INTER-AMERICAN DEVELOPMENT BANK

BRAZIL

CAMPINA VERDE BIOENERGY PROJECT (BR-L1108)

ENVIRONMENTAL AND SOCIAL MANAGEMENT REPORT (ESMR)

February 2008

Project Team: Sylvia Larrea (Team Leader, SCF/INF), Rafael Matas (SCF/INF), José Felix-Filho (VPS/ESG), JGP - Consultoria e Participações, Ltda. (Environmental and Social Consultants), under the supervision of Warren Weissman (Chief SCF/CFI)

TABLE OF CONTENTS

I INTRODUCTION

1.1 The Project involves: (i) the construction and operation of a greenfield sugar and ethanol mill located in the Municipality of Campina Verde, State of Minas Gerais in Brazil, with a sugarcane crushing capacity of 2.5 million tons per year (equivalent to a production capacity of approximately 33 million gallons per year of ethanol, if produced only ethanol, or 156 thousand tons of sugar, if produced only sugar); (ii) the construction of a 56-Megawatt ("MW") cogeneration power plant that will supply energy to the sugar and ethanol mill and sell the excess energy to the Brazilian electricity grid; and (iii) the development of sugarcane plantations to a total of approximately 33 thousand hectares (all together the "Project").

1.2 The Project will be developed, constructed, commissioned, owned, operated and maintained by *Campina Verde Bioenergia Ltda.* ("Campina Verde", "Project Company" or "Borrower") a special purpose subsidiary of *Companhia Nacional de Açúcar e Álcool* ("CNAA"). CNAA is a holding company incorporated in Brazil; it was founded and is managed by *Global Foods Holding, N.V.* ("Global Foods") and *Companhia Energética Santa Elisa S.A.* (located in the Municipality of *Sertãozinho*, State of São Paulo) ("Santa Elisa", together with Global Foods, the "Sponsors"). Santa Elisa will be closely involved in supervising the construction and in the operation and maintenance of the new Projects. Santa Elisa has recently merged with *Companhia Açucareira Vale do Rosário*, located in the Municipality of Morro Agudo, also in the State of *São Paulo*, forming *Santelisa Vale Bioenergia S.A.* ("Santelisa Vale").

1.3 Also, CNAA is the sole owner of *Ituiutaba Bioenergia Ltda.*, which is developing the Ituiutaba Bioenergy Project in the Municipality of Ituiutaba (State of Minas Gerais), and CNAA and a partner, *Usina Santa Luzia Ltda*., own (78 and 22 percent respectively) *Companhia Itumbiara de Bioenergia e Alimentos Ltda.* ("Itumbiara"), which is developing the Itumbiara Bioenergy located in the Municipality of *Itumbiara*, State of *Goiás*. Those two other projects are very similar to the Campina Verde Project and are also being analyzed separately for possible financing by the Inter-American Development Bank ("IDB").

1.4 Taking into account the potential environmental and social impacts and mitigation measures associated with the Project, as per IDB's OP 703 Environment and Safeguards Compliance Policy, the Project has been classified as a Category B operation.

1.5 The Environmental and Social Due Diligence ("ESDD) performed by the Bank involved also inspection of Santelisa Vale's main industrial facilities and agricultural operations to assess adequacy of existing procedures and management systems to address environmental, social, health, safety and labor issues, as this company will be closely involved in the supervision of the construction and operation and maintenance of the Project.

II PROJECT DESCRIPTION

A. Project Location and Main Components

2.1 The Project will be located in the Municipality of Campina Verde (approximately 20 thousand inhabitants in 2007), in the State of Minas Gerais, in the *Triângulo Mineiro* (Minas Triangle) Region, in the Center-South Region of Brazil (**see Figure 1**). The Campina Verde Project is included in the Rio Verde (or Feio) river basin, part of the Rio Grande river basin, whose

main tributaries are: Ponte Alta, Uberaba, São Francisco, da Moeda, Verde (or Feio) and Parafuso rivers.

2.2 The Minas Triangle Region provides agricultural, economic and topographical conditions that are favorable for growing sugarcane. The agricultural and economic conditions refer to soil properties, rainfall levels, and sunlight exposure required for sucrose accumulation. The topographical conditions refer to the potential for employing mechanized harvesting and other aids related to the planting and sugarcane transportation logistics.

2.3 The Central-South Region contains logistical infrastructure that facilitates access to the export corridors of the Ports of Santos (State of São Paulo or SP) and Vitória (State of Espírito Santo or ES). The location of the project includes a roadway transportation network that allows for convenient land access to the consumer centers of the States of São Paulo and Minas Gerais.

2.4 The industrial site where the mill facilities will be implemented is located about 17 kilometers from the city of Campina Verde, and is currently occupied by pastureland. Cattle raising farms, without population centers, except for a few people in the farm headquarters, also occupy the surroundings.

2.5 The sugarcane needed to feed the mill will essentially come from plantations located within a radius of 20 km. The agricultural sector is in its initial production phase, which consists in the planting of the first sugarcane nurseries for reproduction of the best variety (the most adapted to the physical conditions and which will provide the maximum yield).

2.6 The Project will basically comprise two main components: (i) the agricultural component responsible for the activities related to sugarcane planting and harvesting; and (ii) the industrial production component, responsible for the production of ethanol and sugar.

A.1 Industrial component

2.7 The industrial installation will occupy an area of about 50 hectares and consist of sugar and ethanol producing facilities, with capacity to process 12 thousand tons of sugarcane per day (about 2.5 million tons per harvest), which could categorize it as a medium-sized mill for Brazilian standards. The plant may produce and market five products: raw (or very high polarization - VHP) sugar, granulated sugar, anhydrous ethanol, hydrated ethanol and excess energy produced in the cogeneration plant that will be fueled by biomass (sugarcane bagasse from the mill). The yearly production cycle of the mill will run in general from the beginning of April to the end of November, according to the seasonal agricultural cycle (equivalent to about 208 days per year).

2.8 The main components of the plant that determine its production capacity are the following: (i) diffuser with the capacity of 12 thousand tons of cane per day (the plant will not use crushers but a diffuser to extract the sugarcane juice from the cane); (ii) sugar dryer with the capacity to process 750 tons a day; (iii) anhydrous and hydrated ethanol distillers with the capacity to process 600 thousand liters a day; (iv) a cogeneration facility composed of three electric power generators fueled by burning sugarcane bagasse, with a total installed capacity of 56 MW. Of the total energy generated, approximately 16 to 18 MWh will be used for internal consumption and the remaining will be introduced in the public electricity grid.

2.9 The project will be implemented in phases as follows: (i) Phase 1, corresponding to the first harvest, will process approximately 1 million tons of cane; (ii) Phase 2, corresponding to the second harvest, will process about 1.6 million; (iii) Phase 3, corresponding to the third harvest, will process around 2.2 million; and (iv) Phase 4, starting with the fourth harvest, will process approximately 2.5 million tons of cane.

2.10 Water will be required at the mill essentially to wash the cane stalks, for cooling purposes, at the boilers to generate steam and energy and in gas scrubbers used to clean the gases coming out from the boiler furnace. Adopting a closed-circuit water recycling system at the mill the Company will minimize the water intake needed. It is estimated that the water demand required for industrial production at full production capacity will be of the order of 1500 m^3/h (or 3m^3 of water per ton of cane). The intake water will be extracted from two water bodies, around 1200 m^3/h will be extracted from the Rio Verde (or Feio), which presents a minimum flow rate of approximately 6900 m^3/h at the water intake point, and approximately 300 m^3/h from the Ribeirão Inhumas, which presents a minimum flow rate of about 1200 m^3/h. Therefore, the amount of water intake extracted will not be significant compared to the flow of the river. Furthermore, approximately 85 percent of the water used in the industrial process will be returned to the fields by irrigation, thereby returning to the watershed.

2.11 One of the main effluents generated at the mill will be the stillage (or vinasse), originated in the distillation columns where the separation of the ethanol occurs. Stillage production will be on the order of 10 to 15 m^3 of stillage per m^3 of ethanol, and its composition will be rich in nutrients, especially potassium, calcium, magnesium, phosphorus, manganese, organic nitrogen and pH raising substances. In sugarcane plantations synthetic fertilizers can be partially substituted by the use of wastes and liquid effluents generate at the mill.

2.12 The entire discharge of industrial effluents from the mill production process (mainly used water and stillage) will be recycled in the crop fields to supplement nutrients, correct soil pH and provide water and other properties to the soil. The transportation of these effluents to the areas to be irrigated is undertaken by a system of pipelines, canals, tanks and pumping and spraying systems, in addition to supply tanks for tank trucks with sprayers. The canals for transporting stillage and water will be waterproofed and the pumps will be electrical to avoid air pollution and oil leaks and contamination.

A.2 Agricultural Component

2.13 The agricultural component of the Project will be responsible for approximately 90 percent of the raw material production (sugarcane), requiring the planting of approximately 33 thousand hectares of cultivated land, which includes a 10 percent technical reserve as a safety margin in case of lower sugarcane output or productivity, in an average radius of 15 to 20 km from the mill, both at owned farms as well as leased land. The remaining 10 percent of sugarcane will come from third party farms.

2.14 Preparation for planting is executed by mechanized methods, but planting is carried out manually in modular areas with organized teams, within a structure made up of coordinators, supervisors, machine operators and agricultural workers. The organizational structure for the personnel doing the planting includes transportation in special buses, shaded areas for mealtime (awnings adapted from the buses themselves, plus tables and chairs), supply of cooled water, modular toilets, uniforms, provision of isotonic drinks and thermal lunchboxes, in addition to mandatory use of personal protective equipment (“PPE”). The work shifts,

breaks and meal intervals adopted are those specified by law. A structure for medical care is also available (cars, ambulance and radio communication for emergency care in the field). The buses also contain electronic devices for time clock control. At meetings conducted by the IDB during the ESDD mission, information was given about implementing work gymnastics for the planting and harvest personnel.

2.15 The cane will be harvested by mechanized methods in 80 to 90 percent of the Project planted area. The project goal is to limit manual cutting to areas where the slope of the terrain does not allow for mechanized harvesting. The topography of the Project region is quite leveled so the manual harvest requirements will be small.

2.16 In plantation areas where manual harvesting will be practiced, the crop will be previously burned, in a controlled way, to eliminate dry leaves or straw and make the conditions less harsh and safer for harvesting workers, decrease health risks to workers, reduce the costs of manual harvesting, and reduce transportation costs. According to current law the practice of controlled burning of cane crop is only allowed in areas away from urban areas, environmental preservation areas, highways, railways and airports, and when the relative air humidity index is greater than 20 percent. Also required are preventive procedures against fire (firefighting brigades) and burning is limited to one planting area at a time. An adequate distance will be maintained between the planting areas to be burned, to prevent burning to propagate from one area to the next. The Company will perform crop burning mostly at night (from 8 PM to 6 AM), as the temperatures are usually lower, humidity higher and winds calmer.

2.17 The access roads between the mill and the sugarcane plantation farms of the Project will be in general the existing neighboring municipal unpaved roads. The maintenance of these roads is the responsibility of the municipality, but the Company will provide assistance. In fact, the Company has already undertaken improvement work on these roads such as widening, grade adjustments, installation of drainage devices, leveling and surface treatment, resulting in significant improvements in their quality so heavy vehicles can use them to transport cane to the mill, and for other requirements related to agricultural operations. The aforementioned improvements in the roads resulted in better transportation conditions in the region’s local network for other purposes not related to the sugar-ethanol sector production chain.

