deforestation as a basis for CERs were removed from the process for the duration of the first commitment period (2008–2012): These projects are:
  - normally mediated and implemented by NGOs, often also they are associated with international investor corporations

  - they seek CERs and the related impact in the companies public image.
- Development projects — these prioritise social objectives alongside environmental objectives. Many project developers have established partnerships with trans-national organisations seeking CERs, offering the investors an image of social responsibility as project financiers. These projects:
  - give priority to the needs of local communities while conserving the local environment

Also, this same study proposed a series of criteria and indicators for their assessment in reviewing CDM projects (May et al., 2003). Going beyond classification scientists have provided a series of criteria and indicators as a guide for discussion among interested groups and government officials, in the hope of providing a basis for the incorporation of local sustainable development concerns more explicitly in project review procedures (see Table 2) (May et al., 2003).

Also, during the project design phase there are many additional constraints imposed to create a suitable LULUCF CDM project, these include (CDM-Executive Board, 2005):

1. To accept and encompass the definition of forest — as a minimum area of land of 0.05–1.0 hectares with tree crown cover of more than 10–30% with trees with the potential to reach a minimum height of 2–5 m;
2. Assess the leakage in the project — as the increase in GHG emissions outside the boundary of a project activity, i.e. if the project reduced access to land, food, fuel and timber resources without offering alternatives may result in carbon leakage as people find needed supplies elsewhere;
3. Access the status of the 5 Carbon pools: above-ground biomass, belowground biomass, litter, dead wood and soil organic carbon. Not only in Baseline calculations but also in the monitoring phase;
4. Indicate if the project activity is related to aforestation or reforestation, based on the past history of the area, where: aforestation — no Kyoto forest land cover for last fifty (50) years and reforestation activities — no Kyoto forest since or before 31st December 1989;
5. Define the Baseline methodology, based on identification of alternative land use types, similar to emission reductions projects, as: existing or historical land us, most economical land use alternative or most likely land use type;
6. Decide the project crediting period, for the A/R project activity, for the purpose of issuance of temporary CERs (tCERs) — baseline of a maximum of 20 years, which then can be revised and renewed up to two times. Thus, up to three consecutive crediting periods, summing up to a maximum of 60 years or long-term CERs (lCERs) — non-renewable baseline of a maximum of 30 years on the one hand.

Table 2 – Evaluation criteria for the analysis of a LULUCF CDM Project (May et al., 2003)

Component	Criteria
Social	Project budget shows evidence of financial commitment to the social component
	Smallholders in communities surrounding project participate directly in the project's "core business" (carbon sequestration)
	Land tenure concentration in project area is not exacerbated by project activities
	Net employment is generated by the project
	Employment quality for community participants is improved by the project
	Net income is generated by the project among local participants
	Knowledge and learning are generated and disseminated based on project activities
	Community members have participated directly in project design
	Forest management has been subject to prior certification
Environmental	A net increase in terrestrial carbon storage is anticipated due to the project
	Local biodiversity will be maintained and/or enhanced by the project
	Biodiversity effects of the project will be monitored
	Project impacts on water resources will be monitored
	Soil monitoring
	Environmental education
Economic	The project will have a favourable effect on the national balance of payments
	The project will have a favourable income multiplier effect in the regional market and local communities
	The project is cost-effective and competitive with other climate abatement initiatives

The aspects to be covered in analysing the potential for the development of LULUCF CDM projects are extensive. It is clear that these projects need to include the participation of the relevant local and governmental stakeholders. An analysis of three of the case studies presented in this paper demonstrates that these stakeholders are not properly involved in the project development process. There is evidence (Yu, 2004) that many projects do contribute towards sustainable development, however, often the main weakness of CDM projects comes from the fact that many are attached to other priorities, and that the inclusion of additional evaluation criteria will not make them more sustainable. If the projects are evaluated with such criteria, then lessons can be learned promoting the desirable development for the country/region. This suggests that development projects (those that prioritise both social and environmental objectives), should be encouraged. They should be developed with the active participation of and in a partnership with local communities and governmental agents.