B. Project Workforce

2.18 The workforce estimated for the construction phase will comprise the direct labor force contracted by the construction company, which may be divided into qualified labor force (engineers and other technically responsible persons, group chiefs, equipment operators, electricians, assemblers, etc.), semi-specialized labor force (masons, carpenters, metalworkers, etc.) and low-qualified labor force (helpers and others).

2.19 During the implementation phase of the industrial plant approximately one thousand direct jobs will be generated, involving contractors for industrial assembly, auxiliary services, cafeteria/hotels and agricultural area services, in addition to a significant demand for skilled labor of professionals related to the design and manufacture of equipment and direct jobs in civil construction activities.

2.20 In the operation phase, the industrial plant will require skilled personnel, demanding continuous dedication and effort in training and labor qualification. It is estimated that

1.5 thousand direct jobs will be generated, 1.25 thousand for the agricultural sector and 250 for the industrial and administrative sectors. Furthermore, it is estimated that approximately 200 indirect jobs will be created in the maintenance, commerce, health and education areas.

2.21 The work regime that will be practiced for the workers in the sectors that require 24 hours of activity daily will involve three fixed shifts of 7 hours and 20 minutes each, with the following periods: 06h:50min to 15h:50min; 15h:30min to 00h:10min; and 23h:50min to 07h:10min.

2.22 All Company workers, without exception, in agricultural production as well as in the industrial production of sugar and ethanol, will be registered and legally employed, have their rights respected as established by the Brazilian Consolidated Labor Laws, and will be entitled to health and other benefits provided by the Company.

C. Project Alternative Analysis

2.23 The Project location was the result of the consideration of technical, market and environmental factors which are relevant to the sugar-ethanol sector. These main factors are: (i) availability of an arable area for sugarcane crop, capable to respond to the immediate and future requirements of the industrial production; (ii) need to avoid the presence of other mills nearby, which could compete for land and other resources; (iii) road system capable to support the logistical requirements of the production chain; (iv) adequate natural conditions, such as appropriate temperature, with precipitation levels from 1500 to 1600 millimeters per year and well-defined seasons during the year, good soil quality, adequate water supply and terrain varying from flat to rolling, the most appropriate for mechanization; (v) region able to supply agricultural implements and industrial consumables; and (vi) location of the industrial unit at the strategic distance of 17 km from the urban center of Campina Verde, allowing to reduce the direct impact on the urban population and still guarantee the rapid transportation for workers.

2.24 It should also be pointed out that the Integrated Development Institute of Minas Gerais ("INDI") regulates the location of sugar and ethanol mills in the State, in cases that involve tax incentives or solicitation for credit to the Development Bank of the State of Minas Gerais ("BDMG"), as is the case for the Project. The main purpose is to organize the spatial distribution of relevant ethanol-sugar units and respective planting areas in a sustainable manner, taking into consideration environmental and strategic aspects, as well as the economic-ecological zoning constraints established for the State.

III. ENVIRONMENTAL LICENSING COMPLIANCE

3.1 According to national and state environmental laws, the main types of licenses, and/or permits required by the Project are the environmental license for the industrial facilities, water use permit, and for the agricultural cycle the environmental license, for farms larger than 200 hectares, or environmental permit to operate ("AAF") for parcels of land 200 hectares or smaller.

3.2 However, in order to get the environmental licenses or permits for the plantations, it is necessary to perform the Legal Reserve ("RL") registration, and obtain the forest exploration permit ("APEF") for each parcel of land or farm to be cultivated. The RL is the area located

inside a rural property or area, besides the Permanent Preservation Area ("APP"), which is representative of the natural environment of the region and required for the sustainable use of the natural resources, the conservation and rehabilitation of the ecological processes, conservation of biodiversity, and for sheltering and protecting native fauna and vegetation, equivalent to at least 20 percent of the property's total area, in that region of Brazil. The area destined for the RL composition may be grouped in one sole section, under a condominium arrangement or common property among different parcels.

3.3 Brazilian federal and state environmental legislation usually foresees three sequential environmental licenses for the type of project that is being analyzed: (i) a Preliminary License at planning stage; (ii) an Installation License to initiate construction; and (iii) an Operating License authorizing operation of the facility.

3.4 In the case of the Project, the respective environmental impact assessment reports ("EIA/RIMA") have already been prepared and submitted, and the competent environmental authorities granted the respective Preliminary and Installation Licenses for the Project's industrial facilities. Regarding the agricultural cycle, the Company obtained the Preliminary and Installation Licenses, or the environmental permit to operate for some of the farms. The Company is in the process of regularizing the status of the licenses or permits for the remaining farms, for the owned as well as for the leased tracts of land, as this has to be performed parcel by parcel.

3.5 During the ESDD performed by IDB, it has been possible to confirm that the Company has adequate systematic procedures to regularize the licensing or permitting status of the remaining land parcels, as well as to obtain the necessary Operation License for the industrial facilities, and that these processes have been initiated and are underway. In addition, the Company maintains a good relationship and a take a proactive approach toward environmental and other regulatory authorities, as well as in relation to license or permit-associated environmental studies or conditions. IDB will follow up and supervise to confirm completion of the licensing and permitting processes.

3.6 The environmental impact assessment reports relating to the Project have been disclosed according to IDB's Operational Policy OP-102 on Information Disclosure, at the Bank's Public Information Centers in Washington and Country Office, and placed for public consultation locally.

IV ENVIRONMENTAL AND SOCIAL IMPACTS, RISKS AND MITIGATION MEASURES

4.1 This chapter is structured into four sections. **Section A** presents broad and strategic issues related to ethanol as a biofuel, project location and technology, and sugarcane crop management. **Section B** discusses potential negative direct impacts typically associated with this type of project. **Section C** presents an analysis of potential negative indirect cumulative and regional impacts sometimes alleged to be related to sugarcane expansion. **Section D** indicates main potential positive impacts associated with the Project.

A. Broad and Strategic Issues and General Mitigation Measures Adopted in the Project

4.2 *Energy diversification and reduction of greenhouse gas emissions.* The use of ethanol as an alternative source of energy provides important environmental advantages compared with other fuels. It is renewable and its use as a fuel generates much lower levels of air contaminants such as sulfur and nitrogen oxides, solid particulate matter, lead and greenhouse gasses (on a life cycle analysis, sugarcane ethanol produces 91 percent fewer greenhouse gas emissions per kilometer traveled than gasoline). The energy balance of the ethanol from sugarcane production cycle also indicates that the energy that can be obtained in its use is 8 to 10 times greater than the energy needed in the production (energy balance obtained from corn ethanol is estimated at 1.2 to 1.3 times). Furthermore, boilers at ethanol producing mills are fed by waste generated at the plants (bagasse); thus eliminating the use of other fuels.

4.3 *Generation of excess energy.* In addition, the cogeneration plant fueled by biomass (bagasse) will generate more energy than necessary in the industrial process and the excess renewable energy will be added to the public grid for other users. Thus, in addition to reducing considerably the amount of waste that needs to be discharged, the process allows the production of excess renewable energy, helping to diversify the Brazilian energy matrix. In the case of the Project the surplus energy that will be generated (about 190 thousand MWh per year) would be enough to power approximately 146 thousand Brazilian average households (around 17 thousand in the USA, or 54 thousand in Europe).

4.4 *Strategic and regional importance.* Strategically, the use of ethanol as an alternative source of energy contributes to diversification of fuel sources and lessens the dependency on oil. In the Americas in general, and in Latin America and the Caribbean Region, in particular, there are important initiatives being developed to foster the production and use of ethanol as an alternative to fossil fuels. IDB launched its Sustainable Energy and Climate Change Initiative ("SECCI)" to promote alternative energy sources and clean fuels, such as ethanol. Also, the Inter-American Ethanol Commission has been created to facilitate private investment in biofuels, and to promote the creation of a hemispheric market in biofuels. Thus, the participation of the Bank in this Project will represent an excellent opportunity to demonstrate its strong commitment to these initiatives.

4.5 *Far from sensitive areas.* It should be pointed out that the Project's facilities and plantations will be located away from any conservation, indigenous and urban areas, and the land acquisition and preparation process will not require or involve the relocation of people. Thus, the Project's facilities and plantations will not: (i) convert or degrade critical natural and/or natural habitats or damage critical cultural sites; (ii) raise any significantly negative indigenous issues; (iii) generate any resettlement issues; or (iv) have associated any trans-boundary issue.

4.6 *Efficient technology.* The Project is being planned and developed using modern and more efficient technologies for the agricultural and industrial cycles, resulting in lower use of resources (water, energy, etc.), fertilizers, soil correctors, pesticides, and consequently in more environmentally sustainable processes. As such, most of the environmental and social impacts that are typically associated with development and operation of the plantations, or construction and operation of the mill will be adequately mitigated.

4.7 *Substitution of synthetic fertilizers.* In the sugarcane plantations, synthetic fertilizers will be partially substituted by the use of waste and liquid effluents generated at the mill and cogeneration facilities, such as the filter cake coming from vacuum filters, the ashes coming from the gas scrubbers at the cogeneration plant, and the stillage (or vinasse) generated at the

distillation process. To reduce soil and water contamination by pesticides, the Company will adopt integrated pest management procedures based on specific soil characteristics, climate conditions, pest history, and crop type for a particular field. This approach will limit pesticide use and help manage the necessary applications to minimize pesticide movement in the field. In addition, the Company will adopt a program of crop rotation and every given number of years (e.g., very likely five) the sugarcane harvest will be alternated with another type of crop (e.g., soybean). This crop rotation will improve the nitrogen naturally occurring in the soil, reducing the need for fertilizer, assist in weed, disease, and pest control, restore organic matter in the soil and protect against erosion; besides helping to diversify agricultural production.

4.8 *Mechanical harvesting.* Approximately 80 to 90 percent of the crop areas will be harvested mechanically and the remaining will be harvested manually (due mainly to sloped terrain). In plantation areas where manual harvesting will be practiced, the sugarcane leafy material needs to be previously burned in a controlled way, to make the conditions less harsh for harvesting workers, decrease their health risks (e.g., cuts, poisonous animals, etc.), reduce the costs of manual harvesting, and reduce transportation costs. Burning the sugarcane crop will generate emissions of air contaminants such as carbon dioxide, methane, other organic compounds, nitrogen oxides, and soot. Cane burning will not be required where mechanical harvesting will be applied, which will contribute substantially to reduce the amount of crop areas that need to be burned, emissions of air contaminants and health risks to workers. Furthermore, with mechanical harvesting the leafy material that is left on the ground helps attenuate erosion processes and recycles more biomass back to the fields. Also, mechanically harvested cane cannot be washed (burned cane needs to be washed), because it would loose sugar content, as the stalks are cut in small pieces during mechanical harvesting; therefore, reducing the overall water requirements.

4.9 *Efficient use of water and less waste generated.* The use of water for irrigation of sugarcane crops in Brazil is traditionally very low. Sugarcane is less water-demanding than other types of crops, such as corn or soybean, and the natural climatic conditions (humidity, rainfall) prevailing in most of the territory provide naturally the water that is needed for crop growth. This is the case for the region where the Company will operate. The mean annual rainfall between 1500 and 1600 mm is sufficient to satisfy the sugarcane crop water needs. Therefore, the water intake for the production of ethanol and sugar will be essentially needed to satisfy requirements at mill and cogeneration facilities. In this regard, all the water used in the industrial process of the Project will be recycled in closed-circuit systems; thus requiring substantially lower water intake from nearby water bodies. In addition, almost all the industrial liquid effluents and solid wastes generated at the mill and cogeneration facilities will be recycled in crop growing areas, and gas scrubbers will be used to clean the atmospheric emissions generated at the cogeneration plant. Furthermore, boilers at the cogeneration plant will be fed by solid wastes generated at the mill (sugarcane bagasse); reducing considerably the amount of waste that needs to be discarded.

4.10 *Improved labor conditions.* The Company will adopt procedures to ensure that all workers in agricultural and industrial production will be registered and legally employed, have their rights respected as established by the Brazilian Consolidated Labor Laws, and will be entitled to health, education and other benefits provided by the Company. To alleviate the pressure for services in the cities, the Company will provide financial assistance to public entities in those communities. Furthermore, the Company will develop and implement actions and programs to address migrant worker needs, and maintain consultation with local authorities to develop

measures to improve the quality of life of workers coming from other regions. The Company will also employ social workers to conduct visits to the residences of the personnel that will work in the agricultural sector, to ascertain their living conditions and basic needs.

4.11 *Minimization of health risks to workers.* Although most of the harvesting will be performed mechanically, a few areas will have to be harvested manually. To minimize risks to health and safety of harvesting workers, all workers will be required to use personal protective equipment ("PPE") provided by the Company and follow established procedures. The Company will adopt measures to make the working conditions safer and more agreeable such as providing hat, neck drape, dark lens glasses, bus service to transport to the harvesting fronts, sanitary facilities in the field, cold potable water, and shaded areas (awnings adapted from the buses themselves) provided with portable tables and chairs for meals. The Company will also offer isotonic beverages to the agricultural workers during the workday to prevent dehydration. The Company is not planning to offer meals to agricultural workers but will provide thermal lunch boxes.

B. Potential Negative Direct Impacts, Risks and Mitigation Measures

B.1 Plantation development and mill construction phase

4.12 The main potential negative impacts associated with the development of plantations and construction of mill facilities will be the following: (i) vegetation clearing; (ii) alteration of the landscape; (iii) change in the natural drainage; (iv) initiation and acceleration of erosive processes; (v) increase in dust emissions; (vi) generation of wastes and liquid effluents; (vii) increase in vehicular traffic; (viii) creation of expectations on the local population; (ix) interference in the day-to-day life of the local population; (x) risk of falls involving workers; (xi) risk of exposure of workers to health-hazardous environmental conditions (*e.g.*, noise, dust, combustion gases and poisonous animals).

4.13 It should be pointed out that the new facilities will be located in areas surrounded by plantations and away from urbanized and/or sensitive areas, and water bodies; characteristics that will greatly contribute to attenuate the impacts associated with construction. Also, the new sugarcane plantations will be developed mostly in areas that were used before for agricultural activities or as pastureland; therefore, the clearing of vegetation will merely involve removal of grass and some isolated trees, after prior authorization from the environmental authorities. Some of these impacts will occur on a limited scale, be temporary and will be mitigated with the standard construction environmental management procedures established by the Company. Other impacts and risks will be prevented and/or mitigated by adopting basic precautions and standard procedures, as established in Company's environmental management and health and safety guidelines. Some of these procedures are also applicable to contractors.

B.2 Operation and maintenance phase

B.2.1 Environmental

(a) Agricultural cycle

4.14 *Soil and water contamination by agrochemicals.* Agrochemicals may include herbicides, fungicides, insecticides, fertilizers, and soil correction agents (e.g. lime). In sugarcane

plantations agrochemicals are usually applied via the soil or directly onto the leaves of the plants. These chemicals can infiltrate and contaminate soil and water through direct application, runoff, wind transport, and atmospheric deposition. It is important to stress that disease and pest control is an essential element for the success of sugarcane production, and the consumption of agrochemicals in sugarcane plantations is lower than for other crops such as corn or soybean. In the sugarcane plantations, synthetic fertilizers will be partially substituted by the use of waste and liquid effluents generated at the mill and cogeneration facilities, such as the filter cake coming from vacuum filters, the ashes coming from the gas scrubbers at the cogeneration plant, and the stillage (or vinasse) generated at the distillation process. To reduce soil and water contamination by pesticides, the Company will apply best practice techniques taking into account specific soil characteristics, climate, pest history, and crop for a particular field. This approach will limit pesticide use and help manage the necessary applications to minimize pesticide movement in the field. In addition, The Company will systematically adopt a program of crop rotation in every sugarcane plot, and every given number of years (e.g., very likely five) the sugarcane harvest will be alternated with another type of crop (e.g., soy). This crop rotation program will improve the nitrogen naturally occurring in the soil, reducing the need for fertilizer, assist in weed, disease, and pest control, restore organic matter in the soil and protect against erosion; besides helping to diversify agricultural production.

4.15 *Induced soil erosion processes.* The periodic harvesting of the plants and exposure of the soil may induce conditions for localized erosion, especially if the crop burning process has been used, on sloped terrain and in areas where soils are particularly loose. It should be noted that soil erosion in sugarcane is generally limited compared to other conventional agricultural crops, such as corn and soybeans. As a measure to reduce erosion, the Company will use vegetative, edaphic, and mechanical soil conservation practices (e.g., contour line dikes, collection basins dispersed in the fields and along access roads). In addition, 80 to 90 percent of the areas will be mechanically harvested and with mechanical harvesting the leafy material that is left on the ground helps attenuate erosion processes.

4.16 *Fauna and flora disturbance by sugarcane plantation practices.* The mill will be located in the middle of sugarcane plantations and away from major conservation areas and/or other sensitive habitats, except for the Permanent Preservation Areas near water bodies, which will be restored and maintained by the Company. For the most part the new sugarcane plantations will be developed in areas previously used as pastures or for other agricultural activities; therefore the deforestation of environmentally sensitive areas will be avoided. Furthermore, most of the non-constructed areas in the region and surrounding the sugarcane plantations are used to cultivate other crops, or as pastureland. These areas do not present high fauna species diversity. Some interference can occur during the controlled crop burning process at the few plantation locations where the mechanical harvesting will not been implemented, due to terrain slope constraints. It should be pointed out that the Company will adopt measures to reduce risks to fauna during crop burning. Before the fire will be set in a specified plantation plot, vehicles will blow their horns to warn animals and make them move to other areas. The fire application technique also calls for the creation of two opposite burning fronts from the outside to the inside of the plantation area, creating a corridor for animals to escape in the middle and for the fire to extinguish itself naturally from lack of flammable material.

4.17 *Impacts on air quality due to burning of sugarcane crop.* In a few plantation areas where manual harvesting will have to be practiced, the crop will be previously burned in a controlled way, to make the conditions less harsh and decrease health risks for harvesting workers,

reduce the costs of manual harvesting, and reduce transportation costs. Burning the sugarcane crop generates emissions of air contaminants such as carbon dioxide, methane, other organic compounds, nitrogen oxides, and soot. Cane burning may also be responsible for increased ozone levels at the lower atmosphere. Cane burning is not required when mechanical harvesting is applied. Federal Decree 2661 of 1998 and state regulations establish specific areas near which crop burning is prohibited (e.g., urban areas, environmental preservation areas, highways, railways and airports). The tendency, in the country, is to gradually eliminate sugarcane crop burning practice by increasing mechanical harvesting, as envisaged in the Federal Decree 2661 of 1998. Furthermore, some of the states that have a substantial amount of sugarcane plantations are considering to adopt similar laws and regulations that are in place in the State of São Paulo, which foresees the total elimination of crop burning by 2021. Many of the sugarcane mill companies in that State are bringing their elimination date forward to 2017, after adhering to the Agro-Environmental Agreement established between the Sugarcane Agro-Industry Association (UNICA) and the State Government.

(b) Mill and cogeneration activities and facilities

4.18 *Impact on air quality associated with combustion of bagasse in boilers.* The thermal oxygenation of the sugarcane bagasse in boilers will play a very important role in the production of thermal energy and the consequent generation of mechanical and electric energy. As a result of the combustion a series of air contaminants will be generated and introduced into the atmosphere, such as carbon dioxide, sulfur oxides, nitrogen oxides and soot. The magnitude of the impact on the air quality will depend on the amounts that are generated and introduced in the atmosphere, the stack height and the natural conditions for dispersion (wind speed, atmospheric turbulence, terrain features, etc.). In the case of the Project, the Company will use gas scrubbers to clean the flue gas coming from the boilers to reduce the amounts of air contaminants introduced into the atmosphere. Also, the natural conditions at the site can be considered relatively good for dispersion of air contaminants and the stack will have adequate height to promote diffusion. Therefore, the impact on air quality associated with mill operations is expected to be of low significance in the case of the Project.

4.19 *Impacts on water use.* In mill activities water will mainly be used to wash the sugarcane at the beginning of the process, generate steam at the boilers and clean flue gas at the scrubbers. As mentioned the Company will adopt modern technology that will contribute to reduce substantially the amount of water intake from nearby water bodies. Almost all the sugarcane wash water will be recycled in the crop. The condensate generated after the steam is used will be recycled in the mill. The water cycle in most of the mill process will run under closed-circuit systems. Mechanically harvested cane cannot be washed, as it would loose precious sugar, and the Company will adopt mechanical harvesting in 80 to 90 percent of the crop; therefore, contributing to reduce water needs.

4.20 *Solid waste generation and disposal.* The wastes generated at the mill will essentially result from sugarcane juice extraction processes, bagasse burning, decanting and filtration processes, mechanical workshops, laboratories, emergency rooms, offices and cafeteria. Most of the solid wastes generated will be considered inert, i.e., classified as II.B waste according to the NBR 10.004/2004, comprising mainly of sugarcane bagasse, boiler ashes, and filter cake. The Company will develop a waste inventory and management plan. This plan will also comprise a set of recommendations and procedures to reduce wastes to a minimum, and establish guidelines for the proper handling, packing, temporary storage, recycling/reuse or final disposal. The filter cake will be reused in the crop and incorporated in the soil as nutrient

supplementing agent (it is rich in organic matter, calcium, phosphorus and nitrogen). Approximately 30 percent of the cane weight is bagasse, which will be combusted after the extraction of the juice, producing steam that will be used to obtain three sources of energy: thermal, electric, and mechanical. The Company will use the bagasse in the cogeneration facility or sell to other users (e.g., other mills, or other industrial plants) to be used to generate also energy in their boilers.

4.21 *Liquid Effluents disposal.* The cane wash water and the stillage represent a great part of the volume of liquid effluent generated in the sugar-alcohol industry. Other effluents can be generated from washing of floors and equipment, boiler purge, and domestic wastewaters. The stillage is derived from the alcohol distillation process and carries a large quantity of organic matter, nutrients, such as potassium and calcium, and pH raising substances. Both the wash water and the stillage will be recycled in the crop fields to supplement nutrients, correct soil pH and provide water and other properties to the soil. The application of stillage will be performed following a plan approved by the state environmental agency and the Company will monitor soil and groundwater quality. The domestic wastewaters will be treated through septic tanks, biological filters, and sinks. The floor and equipment wash water will be directed to oil-water separators and decanting tanks.