This approach, involving a merging of the local, regional and national interests into the sustainable development process and the definition of suitable LULUCF projects via effective multi-stakeholder participation, could be quickly adopted into the CDM project development process. Clearly all partners should approve the process by consensus, such that the potential issues and problems can be identified and respected by the stakeholders. This process would give Brazil a powerful tool for capturing synergies in the development for CDM projects. Such a

potential methodology is described by Swart et al. (2003); it is based on a twin point analysis:

- First — recognise that GHG emissions, and anthropogenic induced global warming, are determined by general development pathways and by specific climate mitigation policies. This leads us to start thinking of future options in a more holistic way, rather than just focusing on individual energy supply, technology demand or adaptation measures. The critical aspect is to place climate policy in the broader context of technological and socio-economic policy development, rather than just being one among the many items of those policies.
- Second — recognition of the linkages and potential synergies and trade-offs in each concrete policy option. As the options were inventoried, it became clear that they are focused in a certain issue within a specific sector. However, for a full economic appraisal it is necessary to take into account the indirect impacts on climate (including mitigation and adaptation), development targets and social goals. Policy options must not be guided by sector-specific results but, instead, encompass the full spectrum of potential impacts.

5. On going activities in Brazil

Here by, three of the initiatives that have been carried out in the filed of forestry projects are resumed, addressing some of its particularities associated with the objectives assumed for a CDM LULUCF and/or A/R project.

5.1. *The Plantar Project*

The Plantar Project is an example of a typical commercial project. The project's justification for CDM eligibility is based on the company's continued utilisation of charcoal as a reducer for pig iron manufacture, rather than to convert to use of mineral coke, a tendency common among other segments of Brazil's charcoal-based iron industry. Plantar is a reforestation company incorporated in the late 1960s. Its revenues in 2001 were about R$ 136.5 M (approx. US$ 75 M), from forest services, metallurgy, and sale of charcoal and seedlings. The project is situated in the central Cerrado region of the southeast Brazilian state of Minas Gerais, this has long been a source of charcoal to the metallurgical industries of Minas Gerais.

Project documents predict that Plantar could generate 12.88 million metric tonnes (M t) of CO_2 emissions reduction equivalents over a 28-year time horizon, seven years correspond to reforestation and growth and 21 years correspond to charcoal utilisation as an iron ore reducer by the industry. These carbon credits would be generated through three project components: a) 7.9 M t CO_2 from industrial activity (net emissions by substitution of mineral coke by charcoal); b) 0.44 M t CO_2 from improvement of charcoal kilns (methane emissions reductions); c) 4.54 M t CO_2 from reforesting 23100 hectares with eucalyptus and assisting in regeneration of 478 hectares of native vegetation.

Part of the credits to be generated was negotiated with the Prototype Carbon Fund — PCF, whose purchase commitment guaranteed a loan to Plantar by the Dutch Rabobank to finance part of the forest plantation. The agreement between Plantar and PCF includes sale of 1.5 M t of CO_2 credits, corresponding to about 12% of the total CERs expected by the project. The negotiated price was US$ 3.50 per ton of CO_2 (about US$ 12.85/t C), determined by PCF estimates, resulting in potential credits totalling US$ 5.25 M.

Plantar project socio-environmental benefits and local development potential:

- The primary social benefit of the project would be the maintenance of 1270 direct jobs, which could be lost should the company close down. This scenario that the company predicted would shortly occur if carbon finance were denied, due to the absence of alternative sources of capital to permit investment in forest assets.
- The project has serious flaws with regards to local sustainable development, particularly in relation to the equity criterion. Given the role of forestry in the region and Plantar's substantial technical know-how in high technology clone seedling production, there appears to exist considerable potential to secure local development benefits through outgrowing under the forest farmer scheme. This could include the possibility for extending carbon credits to include such farmers. No such forest technology diffusion or social inclusion efforts were proposed by the company, which restricted its relations with the local community to a modest environmental education programme and certified "child friendly" status in respect of child labour laws.
- The necessity for the purchase of large land areas for forest carbon accumulation could encourage a new process of tenure concentration, bringing harmful social consequences if schemes such as the out grower approach are not included in the projects.
- Plantar's pre-existent plantation certification assured investors that the company is meeting all applicable environmental and labour laws, as well as permitting it to launch a "green pig iron" label, associated with its chain-of-custody certification from plantation to industry. Prior certification according to these criteria however does not necessarily assure social sustainability.
- The CDM can guarantee and reinforce the economic sustainability of biomass based energy alternatives. This project, which juxtaposes the utilisation of forest biomass against fossil fuel exploitation, is a good example of this potential role for CDM.