4.22 *Risk of explosion and fire due to the storage of ethanol.* Ethanol will be temporarily stored at the mill site. The storage tanks and their surrounding area are designed and will be built in accordance to Brazilian technical safety standards (NBR 7.820/83 and NBR 7.505/95). The storage tank area will include retention basins for protection of external areas and containment of any leakage.

B.2.2 Social

(a) Agriculture cycle

4.23 *Risk of chemical contamination of local communities during the application of agrochemicals.* If not performed properly the application of pesticides, herbicides, and other chemicals may contaminate farm animals and other cultures near the plantation area. In the case of the Project there are only a few small farms that could be affected by the application of agrochemicals. It should be noted that the application will be mostly done by tractor, to minimize dispersion in the air. During the application, the tractor must stay away at least 500 meters from adjacent properties. In addition, a person in the field crew will be responsible for observing the presence of any domestic animals and contacting the owner.

4.24 *Risk of fire in adjacent properties during crop burning.* During the controlled burning of the sugarcane crop, there will be a risk that the fire may affect adjacent properties. In addition, there will also have the risk of illegal fire occurring in the sugarcane plantations, which could spread to adjacent properties or forests, particularly during the dry season. Again, only a small proportion of the crop areas will need top be burned in the case of the Project. Furthermore, the Company will also take several steps to ensure the fire stays controlled such as night burning (lower temperatures, higher humidity, low wind speed, etc.), creation of a safety vegetation and/or fire free buffer zone around the plot that will be burned, and the presence of standby water trucks.

4.25 *Effects associated to sugarcane transportation on secondary roads.* Transport of sugarcane to supply the mill will be made by trucks towing usually two trailers, mainly through existing

unpaved rural roads. The increase in heavy traffic will tend to cause a reduction in the average speed on secondary roads (and possibly, on parts of paved roads), contribute to degrade the road surface, increase in dust concentration in the adjacent areas, and accumulation of waste on the roadway, due to small pieces of cane falling off the trucks (these pieces on the ground are called "*bitucas*"). The Company will have a program, in conjunction with the municipality, to improve and restore access roads. The Company will also monitor the amount of cane pieces that fall on the ground and will take appropriate measures, if needed.

4.26 *Induced population and/or economic growth.* The Company will try to hire workers as much as possible from the local communities. However, it is estimated that around 30 to 40 percent of the workforce will be composed of seasonal workers, coming from other states to perform harvesting duties. A few of these workers will remain in the local communities after the harvesting season; others will go back to their original place of residence. Technological advances in the sugarcane industry have increased the harvest season to nine months, causing pressure for an extended period of time in the municipalities where the seasonal workers temporarily reside. To alleviate the pressure for services in the cities, the Company will provide financial assistance to public entities in those communities and/or will offer workers and their dependents ambulatory facilities, with doctor, dentist, social assistants, and nurses. Furthermore, the Company will develop and implement a migrant worker program and maintain consultations with local authorities to develop measures to improve the quality of life of workers coming from other regions. The Company will also employ social workers to conduct visits to the residences of the personnel that will work in the agricultural sector, to ascertain their living conditions and basic needs.

(b) Mill and cogeneration activities and facilities

4.27 *Increase in noise levels.* This impact will be associated with the operation of some equipment at the mill facilities. However, the Project's mill will be located away from any community or farm, will be and surrounded by plantations that will work as buffer zones allowing significant attenuation between noise generating equipment and site boundaries. Thus, the risk that noise generated at the mills may disturb human receptors and sensitive areas is considered to be minimal in this case.

4.28 *Odor.* The stillage from ethanol distilleries may have a disagreeable odor, particularly if it is left standing. The Company will mix the stillage with other effluents before storage and application, and will reuse it as soon as it is generated, thus reducing potential odors to the communities and adjacent properties. Furthermore, to ensure adequate application, The Company will develop and implement a stillage application plan approved and supervised by the environmental regulatory agency.

B.2.3 Health and safety

(a) Agriculture cycle

4.29 *Risk of injuries during planting and harvesting.* Manual sugarcane planting and harvesting activities may include a variety of situations in which workers can be exposed to cutting objects (cutting knife, cane foliage, etc), lifting and carrying loads, repetitive motion, and work-posture injuries. To minimize these injuries, the Company will provide to all manual planting and harvesting workers appropriate personal protective equipment - PPE - (including:

steel-mesh-reinforced gloves, arm protection sleeves, steel-plated shin protector, steel-toed boots, hat, neck drape, and dark lens glasses).

4.30 *Heat Exposure.* Workers can be exposed to heat and sun, particularly the manual planting and harvesting workers. The Company will adopt measures to make the working conditions safer and more agreeable, the Company will adopt measures such as providing bus service to transport the workers to the harvesting fronts, sanitary facilities in the field, cold potable water, and shaded areas (awnings adapted from the buses themselves) provided with portable tables and chairs for meals. The Company will also offer isotonic beverages to the agricultural workers during the workday to prevent dehydration. The mechanical harvesting machines are modern and provided with air-conditioned cabin.

4.31 *Chemical, Physical and Biological Hazards.* Agricultural workers may be exposed to dust (including biological and microbiological agents) and venous animals (such as snakes) during soil preparation, planting, manual harvesting, and field cleaning. Workers applying agrochemicals may be further exposed to chemical contamination. The Company will require all workers to use appropriate PPE and follow established procedures to reduce these kinds of risks. Furthermore, workers that handle chemical products will have additional medical tests included as a part of their periodic health exams. In addition, The Company will provide appropriately equipped first-aid stations in each town and ambulances at harvesting fronts.

(b) Mill and cogeneration activities and facilities

4.32 *Physical Hazards.* Typical risks of accidents in sugar and ethanol manufacturing areas are falls caused by slippery floors, stairs, and elevated platforms, incorrect use of equipment (for example, packaging and transport equipment), contact with sharp edges on process equipment, contact with hot surfaces, and explosions (for example, sugar drying, ethanol storage, gas, fuels, boilers). However, The Company will develop and implement specific technical specifications and procedures to minimize the frequency and consequences of these types of accidents. Furthermore, workers will bee required to use appropriate PPE provided by the Company.

4.33 *Noise.* Noise and vibrations are common in industrial settings and result from a variety of sources, including internal and external transportation, rotating machinery, fans, turbines, and compressors. The Company will adopt technical specifications and procedures to minimize the frequency and consequences of hearing injury, and workers will be required to use appropriate PPE provided by the Company. Periodic hearing examinations will be performed for mill workers.

C. Potential Negative Indirect, Cumulative or Regional Impacts and Risks

C.1 Potential alteration of land use and advance of crops into environmental sensitive areas

4.34 The increase in the production of ethanol in Brazil could lead to competition with other land uses in some areas of the country. However, in the case of the Project, the potential impacts related to the alteration of land use, including the relocation of former agricultural and cattle-raising activities to more sensitive ecological areas, and risk of expansion of sugarcane plantations into environmentally sensitive areas will not be significant, as the Company has in place procedures to mitigate these impacts, such as judicious selection of the plots of land to be developed. As a result, the areas chosen for the location of the mill and for development of

the sugarcane plantations are characterized mostly by land that have already been used by farming and pasture activities in the past and located away from the Amazon Rainforest, Atlantic Forest, *Pantanal*, *Caatinga*, and Southern Fields, which are considered major biomes in Brazil. In the Region there are some patches of areas considered to belong to the *Cerrado* formation, another relevant biome in Brazil; however, the mill and plantation areas will not affect *Cerrado* areas. The only limited areas that present some sensitivity and are located near or in the agricultural properties to be developed are Permanent Preservation Areas ("APP"), namely patches of native forests located near water streams and that are protected by law. However, the Company will avoid affecting these areas and will establish a program to help restore and maintain them.

4.35 In fact, the implementation of the Project may contribute to maintain other agricultural or cattle-raising activities in the region. Some of the small and medium farmers in Minas Triangle Region are usually in a capital-poor situation and their lands underused, abandoned and/or degraded. Therefore, the sale or lease of part of their lands for the development of sugarcane plantations for the Project represents a good opportunity, enabling them to get additional income to pay off debts, regularize their land situation and re-invest in more efficient methods of production in the remaining portion of their properties, whether in cattle or for other crops. This situation has been verified during the ESDD site reconnaissance visits and upon consultation with local and state authorities.

4.36 Nevertheless, the discussion regarding potential direct and indirect impacts of the sugarcane agro-industry expansion on Brazilian ecosystems of interest for biodiversity conservation, such as the Amazon Rainforest, the *Pantanal* and the *Cerrado* captured the attention of the global media, causing concern on the part of some governmental and non-governmental institutions both in Brazil and internationally.

4.37 In view of the growing importance of Brazil in the world bioenergy market (ethanol and biodiesel), brought about in part by the rise in oil prices and the international pressure for reduction greenhouse gas emissions, several detailed studies have been performed to assess the potential consequences of the expansion of sugarcane in the country. Some of the results of these studies, are highlighted in the thematic articles and conclusions of the international workshop "The Expansion of Agroenergy and Its Impact on the Brazilian Ecosystems", held in Brazil on March 26-27, 2007, with the participation of the National Economic and Social Development Bank ("BNDES"), Ministry of the Environment ("MMA"), of the Brazilian Institute for Environment and Natural Renewable Resources ("IBAMA"), NGO Conservation International-Brasil ("CI") and Brazilian Foundation for Sustainable Development ("FBDS"), and associations of biofuel producers, UNICA and AGROPALMA. The articles are available in PDF format at the FBDS site in the Internet[(1)] .

4.38 The study of the State University of Campinas ("UNICAMP"), conducted as part of the Ethanol Project of the Ministry of Science and Technology, in conjunction with other entities, provides a very comprehensive and realistic analysis of the expansion trend of the sugarcane agro-industry[(2)]. The research mapped the areas with potential for cane cultivation, taking into account such aspects as the quality of the soil and slope of the terrain, as well as potential scenarios with and without irrigation, among others. The areas were classified into high, good, average and inadequate in terms of potential for sugarcane plantation (**see Figure 2**).

[(1)] http://www.fbds.org.br/article.php3?id_article=409
[(2)] http://www.fbds.org.br/Apresentacoes/5_Bioethanol_in_Brazil_Unicamp.pdf

4.39 It is estimated that Brazil has approximately 280 million hectares of agricultural and pasture areas, and of this amount 6 million are currently used for sugarcane plantation (approximately 2 percent). In a possible scenario of cumulative expansion of sugarcane plantation to satisfy 5 percent of the world demand for gasoline in the year 2025, and in a conservative assumption of same yields as in present times in terms of sugarcane per hectare and ethanol per ton of sugarcane, the area needed to satisfy that demand would be approximately 22 million hectares, which would correspond to less than 8 percent of the total available agricultural and pasture areas. Furthermore, it is estimated that the Center-South Region would account for nearly 60 percent of the production, and areas in the North-Northeast for roughly 40 percent.

4.40 Going further in a complementary analysis (at a larger scale), the Ethanol Project excluded the areas of the States of São Paulo and Paraná, currently the largest producers of sugarcane for industry, and of Santa Catarina and Rio Grande Sul, which are not sugarcane producers, and selected the best areas to comprise the new expansion borders for the sugarcane crop. The mapping coordinated by UNICAMP was not only based on productivity criteria, but took also into account the need to maintain adequate distance from environmentally sensitive areas. **Figure 3** shows the location of these priority areas. The Project will be located in one of these priority areas, designated by A07.

4.41 One main concern raised by environmentalists regarding the expansion of sugarcane plantations in Central-South and Center-West Regions of Brazil is that this expansion could contribute directly to accelerate the deforestation of the *Cerrado* areas and the headwaters of the rivers that feed the *Pantanal* in Southern Mato Grosso, and indirectly, pressure the cattle-raising and soybean areas to move northwards, i.e., in this view, the sugarcane expansion could force the pastures and soybean plantations to the Amazon Rainforest, accelerating deforestation pressures in the states of Pará and Mato Grosso.

4.42 To assess this potential conflict between development and conservation, Conservation International ("CI") Brazil developed, with the support of MMA, a study named "Priority areas and landscapes in the *Cerrado*, *Pantanal* and Amazonian Region"[(3)]. The study initially identified priority areas for conservation and areas of extreme biological importance in the three biomes, based on the existence of endangered or endemic species, remnants of native vegetation and important hydrological components, such as springs and headwaters. Another map was also produced, which shows the most favorable regions for sugarcane crops, using as criteria the natural conditions that favor sugarcane productivity: average rainfall levels above 1200 millimeters per year, presence of an established dry season, minimum temperatures higher than 18°C and maximum temperatures lower than 45°C. The comparison of the two maps (**see Figure 4**) shows that the expansion of the sugarcane agro-industry includes some potential risk for the preservation of the *Cerrado* vegetation remnants in the Center-West Region of the country, including the surrounding areas of the *Pantanal* in Southern Mato Grosso, but not in the Minas Triangle Region where the Project will be located.

4.43 Regarding the risk of indirect inducement of displacement livestock and soybeans activities to Amazon Rainforest biome areas, some considerations should be made. In 1996, Brazil had approximately 178 million hectares of pastureland. According to data from the Ministry of Agriculture (Brazilian Institute of Geography and Statistics - "IBGE", Municipal Livestock Production Survey - "PPM" - 1994 and 2004), pastures currently occupy approximately

(3) http://www.fbds.org.br/Apresentacoes/6_Areas_Cerrado_Pant_Amaz_Paglia.pdf

220 million hectares, a large portion of which is comprised of pasturelands in degraded conditions. Therefore, there was an increase of 24 percent in the amount of pastureland area. Between 1990 and 2004, the cattle herd grew around 39 percent, from about 147 million to 205 million head, and Mato Grosso, Pará, Rondônia and Tocantins were the states that most contributed to this growth. It should be noted that the growth in productivity was greater than the increase in pastureland area, which indicates results from investments in genetic improvement and more efficient cattle-raising (*e.g.*, confinement) and pastureland management methods.

4.44 Regarding agriculture, a study performed by the Applied Economic Research Institute ("IPEA") (2005)[(4)] indicates that the recent expansion of the agricultural area in the country was characterized by an increase of about 23 percent of the area planted with grain, during only three crop years (2001/2002, 2002/2003 and 2003/2004). This expansion is radically different from the pattern that prevailed during the entire 1990's decade, where the total area of crops remained constant, and the entire increase in agricultural plant production was essentially derived from increases in productivity. The expansion was due mostly to soybean plantations, which during only three crop years grew by almost 40 percent in the South and Southeast Regions, and about 66 percent in the Center-West Region, especially in Mato Grosso. However, the IPEA study indicates that the recent expansion of soybean areas was based preponderantly on the conversion of degraded pastureland, and not from "virgin" or "border" areas with native vegetation (*Cerrado* or in the Amazon Rainforest).

4.45 In fact, the increase in the production of soybeans via temporary leasing of land previously occupied by pasture is an agro-economic method consistent with the objective of fast soybean production (in order to take advantage of a favorable price situation), and it is also more economically viable than other alternatives for increasing production, such as permanent replacement of pastureland or conversion of virgin areas, since it reduces the immobilization of capital and allows for more flexibility in dealing with the volatility of the international grain markets. The conversion of degraded pastureland areas into soybean plantations also provides, after a few years, more productive pasture areas, increasing the profitability of the investment in these areas.

4.46 It should be noted that the South and Southeast Regions also underwent a rapid expansion of soybean areas in the last three years, after total stagnation of the area during the 1990's. Since there are practically no more virgin forested areas in these regions, and also since crops were not replaced, the conversion from pastureland is the only feasible explanation for the radical change in the use of land in the South and Southeast Regions.

4.47 In the State of São Paulo, the largest producer in the country, sugarcane has advanced mainly on range type cattle pastureland. It is very likely that a similar conversion pattern will predominate in the case of the Minas Triangle, as was possible to observe in the field during the ESDD site reconnaissance and consultation with local and state authorities. Soybean planters also tend to lease part of their land for sugarcane plantation, as the international prices have been favoring the sugarcane agro-industry. It should also be reminded that the Company will perform crop rotation in all sugarcane plots from time to time to restore soil conditions. Soybeans, peanuts and corn will be some of the crops used in the crop rotation programming.

[(4)] http://www.ipea.gov.br/pub/td/2005/td_1103.pdf

4.48 Data from the Ministry of Agriculture shows that the current planted area in Brazil is approximately 60 million hectares, of which sugarcane crops occupy 6 million, or 10 percent. The estimated area of pastureland is about 220 million hectares. Allowing for an expansion of sugarcane plantation areas to 22 million hectares by 2025, according to one of the Ethanol Project's scenarios, this would represent an additional 16 million hectares. Therefore, if this entire area were added only from the conversion from pastureland, the impact on pastureland area reduction would only be 7 percent. Thus, there is sufficient available space for sugarcane, soybeans, and cattle to coexist in harmony and in a sustainable way. Furthermore, the favorable economic conditions for the farmers resulting from partial conversion of their pasture and agricultural land and the opportunity to improve cattle-raising and agricultural management methods represents a positive indirect impact attributable to the expansion of the sugarcane agro-industry.

4.49 It should be highlighted, however, that the Conservation International proposals and recommendations related to the definition of priority areas for conservation of the *Cerrado* biome and strategies for expansion of the biofuel industry in a sustainable way are very opportune. In this sense, the sugar-ethanol sector should follow and support state policies to rehabilitate Legal Reserves, demarcate and restore the Permanent Preservation Areas and create new conservation areas, whether public or private, so as to add value to the production of clean energy while preserving biodiversity. The Project Company's plans on this regard are consistent with these recommendations and policies, as the sugarcane plantations needed for the Project will be developed in areas that have been used in the past for agricultural and cattle-raising activities, and the Company will develop and implement a program to restore and maintain Legal Reserve and Permanent Preservation Areas that will be present in their plantation areas.

C.2 Potential competition with food production

4.50 It is estimated that Brazil has approximately 280 million hectares of agricultural and pasture areas, and of this amount 6 million are currently used for sugarcane plantation (approximately 2 percent). Even allowing for an expansion of sugarcane plantation areas to 22 million hectares by 2025, according to one of the Ethanol Project's scenarios, the additional area would represent only around 6 percent of the total area available for food production. Thus, the impact of sugarcane expansion on availability of land for food production would be minimal. Also, there is no evidence that sugarcane expansion in Brazil has generated food supply constraints and price increase, as has been suggested in relation to other biofuel feedstocks elsewhere. On the contrary, a recent International Monetary Fund Report[(5)] states that the potential impact on food supply and price associated with expansion in biofuel production can be mitigated if barriers are reduced to biofuel imports from developing countries (such as Brazil), where production is cheaper, more efficient, and environmentally less damaging.

4.51 In fact, in some regions of the country, including the Project area, farmers are having the opportunity to become more productive as a result of the expansion of sugarcane plantation areas and the extra income and enhancement of the local economy that is frequently associated with it, and they have conditions to produce more food per hectare than before.

[(5)] http://www.imf.org/external/pubs/ft/weo/2007/02/pdf/text.pdf (see pp. 15 and 48 of the IMF Report).

4.52 Also, the Ethanol Project identified 12 areas where ethanol clusters could be formed, increasing the economic benefits for the specific region. These areas were selected based on ideal soil properties, absence of environmental issues, and little interference with food crops. The Project will be placed in one of these areas, i.e. area A07 (**see Figure 3**). Therefore, the competition with food production will not be relevant. It is important also to stress that Brazilian agriculture is still being developed at a relatively low occupation level compared with other countries with a strong agricultural sector, and as Brazil gains in efficiency regarding food plantation and production, the impact of increasing sugarcane areas can be further minimized.

C.3 Potential cumulative impacts in association with other similar projects

4.53 Some of the fundamental criteria adopted by the Company to define the location of the mill and plantations, and that are usually essential for the overall success of a sugarcane ethanol project, are related to the easy availability of sufficient arable areas for the development of sugarcane crops, and the need to avoid the presence of other mills nearby, which could compete for arable areas and access roads, as well as for raw materials, agricultural implements and industrial consumables, workforce, services and other resources. As the sugarcane feedstock will have to come from plantations located up to 15 to 20 km from the mill, desirably the distance between mills should be of at least 30 to 40 km. Therefore, reducing the probability of occurrence and magnitude of potential cumulative impacts. In addition, as mentioned the Company will adopt measures to effectively control air emissions, and effluent and waste discharges, and these measures will also be effective in further mitigating potential cumulative impacts.

4.54 Inspections performed during ESDD site reconnaissance visits and consultation with local authorities confirmed that there is no other mill in the municipality where the Project will be located. There are some mills in neighboring municipalities; however, these mills are in general located at considerable distances from the Project and each other and no significant cumulative impacts have been identified or are expected in connection with their operations and the implementation of the Project. Consultation with local and state authorities did not indicate any evidence of significant cumulative impacts from other mills and plantations.

4.55 Furthermore, the state authorities have mechanisms to control the occupation of the territory and the location of relevant industrial facilities, thereby reducing the probability of occurrence and magnitude of cumulative impacts. In Minas Gerais, the Integrated Development Institute (“INDI”) regulates the location of sugar and ethanol mills in the State, in cases that involve tax incentives or solicitation of financial support to the Development Bank of the State of Minas Gerais (“BDMG"), as is the case for the Project. The main purpose of this tool is to organize the spatial distribution of relevant ethanol-sugar units and respective planting areas in a sustainable manner, taking into consideration environmental and strategic aspects, as well as the economic-ecological zoning constraints established for the State. The Project has been subject to approval by the state authorities after prior review and approval of its location by INDI.

D. Other Potential Positive Environmental and Social Impacts and Benefits

4.56 Besides the favorable broad and strategic benefits referred to before in **Section IV.A**, there are other relevant potential positive environmental and social impacts and benefits associated with the Project, such as the ones discussed in the following paragraphs.

4.57 *Overall job creation.* The operation of the plantation and industrial facilities is expected to generate around 1500 new direct jobs, a considerable part recruited from local communities, as well as a number of new indirect jobs on the service and retail sectors, and this will have a positive impact on the economy of these communities. Furthermore, the expansion of the ethanol market in Brazil and worldwide will likely have a positive impact on direct and indirect job creation throughout the whole chain, from plantation, production, transport, export and distribution. As the global ethanol market grows, it is likely that qualified Brazilians will be requested to transfer their knowledge and technical expertise elsewhere. This is why companies such as the Project Company have training programs for their workers that allow them to occupy more qualified positions.