5.2. *The Peugeot/ONF/IPN Project*

The Peugeot carbon sink Project has a primarily commercial objective. It seeks to create an environment friendly image as a market strategy to counteract the negative environmental perception of the emissions-intensive automotive manufacturing industry. The fact that the investment is self-fulfilling and that the project does not intend to claim carbon credits, allows the developers a substantial margin of freedom to decide on project activities.

The project is located in northwest Mato Grosso state, in the so-called "Arc of Deforestation" of the Amazon basin. Reforestation began concomitant to the inauguration of Peugeot's industrial facility in Rio de Janeiro in 2000. The project is implemented by ONF— *Office National des Forêts*, a government institution that tends to the public forests in France, in partnership with Instituto Pró-Natura (IPN), a socio-environmental NGO which has had a long-term presence in the project region.

The publicity impact desired by the investor led to the establishment of an overly ambitious target – establishment of 10 million native trees in three years on 5000 ha – in an environment culturally and ecologically unfamiliar to the executor. As a result of this overly ambitious target, the project faced a number of hurdles during its initial phase, which forced it to change course. The principal barriers to successful implementation were due to a low survival rate of seedlings planted in vigorous *brachiaria grass*, and the repercussions of attempts made by the executors to surmount this hurdle by adopting aerial spraying with the herbicide Roundup. This together with accusations of biopiracy against the executor, deeply affecting the project, forced its executors to change their approach, and to adopt a more accommodating position regarding the relations with Brazilian public institutions.

The process of internal re-evaluation resulted in a number of changes: (i) substituting the use of herbicides with manual weeding; (ii) reduction of reforestation targets from 5000 ha to 2000 ha; (iii) restoration of permanent protection areas in line with the state's rural land use licensing system; (iv) creation of a Scientific Advisory Committee with the participation of regional universities and government institutions; (v) substitution of foreign equipment and expertise with local inputs; (vi) enhancement of local integration through an environmental education program and seedling distribution to local farmers.

Peugeot project socio-environmental benefits and local development potential can be summarised as:

- In terms of carbon benefit, with the establishment of more realistic targets, the initial estimation of 2 M t C to be sequestered over 40 years has now been reduced to 500 000 t of Carbon over 100 years. However, this reduced target has not undermined the positive image associated with its car manufacturer. The area reforested is quite considerable in an area of agriculture frontier and rapid deforestation, where experience with native forest recuperation is very weak. In this sense, the project has attracted considerable attention and reaction in attitudes of local landowners. The potential for technology adoption would only be effective when combined with other social integration efforts such as extension assistance, environmental education and financial support to sustainable land use practice.
- In terms of social benefits, the project has created job opportunities in tree planting and maintenance, income generation through seed purchase and service tax levied by the local government. However these benefits have been most significant only during the project's implementation phase. In the maintenance phase, beginning in 2003, employment and local tax revenues have fallen off quickly. The large-scale nursery established to expand carbon forest plantings in the region was de-activated.
- A forestry extension activity of seedling distribution of multifunctional trees to smallholders is being undertaken in partnership with IPN in line with the institution's role in disseminating agro forestry practices in the region. Along with modest donations for hospital facilities and the environmental education programme aimed at local school-children, this component has promoted some measure of integration of the project with local communities and surrounding land reform beneficiaries.
- Involvement of local farmers in carbon schemes would be a more effective means than large-scale demonstration plantations to encourage sustainable land use practices. Project findings indicate that regional programmes in progress of implementation such as Proambiente can leverage such involvement. Learning from Peugeot has been timely and valuable.

5.3. *The Bananal Project*

The Bananal Project is essentially experimental. Its subliminal aim is to learn how to format competitive carbon projects and open up future opportunities. As an experimental project it seeks to make no claim for tradable carbon credits, which gives a margin of freedom to the developer to adapt its activities. The project was originally financed by AES Barry Foundation, a philanthropy linked to a British gas utility company, and implemented by Instituto Ecológica[2], a regional socio-environmental NGO, based in Palmas, Tocantins state (IE — Instituto Ecológica, 1997).