4.58 *Carbon Credits*. The Project presents great potential for participation in carbon emission reduction markets, as it will include a 56 MW cogeneration plant fueled by biomass that will supply energy to the sugar and ethanol mill and sell the excess energy to the Brazilian electricity grid, thus contributing to sustainable energy generation and energy efficiency. It should be pointed out that there are already approved methodologies, under the Clean Development Mechanism ("CDM") integrated in the United Nations Framework Convention on Climate Change ("UNFCCC"), to verify and certify greenhouse gas emission reductions associated with cogeneration plants fueled by biomass (sugarcane bagasse), and the Company is planning to present a request for credits related to the emission reductions associated with their cogeneration plant. IDB may assist the Company in exploring ways to manage carbon credits associated with their activities, through initiatives such as SECCI.

4.59 *Carbon sequestration*. The Company will develop and implement a program to restore and maintain Legal Reserve and Permanent Preservation Areas (namely patches of native forests near water streams that are protected by law) located in their plantations. These areas were degraded in the past by other activities and the Company will help recover by replanting native trees and then maintaining them. Reforestation is an acceptable and desirable strategy for carbon sequestration (removal of carbon dioxide from the atmosphere), thereby contributing for the reduction of greenhouse gas concentrations in the atmosphere.

4.60 *Improvement in regional and national air quality as a replacement of gasoline as a fuel*. The use of hydrated ethanol or a mixture of anhydrous ethanol and gasoline as fuel generates much lower levels of air contaminants such as sulfur and nitrogen oxides, solid particulate matter, lead and greenhouse gasses (*e.g.*, on a life cycle analysis, sugarcane ethanol produces 91 percent fewer greenhouse gas emissions per kilometer traveled than gasoline). Therefore, the use of ethanol as a replacement of gasoline as fuel may have significant positive impacts in the air quality at regional and national level. Its disadvantages include the production of some reactive aldehydes.

4.61 *Improvement of economic situation of local farmers.* The Project may have associated positive indirect social impact by contributing to the improvement in the economic conditions of farmers that sell or rent part of their land for the development of sugarcane plantations for the Project. As mentioned, some of the small and medium farmers in Minas Triangle Region are usually in a capital-poor situation and their lands underused, abandoned and/or degraded. Therefore, the sale or lease of part of their lands for the development of sugarcane plantations for the Project represents a good opportunity, enabling them to get additional income to pay off debts, regularize their land situation and re-invest in more efficient methods of production in the remaining portion of their properties, whether in cattle or for other crops. This situation

has been verified during the ESDD site reconnaissance visits and upon consultation with local and state authorities.

4.62 *Fostering local and regional economic and social development.* Implementation of the Project will create conditions for enhancement in agricultural, industrial, and commercial activities, thereby producing beneficial effects on the local and regional economies, by attracting companies that supply inputs, machinery and implements for the agricultural and industrial processes, and stimulating an increase in the demand for services (e.g., food, transportation, lodging and others). Another beneficial effect associated with the Project will be the increase in the salary base with the creation of direct and indirect jobs in both industrial and agricultural sectors, and as payrolls in the municipality and surrounding region will likely increase, especially during the operating phase. Furthermore, the incremented productivity of agricultural, industrial, and commercial establishments, as well as the increase in the number of consumers will indirectly cause an increase in the collection of municipal and state taxes levied on production and consumption, creating multiplying beneficial effects on local economies.

V ENVIRONMENTAL, SOCIAL, AND HEALTH AND SAFETY MANAGEMENT

A. Environmental and Social Monitoring Programs

5.1 *Monitoring of construction activities.* The Project Company will periodically inspect construction sites, perform monitoring of environmental, social and health and safety aspects of construction activities, and the ensuing reports will be submitted to environmental authorities.

5.2 *Bird monitoring program.* Following one recommendation of environmental impact assessment process, the Company will be develop and implement a program to follow-up and monitor relevant bird species in the area of influence of the Project, to assess possible effects of sugarcane conversion.

5.3 *Monitoring of atmospheric emissions.* During operation the Company will monitor flue gas from boilers. After passing through the scrubber the flue gas will be sampled with the purpose of obtaining qualitative and quantitative data on gaseous emissions. The monitoring reports will be submitted to the environmental authorities, which periodically will inspect mill facilities.

5.4 *Soil and surface and groundwater quality monitoring.* Soil and surface and groundwater quality in the plantation and surrounding areas will be monitored, particularly in view of assessing possible effects of stillage application. The ensuing reports will be also submitted to the environmental authorities.

5.5 *Sanitary and industrial effluents monitoring.* The Company will develop and implement programs for monitoring the quality of sanitary and industrial effluents, such as stillage, following monitoring criteria established with the state environmental agency. The ensuing reports will be also submitted to the environmental authorities.

5.6 *Solid waste survey and monitoring.* The Company will develop a survey of the wastes generated in their activities and monitoring will be conducted on a periodic basis, to assess

type and amounts generated, as well as destination. Furthermore, a solid waste inventory will be developed according to current law to be submitted annually to the state environmental agency.

5.7 *Monitoring of health and safety aspects.* Based on the large experience acquired by Santelisa Vale in managing health and safety aspects, the Company will adopt a detailed set of safe work instructions for all relevant activities relative to operation and maintenance of mill facilities and plantations. Human resources department personnel will regularly conduct health and safety inspections of Company's facilities and operations as well as of contractors. The Company will also keep records of all work accidents, occupational illness, number of days absent from work and location of the accident in order to design effective accident prevention programs. State or federal labor authorities will also make inspections periodically, both at the industrial facilities and agricultural activities.

B. Contingency Plan

5.8 In Brazil, in general, the risk of natural disasters is relatively low. Major emergency situations associated with natural events and involving the Project facilities and operations will be probably related to the effects of natural fire in sugarcane plantations, storms on electric energy distribution networks and excess of rain that can cause damage to the plantations.

5.9 The Company will develop a risk management plan for mill facilities and emergency plans for their activities in general, to define relevant emergency situations and criteria for actions to be taken in these circumstances. These plans will establish the steps to be taken, persons and/or entities to contact, and responsibilities in case of a particular emergency situation. The Company will have an internal fire brigade trained to handle internal fire situations. For external fires the employees may also call the nearest firefighting department, if needed. The Company will implement training programs for their personnel on how to act in emergency situations; these programs will also involve periodic emergency exercises.

5.10 In the case of accidents in the plantation areas, first-aid will be provided by the team leader present at the field, who will have special training for this purpose and ability to assess the particular situation and worker condition, to recommend and facilitate other level of treatment, if necessary. There will also be available a specially equipped ambulance that will circulate throughout the work fronts in the agricultural sector, with the ability to handle possible emergency situations, or to transport to the nearest hospital (the Company intends to establish agreements with hospitals located in the area of influence of the Project).

C. Environmental and Social, and Health and Safety Management Systems

5.11 Santelisa Vale will be closely involved in supervising the construction as well as in the operation and maintenance of mill facilities and sugarcane plantations. Therefore, the Environmental and Social Due Diligence ("ESDD") performed by the Bank involved also inspection of Santelisa Vale's main industrial facilities and agricultural operations to assess adequacy of existing procedures and management systems to address environmental, social, health, safety and labor issues.

C.1 Environmental and Social Management System

5.12 Environmental and social management procedures, mechanisms and resources currently in place at Santelisa Vale are integrated in the Agricultural Sector Department. Responsibility for environmental matters is distributed among a few professionals and there is no environmental department or unit. The environmental team is essentially composed of one manager, one individual responsible for addressing licensing matters and processes, as well as land registration, essentially for the agricultural sector, another for reforestation and Permanent Preservation Area restoration and maintenance programs, and one to deal with waste management issues. However, the management system lacks upper management responsibility and accountability, and clear definition of which procedures are corporate and which are unit based only.

5.13 Santelisa Vale, and the Project Company as well would benefit in bringing the responsibility and accountability for the environmental and social issues to the highest management level and making sure the procedures become applicable to all operations, creating adequate standards and procedures for the entire Group. Furthermore, the knowledge and experience accumulated by professionals in different sectors of the Group could be better shared to improve, standardize, and harmonize all relevant environmental and social, as well as health and safety, and labor management procedures and systems. During the ESDD, several examples of good practices were observed in terms of environmental and social management procedures and/or initiatives. In addition, Santelisa Vale and the Project Company maintain a good relationship and a proactive attitude toward the environmental authorities.

5.14 Based on the work performed in the ESDD, the Project Team confirmed that Santelisa Vale and, thereby, the Project Company have in place procedures and control measures (formal or informal) to manage environmental, social and labor impacts and risks associated with the Project. Therefore, the Team considers the Project to be feasible and has not identified any risk factor that can represent a relevant risk to the environmental sustainability of the operation with IDB.

5.15 However, the procedures and measures adopted are not organized into a structured Environmental and Social Management System, particularly at corporate level. One of the companies of the Group has obtained ISO 14001 environmental management certification for their agricultural activities and most of Santelisa Vale activities are certified under ISO 9001 (quality management) and ISO 22000 (food safety management system).

5.16 Nevertheless, Santelisa Vale has already initiated a process to obtain certification for all activities and companies of the Group, including the Project Company, under ISO 14001, OHSAS 18001 (health and safety management), ISO 9001, SA 8000 (social accountability standards), and ISO 22000. This process will help the Project Company to better manage the impacts and risks associated with the Project and, at the end of the process, Santelisa Vale will certainly set a benchmark example for companies in the sector.

5.17 Still the Team identified a few areas regarding the Project Company's environmental, social and labor management capacity that can be improved. These additional requirements shall be reflected in the Environmental, Health, and Safety Action Plan ("EHSAP") to be prepared by the Company, in form and substance satisfactory to IDB, and submitted to the Bank prior to signing of the Agreement.

5.18 Also, it has been verified that environmental, social and labor issues related to the Project are in general handled in a very diligent way by qualified staff that produces good quality work.

However, as remarked, responsibility for environmental and social matters is distributed among a few professionals; therefore, it is recommended that a specific unit be created and strengthened to better address the multiple tasks and responsibilities involved in association with the systematic monitoring and supervision of Company's and contractors' activities, as well as for environmental and social matters pertaining to licensing and permitting.

C.2 Health and Safety Management System

5.19 Health and safety management capabilities and procedures of Santelisa Vale are currently integrated in the Human Resources Department. The Group presently has 32 employees in the medical area, 2 safety engineers and 9 safety technicians, and has detailed health and safety procedures, standards, guidelines and programs.

5.20 Procedures and work instructions address risky activities as well as contractor's activities, and they include specific training. The internal standards define the general conditions for prevention of occupational accidents and illnesses. They include detailed safe work procedures for most construction, operation and maintenance activities and are fully compliant with all Brazilian Health and Safety Regulations (*Normas Regulamentadoras*).

5.21 Santelisa Vale is aware of the occupational risks relating to their activities, which are essentially associated with repeated movement, fire, work with hazardous materials and physical risks. These risks are properly identified in the Environmental Risk Prevention Program ("PPRA") and are monitored by the health and safety staff through procedures established in the Occupational Health Medical Control Program ("PCMSO"). The PCMSO is designed to handle the risks stipulated in the PPRA.