The project is located in an ecological transition zone, covering three important Brazilian biomes: the Amazon forest, savannah bush land and the marshland. The location of the project can be seen in Fig. 3. The project has introduced the so called "social carbon" meaning carbon generated with a priority focus on social aspects, for which reason it is considered a carbon project of developmental type. The forestry component is divided into three activities: protection of 200,000 ha of standing mature forest, regeneration of 60,000 ha of degraded Cerrado woods land and the planting of 3000 ha of agro forestry practices with an estimated gain of 25 M t C.

The project as originally conceived would strengthen forest conservation within parks of the Ilha do Bananal as its central component, to be managed in partnership with the respective Federal and State Government agencies responsible. However, these partnerships did not materialize for a number of reasons, during the course of the project. This restricted the project outputs to the social and research components.

Bananal project socio-environmental benefits and local development potential:

- The research component focuses basically on the development of carbon monitoring methodologies and studies of regional biodiversity. Monitoring of the deforestation rate in the project intervention areas is foreseen throughout the project's horizon. Due to the substantially reduced forest activities, the amount of carbon sequestered by project

[2] www.ecologica.org.br.

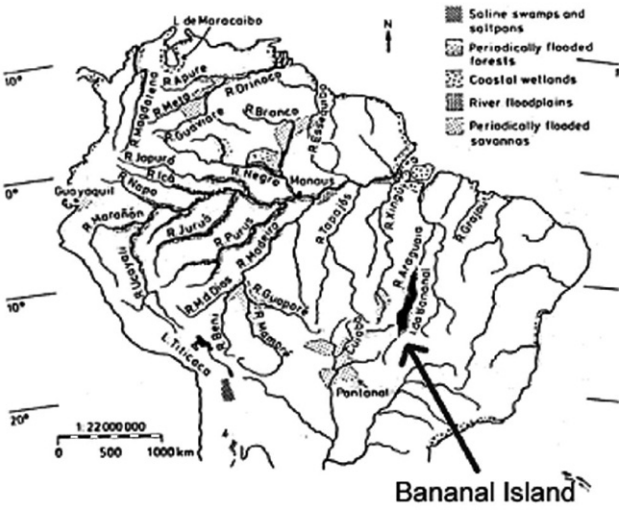

Fig. 3 – General position of Babanal Island in Brazilian territory (http://www.geog.ucsb.edu/~rivers/sa/bananal-web/wetlands.html).

related activities must be cut sharply. However, the concept of using carbon funds to support official agencies to protect and restore conservation units could be fruitfully carried forward by other projects. The key issue for baseline assessment is to consider deforestation as a reference for actions that may reduce its rate over a broader area in subsequent years.

– The project's social component focused on environmental education to school students and community members, support to income generation activities, distribution of seedlings and establishment of agroforestry systems. The primary project stakeholders for these elements are land reform beneficiaries, community members and indigenous groups. The project expects that raising environmental awareness may also contribute to carbon benefits, both by increasing tree planting and by reducing deforestation.
– The project pioneered the introduction in Brazil of the Sustainable Livelihood Approach to assess intervention on local communities with their participation. The project itself did not generate significant employment. Efforts are underway to support sustainable income generation activities, but the net results of such efforts for income and employment will require long-term support and assessment. Their impact on regional carbon stocks is indirect and difficult to measure.
– Lessons learned suggest that partnerships with government agencies need to be formalized and budgets clearly defined to avoid political discontinuity, endangering results. Although the Kyoto Protocol does not allow credit under the CDM for avoided deforestation, in agricultural frontiers such as the Amazon region, complementary incentives such as forest valuation by the carbon market are urgently needed to guide proper land use. Government environmental agencies may thereby strengthen their capacity to protect unique biomes, and rural development agencies may thus induce landowners to restore mandatory permanent reserves or establish sustainable production systems.

6. Profile of the north and northeast regions and its relations with the Kyoto issues

In order to better explain the relationship between the Brazil emissions profile and the issues analysed here, some of the key characteristics related to the north and northeast regions of the country are detailed in the following section to further support the ideas presented in this paper.