5.22 According to the information provided, all employees in the Group have health plans paid 50 percent by the company and 50 percent by the employee. The Project Company intends to extend this coverage to employee dependents.

5.23 Based on the work performed in the ESDD, the Project Team confirmed that Santelisa Vale and, thereby, the Project Company have in place procedures, guidelines and standards to manage health and safety impacts and risks associated with the Project. However these procedures, guidelines and standards are not organized into a structured Health and Safety Management System, particularly at corporate level.

5.24 As mentioned, Santelisa Vale recently embarked in a process to address its health and safety issues at corporate level and for all activities in line with OHSAS 18001 international health and safety management standard. The Project Company will certainly benefit from this process.

C.3 Environmental and Social Responsibility

5.25 Santelisa Vale has established directives for implementing and managing corporate social responsibility activities, including involving the community. The directives follow in general those established by the reputable ETHOS Institute.

5.26 The main programs presently being carried out are: (i) Personal Qualification and Development Program; (ii) Continuing Education Program; (iii) Technical Training and

Professional Qualification Program; (iv) Human Development and Professional Training Program; (v) Healthy Persons Program; (vi) Family Income Administration Program; (vii) Family-Company Integration Program; and (viii) Motivational Programs.

5.27 Santelisa Vale has a dedicated budget to provide assistance to nearby communities and institutions. Within the Social Responsibility Policy, the Santelisa Vale Group outlines policies and procedures to establish criteria for supporting community and institutional programs. The target audience is usually comprised of non-governmental and governmental organizations, as well as institutions that meet some basic criteria in terms of integration in the community. The amount allocated for supporting community and institutional programs during the 2006/2007 crop season was approximately 3 million reais (near US$ 1.7 million).

VI PUBLIC CONSULTATION

6.1 Brazilian environmental laws and regulations include requirements that public consultations, and in some cases public hearings, be performed in the environmental licensing process for some types of projects.

6.2 All procedures established in state law regarding public participation and public notice of environmental licensing procedures were complied with by the Project Company. A public meeting with environmental authorities, in which the Project was reviewed was held in June 2007.

6.3 Furthermore, following an IDB request the Company performed in September 2007 another consultation with local communities using the environmental impact assessment reports ("EIA/RIMA") prepared for the Project. Therefore, the environmental impact assessment reports relating to the Project have been disclosed according to IDB's Operational Policy OP-102 on Information Disclosure, at the Bank's Public Information Centers in Washington and Country Office, and placed for public consultation locally.

VII RECOMMENDATIONS

7.1 IDB will require as part of the Loan Agreement that the Company and all portions of the Project shall, at all times during the life of the Loan Agreement, comply with each of the following:

1. All applicable environmental, health and safety Brazilian regulatory requirements and all applicable IDB's environmental and social policy and requirements.
2. All requirements associated with any environmental, health and safety related permits, authorizations, or licenses that apply to the Project or the Company.
3. All environmental, health and safety requirements of the Project contracts, and any subsequent modifications.
4. All aspects and components of all of the Project environmental, health and safety documents.
5. Applicable aspects of the World Bank Sugar Manufacturing Guidelines (Pollution Prevention and Abatement Handbook, 1998).
6. Applicable aspects of the World Bank General Environmental Guidelines (Pollution Prevention and Abatement Handbook, 1998).

7. Applicable aspects of the World Bank Monitoring Guidelines (Pollution Prevention and Abatement Handbook, 1998).
8. Applicable aspects of the International Finance Corporation Environmental, Health and Safety Guidelines for Plantations (1998).
9. Applicable aspects of the International Finance Corporation Health and Safety Guidelines (1998).
10. Consult with IDB before approving or implementing any and all substantive changes to the Project or its timetable that could potentially have negative environmental, social, or health and safety effects.
11. Send written notice to IDB of any and all non-compliances with any environmental, social or health and safety requirement of the Loan Agreement and any significant environmental, social, or health and safety accident, impact, event, claim or material complaint.
12. Ensure that all companies contracted for construction and operation activities comply with the applicable environmental, social and health and safety requirements of the Loan Agreement.
13. Implement ongoing information disclosure and consultation activities related to environmental, social, and health and safety aspects of the Project, including, if applicable, information from environmental and social, health and safety monitoring reports prepared by external consultants, in compliance to Bank's OP-102 Disclosure of Information Policy.
14. Implement Environmental and Social, and Health and Safety Management Systems that are consistent with the principles of ISO 14001 and OHSAS 18001.

7.2 Prior to Financial Closure the Company shall submit an environmental, health and safety action plan (EHSAP), in form and substance satisfactory to IDB, properly addressing the environmental, social, health and safety improvement recommendations, as well as any pending non-compliance and/or liability associated with the Project. This Action Plan shall clearly address the following aspects:

1. The proposed actions, programs and plans to be adopted to improve environmental, social, health and safety management procedures, and correct any pending non-compliance and/or liability, including: (i) development and implementation of an Environmental and Social Management System (ESMS), and a Health and Safety Management System (HSMS) as well as any pertinent contingency plan (CP); (ii) promoting upstreaming of responsibilities and accountability regarding environmental and social issues to upper management level; and (iii) provision of adequate environmental staff to better address environmental and social issues.
2. The proposed procedures, programs and plans to be developed and implemented to prevent, mitigate and/or compensate for environmental, social, health and safety impacts and risks associated with construction and operation of the Project.
3. A time schedule for implementing such proposed actions, programs and plans, including due dates and key milestones.
4. Estimated costs associated with such proposed actions, programs and plans, as well as indication of budgetary assignment in the Project.

7.3 Prior to First Disbursement of the Loan, the Company shall present, in form and substance satisfactory to IDB, the applicable documents, reports and plans indicated in the EHSAP, whose due dates are referenced as prior to First Disbursement, including documents

pertaining to: (i) plan to describe the environmental and social management system; (ii) health and safety management plan (HSMP); and (iii) contingency plan.

7.4 Prior to each disbursement, the Company shall certify compliance with all environmental social, and health and safety requirements in the Loan Agreement.

7.5 During the life of the Loan Agreement, the Company shall present, in form and substance satisfactory to IDB, the applicable documents, reports and plans indicated in the EHSAP, and prepare and submit Environmental and Social Compliance Reports (ESCR), in form, substance and frequency satisfactory to IDB.

7.6 The Bank will monitor the environmental, social, health and safety aspects in the Loan Agreement via internal Bank supervision actions (e.g., site visits, review of documentation) and will contract an external independent Environmental and Social Consultant to perform more detailed supervision/monitoring actions during the life of the Loan Agreement. In addition, the Bank will have the right, as part of the Loan Agreement, to contract for the performance of independent environmental, health, and safety audits, if needed.

FIGURES

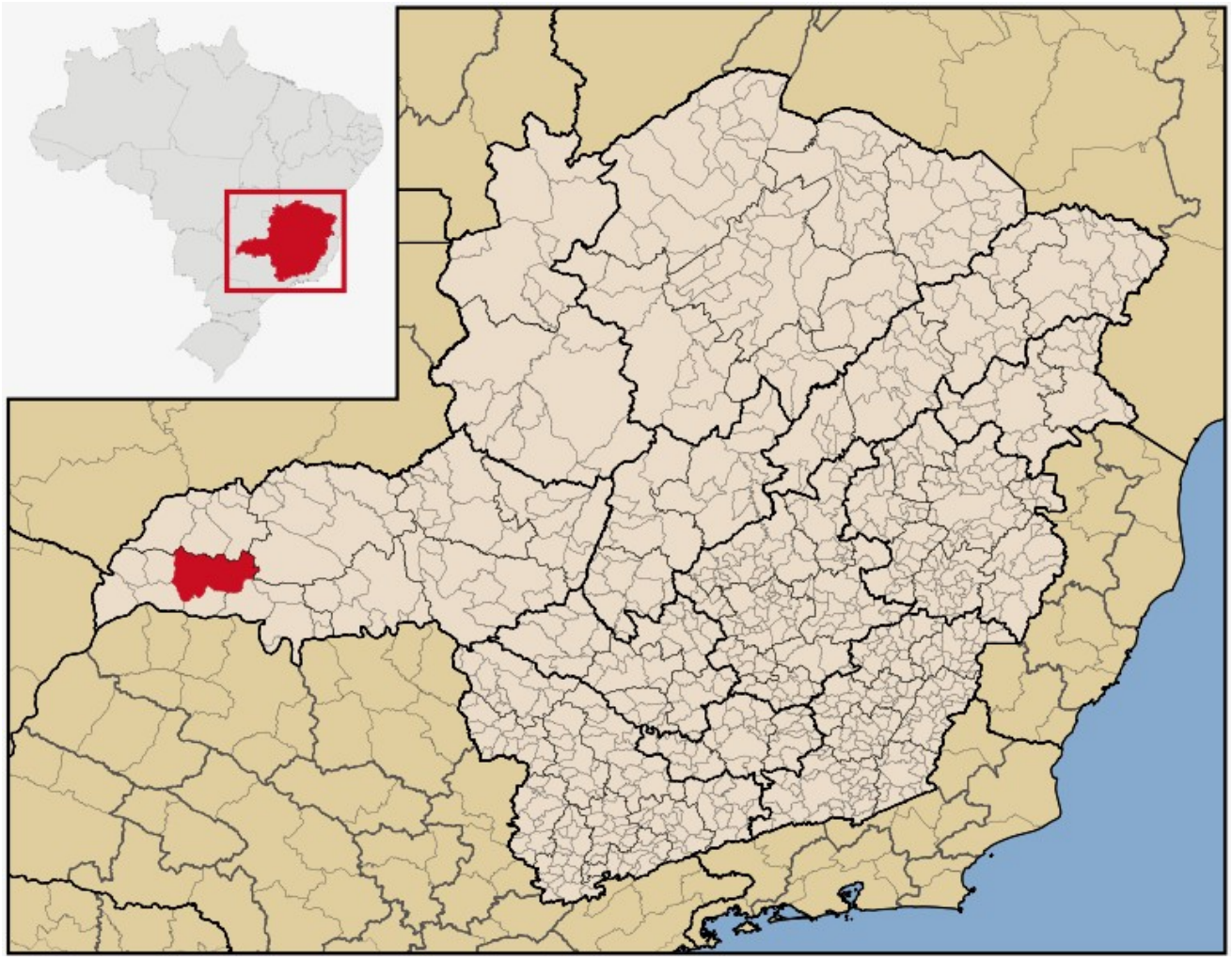

Figure 1: Location of the municipality where the Project will be implemented

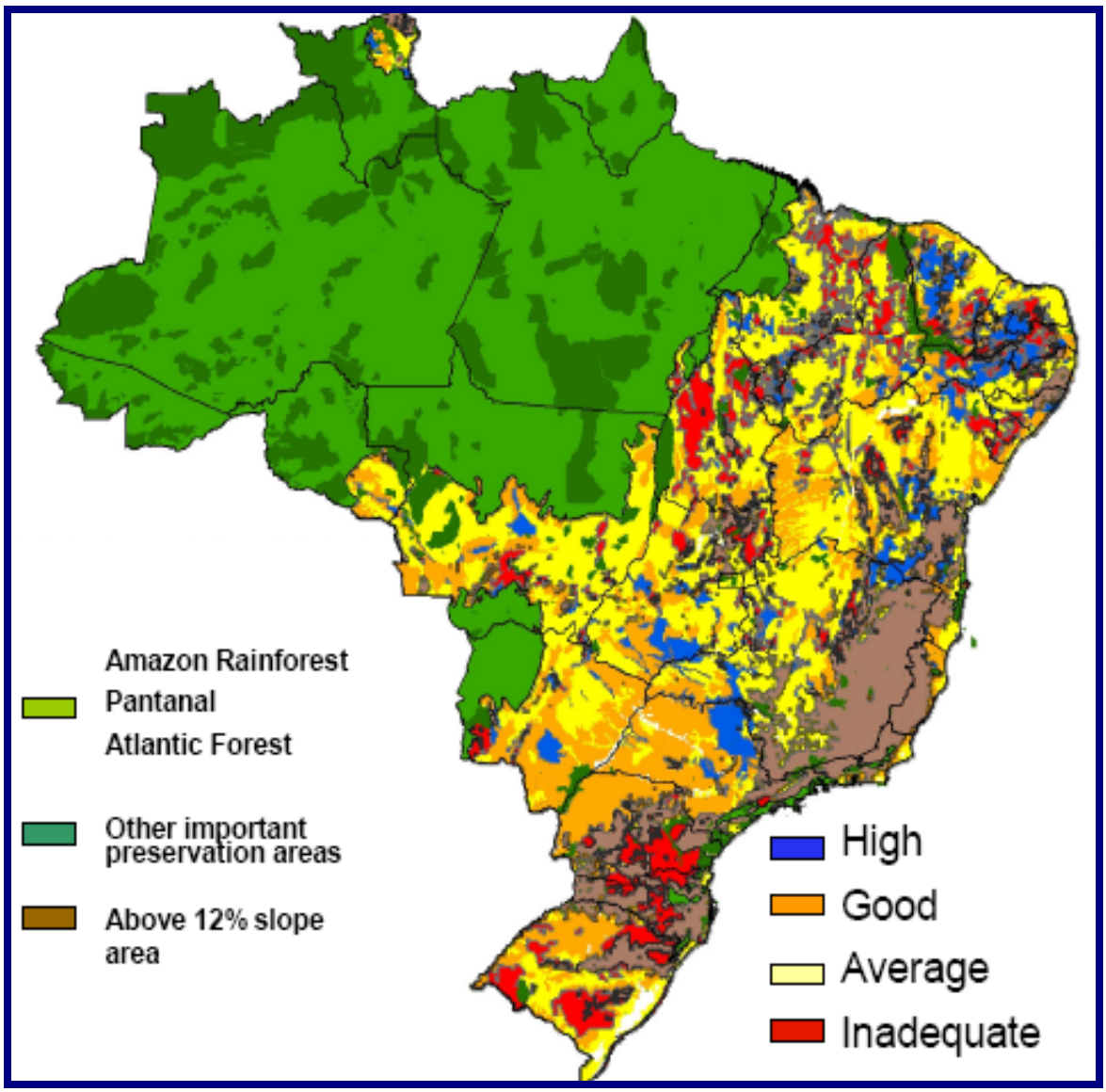

Figure 2: Potential for sugarcane production in Brazil, considering soil and climate (with irrigation) (UNICAMP, 2006)

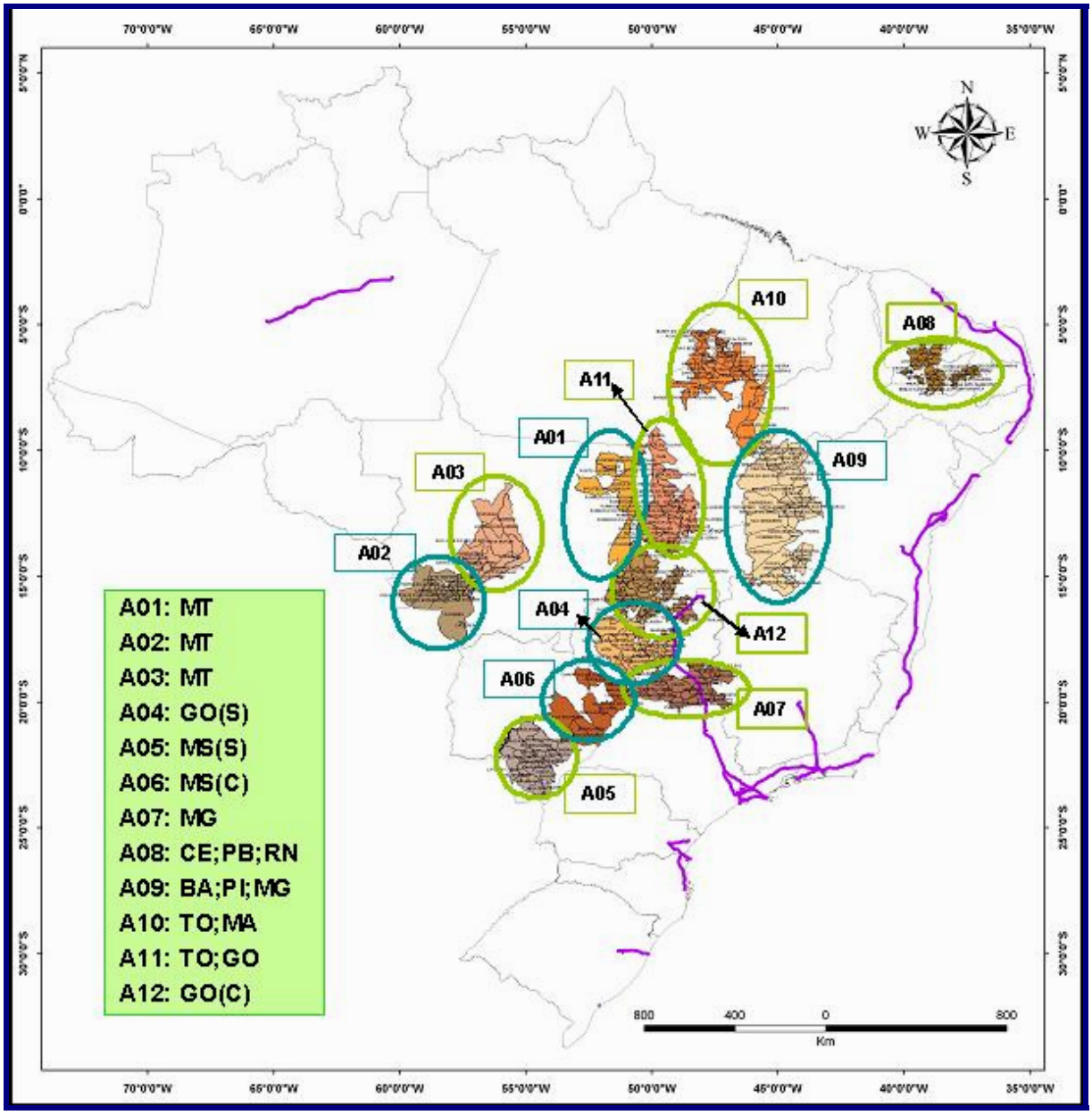

Figure 3: Ethanol Project - Selected areas for sugarcane expansion in Brazil
(based on ideal soil properties, absence of environmental issues, and little interference with food crops)
(UNICAMP, 2006)

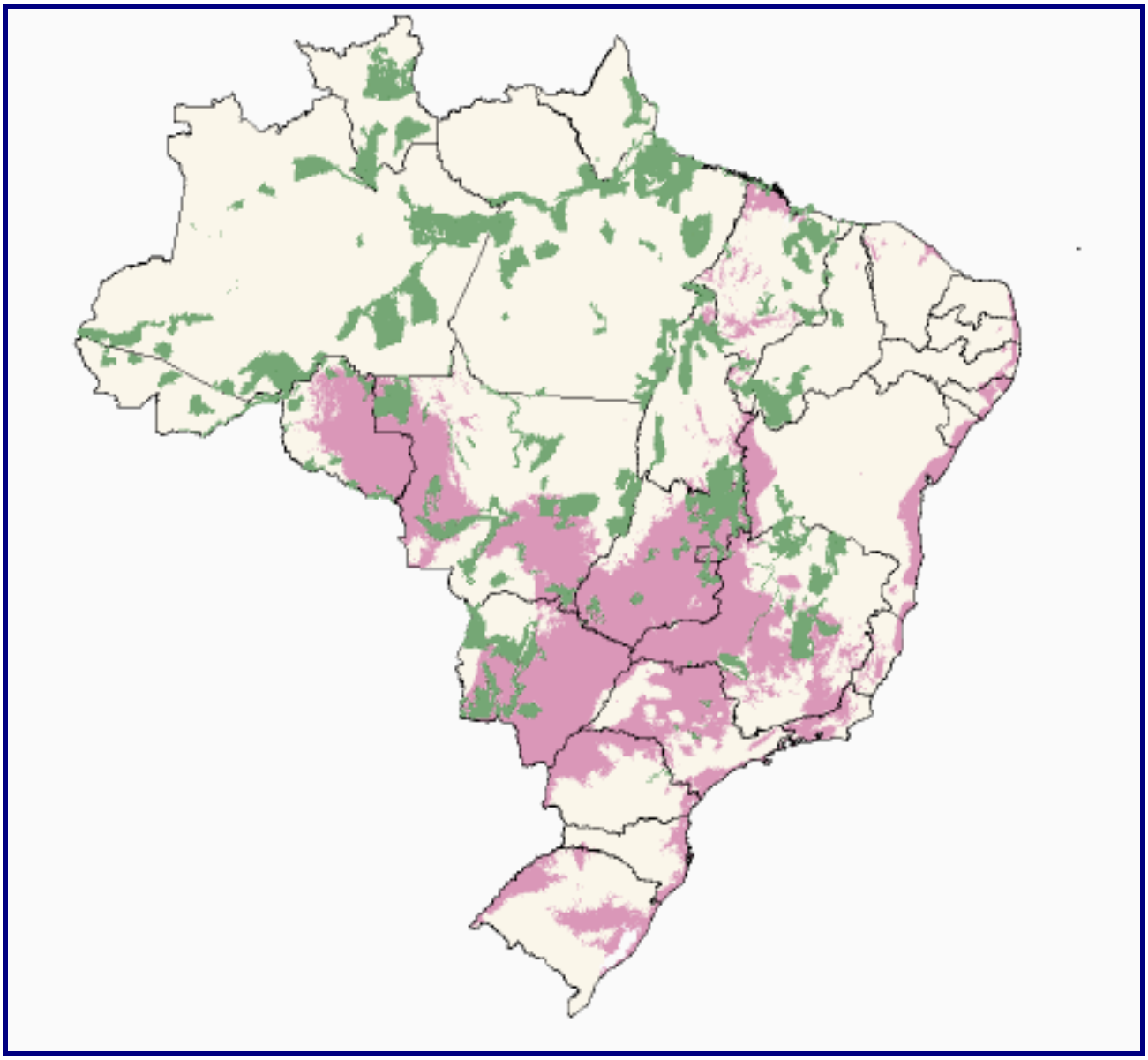

Figure 4: Potential areas for sugarcane production and priority areas for conservation
(potential areas for sugarcane production in magenta; priority areas for conservation - areas with extremely high biological importance – in green)
(Conservation International - Brazil, 2006)