6.1. *North region*

The North region represents almost 45% of the country's territory (3,831,694 km^2). It encompasses the region of the Amazon Forest, and is constituted by the following states: Acre, Amapá, Amazonas, Pará, Rondonia, Roraima and Tocantins. The consequences of climate change for this region are represented by an increase in sea level, leading to a bigger penetration of the tides into the rivers. Flooding of the adjacent areas, with possible sedimentation of the river bed, the impact also will rise from the increased erosion on the sea cliffs and destruction of mangroves (MCT — Minister of Science and Technology/General Coordination on Global Climate Change, 2004). Another important aspect is that climate change will bring high levels of stress on the

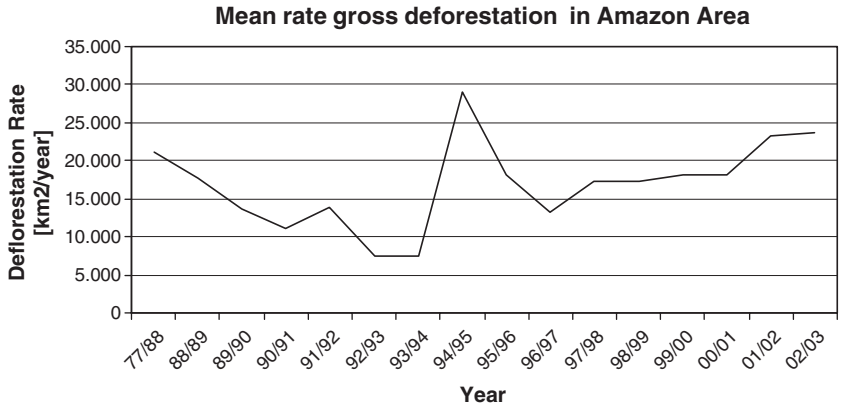

Fig. 4 – Mean rates of gross deforestation in Amazon Area (INPE — Instituto de Pesquisas Aeroespaciais, 2004).

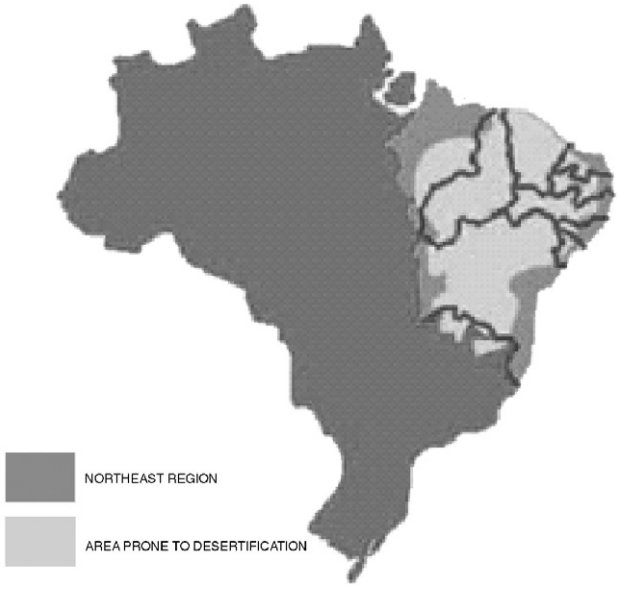

Fig. 5 – Main areas in Brazil that are likely to undergo the desertification process (MCT — Minister of Science and Technology/General Coordination on Global Climate Change, 2004).

environment, and a significant number of species are likely to disappear (MMA, 2005).

Estimation on the level of deforestation in the Amazon region was done based on Satellite images data analysis, and the results, in terms of mean gross rate of deforestation in the region can be seen in the Fig. 4. These data can now be obtained in a real time basis, due the development of a surveillance system based in Satellite image processing, the PRODES and DETER projects (INPE — Instituto de Pesquisas Aeroespaciais, 2004).

6.2. *Northeast region*

It represents only 17% of the territory (1,447,528 km^2), with the following states: Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernanbuco, Piauí, Rio grande do Norte and Sergipe. The impacts of climate change will be more serious in several coastal cities such as Recife, Aracaju and Maceió, where the urbanization has expanded to low areas of coastal plains, also where drainage problems associated with floods in Maranhão state, and Salvador city are to be expected. Some impact on the rivers flows and possible increase on the sedimentation process in the river bed (that leads to the sea) is likely, and also a possible decrease in the level of rain fall would enhance the desertification pressure on the continent.

According to MCT — Minister of Science and Technology/ General Coordination on Global Climate Change (2004) a significant area of the region is threatened with the desertification process, as shown in Fig. 5.

7. Discussions

Getting back to the country emissions profile, and the need to develop actions that are in line with the need to improve the relations of mankind and the environment in the most fragile and endangered environments in Brazil, it is necessary to seek for an action plant capable to imprint a new form of relationship in terms of sustainable use of the natural resources and a decrease in the pressure of the depletion of the natural resources. It is clear, that promoting the CDM LULUCF A/R projects is one of the possible strategic actions to promote forest and preservation actions.

When encompassing the requirements of a correct design of a A/R PDD (Project Design Document), many of the criteria analysed force the proponents not only to understand the design of LULUCF CDM projects as drivers of a new model for the land use, but also as part of a deep understanding of the past history of the local area and people that lives there. In this case they would need to certify the accomplishment of set of forestry development project criteria (defined in a mutual stakeholders consultation process). Understanding the habits of the local population would avoid many undesirable outcomes and barriers for the CDM Project, as the leakage effect, and yet have the necessary statistical and numerical data to build a consistent database on all carbon pools (methodology on how the carbon storage is accounted in A/R projects), past history of the area (with official documentation and or making use of remote sensing tools), in a historical perspective documented in a sufficient lime line to support the aforestation and or forestation criteria as defined by the UNFCCC and the needs for the registration and certification process.

In defining the project activity, it is necessary to understand the current and potential future trends in the area/ region's economical activities, so that they can be properly framed in the calculations for the baseline and the methodologies for crediting and certification activities.

All these must be done in order to take part in an LULUCF A/R project activity, and per se, incur the level of additional costs required to develop, submit and register the project under the CDM.

Perhaps this set of actions might be considered as unproductive in terms of promoting the necessary change in the Brazil's emissions profile, as it does not tackles directly the GHG emissions reductions. However, the fact that those local issues are encompassed in the design of the A/R projects (that is not an issue for the international community, as it is rather a national process), is necessary to the Brazilian society to understand the need to change and the tools, options and potentials to be explored in pursuing the necessary changes to face the challenges imposed by the climate change phenomena.

Are the CDM LULUCF A/R projects suitable tools to address the necessary changes, and in what why? Do the case studies presented here show that there is a common path, or even a central national policy that could be implemented? If the Plantar Project could have proven its additionality. What would have been if the Peugeot/ONF/IPN Project were only a bit more focused on being a carbon focused project, and not having its core in the management of a companies image action, disassociated with the local communities?

Also, what would have been the outcome for the Babanal project, if right at the beginning, the project could have count with a better carbon pool statistical database? Would all these activities had a different outcome?

Should this additional support necessary come from the Brazilian government, in the form of clear climate related policy, and stronger support for research institutions? Brazil likes to present itself as having a strongly regulated market. The reality of this market is that due to the frequent instability and uncertainty in the country, investors tend to wait before investing. Often they wait for a better definition of the federal regulation in accordance to the investment environment (that would includes clear rules regarding the Kyoto Protocol). This behaviour is normally adopted to avoid unexpected surprises and unforeseen obstacles and events affecting this private investment.

In that sense, for the future implementation of LULUCF CDM projects, as cost objective tools to decrease the global emissions as they were originally designed, it is unforeseen that purely market oriented tools would be significant to diverge the actual path of investments, been needed the reinforcement of other instruments, as national policies, regulatory actions and even scientific supporting studies.

The need to adopt a comprehensive government led to climate change policy in Brazil, which is very strong. This must constitute a common framework between several government institutions involved in the Management of the CDM actions (Environmental Minister, DNA, Agricultural Minister, Science and Technology, etc.) on their development plans and policies towards promoting sustainable development.

It is important to understand that the international demand for emissions reductions and its relations with demand for CDM projects is a market orientated toll and, as a result the market will always naturally go for the lowest cost and lowest risk options, which are mainly represented in CDM by the energy based projects. In terms of CDM potentials LULUCF based projects, Brazil is an important host, and has a significant role to play, as it has significant potential for LULUCF projects, estimated at approx 55.6 Mt CO_2 per year as CERs in Brazil (NAE — Núcleo de Assuntos Estratégicos da Presidência da República, 2005). In terms of global potential, Brazil represents the third most important host for sink projects (15%: 10 Mt CO_2 per year), preceded by China (37%) and Indonesia (25%) (Niles et al., 2001).

Further it is important to recognise that forestry projects, while conceptually similar to sustainable management (as opposed to simple resource depletion), will tend to have reduced profitability. This is due to the need to pursue complementary benefits that foster the adoption of a more sustainable use of resources. (Pearce et al., 2003).

Brazil offers one of the biggest world potential for sink projects (under the LULUCF modality). However, undertaking these projects requires a suitable set of conditions (social, environmental and governmental) than to create the optimum conditions. Brazil also needs LULUCF projects to be developed in order to achieve better long lasting effect in terms of carbon emissions mitigation and also climate change adaptation.

8. Conclusions

In climate change mitigation which is the achievement of the maximum number or CERs, at the minimum cost, energy based projects are the most potential (when looking just into the project boundaries, as they do lead to a more significant emission reductions). However, under the scope of countries' sustainable development goals this assumption is not correct. The LULUCF projects have greater potential to tackle local and rural development, promote the sustainable use of forestry and soil resources while still decreasing the anthropogenic emission of GHG.

So it is possible to say that for specific areas of the country, where the local needs and local governments commitments are made, the CDM projects based on the Land Use and Land Use Change and Forestry can, and should, be used to work in a partnership with the government and local stakeholders to make a positive impact on the sustainable development of sensitive regions of the globe under the stress of the climate change.

On the other hand, although positioning the country as a suitable target for CDM investments is an important issue, for a non-annex 1 country, that yet does not have an imposed limitation to its emissions, is also important to develop a set of actions direct target on reducing its emissions.

This would be based, not only addressing correctly its emissions profile, but in line with a strategic national plan to respond to future possible imposed emissions reductions. One possible collateral effect would also be a clear demonstration to the international community and its commitments and that efforts have been taken to attract investments in CDM projects, by reducing risks and removing barriers, at the same time that increase the International perception of been an interesting target country for CDM projects.

Considering the mix of Brazil's emissions, where 56% of the emissions are due forestry and land use and 25% in the agricultural sectors, there is no doubt that LULUCF CDM projects must be pursued. And that while there are some government initiatives, being implemented by the Ministry of Science and Technology, and the Ministry of Environment, there is not an adequate sense of urgency.

LULUCF CDM projects need to play a significant role in Brazil's emissions reduction portfolio. As the Federal government has indicated that these projects represent more than half of the country's CDM potential (MCT — Minister of Science and Technology/General Coordination on Global Climate Change, 2004), and yet these projects are not currently receiving a similar proportion of the attention. As a result there is a noticeable lack of coherence on emission profile and the climate policy. This observation demonstrates the existence of a dual position, in the Brazilian case, where in the energy sector, contrary to the rest of the world, the country has a very Kyoto friendly situation, while in other sectors there is little knowledge on the possible impacts (quantification), nor potential remediation and mitigation actions and strategies.

There appear to be two separate issues, the energy profile and the emissions profile. An acknowledgment of the differences between these two would create a basis to avoid future emissions caps in future negotiations. This dual reality demonstrates that with regards to climate policy Brazil's situation is mixed. As a result for emissions limits to be imposed, this would be only in the areas where a minimum level of development is already achieved (industrial and energy sectors, for example), and not where a lot of work is

yet to be developed, as in the fields of land use, agriculture and forestry.

The Brazilian government should act towards supporting LULUCF projects, by any means necessary, using tools such as:

- Elaboration and public dissemination of a map of areas suitable for LULUCF projects based on satellite image analysis. Those areas must correspond to the forestation and aforestation criteria of the Kyoto Protocol (aforestation — no Kyoto forest land cover for last fifty years and reforestation activities — no Kyoto Forest since or before 31st December 1989);
- Specific regulatory framework, mandate to facilitate the sustainable timber use in LULUCF areas;
- Quota system in the CDM projects approved in the country by the DNA, forcing the market to developed more LULUCF projects rather than only energy focused ones;
- Improvement of the technological base of the projects under development with strengthening the bounds between government agents, scientific academia, and local stakeholders associations, in the development of the projects;
- Establish a task force within the several stakeholders in pursuing a definition of a specific policy targeting CDM projects in the area of Land use, that would encompass federal regulation to avoid project barriers to projects that are in line with a suitable model of development.

Acknowledgments

The authors would like to acknowledge the importance of the funding provided by the European Commission, within the scope of the OPET Latin America Program, managed by the EESD. We would also like to thank the collaboration of all local stakeholders, especially the interesting discussions with Mr. Alexandre B. Strapasson from the MMA-Brazil, and the dedication of the entire project consortium.

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