



# GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project

TYPE OF TRUST FUND: GEF Trust Fund

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## PART I: PROJECT INFORMATION

Project Title:	Biogas applications for the Brazilian agro-industry		
Country(ies):	Brazil	GEF Project ID: <sup>1</sup>	9057
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	150014
Other Executing Partner(s):	Ministry of Science, Technology and Innovation (MCTI), Itaipu Binacional / CIBiogás-ER	Submission Date:	2015-03-13
		Re-submission Date:	2015-07-28
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP	<input type="checkbox"/>
Name of parent program:	[if applicable]	Agency Fee (\$)	665,000

## A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES<sup>2</sup>

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CCM-1 Program 1	GEFTF	7,000,000	42,248,000
Total Project Cost		7,000,000	42,248,000

## B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To reduce GHG emission and dependence on fossil fuels through the promotion of biogas-based mobility and other energy solutions for productive uses within agro-industrial value chains and by strengthening of national biogas technology supply chains.						
Project Components	Financing Type <sup>3</sup>	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Strengthening of the policy and institutional framework.	TA	1.1 Policies, regulations and institutional coordination are fine-tuned to facilitate the uptake of biogas energy solutions including mobility.	1.1.1 Assessment of the policy framework for biogas utilization by agro-industries including climate change, environmental protection, agricultural and industrial policy.  1.1.2 Recommendations (incl. proposals for secondary regulation) to streamline the policy framework towards greater uptake of biogas solutions prepared, validated and submitted to the government for adoption.  1.1.3 Exploitation of synergies with initiatives	GEFTF	700,000	2,700,000

<sup>1</sup> Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

<sup>2</sup> When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#).

<sup>3</sup> Financing type can be either investment or technical assistance.

			and mechanisms supportive to the national priority of implementing results-based financing for climate change mitigation activities in Brazil.			
2. Strengthening of the biogas technology base and supply chain.	TA	2.1 Technical know-how, business models and best practices for biogas applications enhanced.	2.1.1 Biogas Innovation Centre (BIC) with viable business plan established and operational.  2.1.2 Information on the energy and nutrient potential of agro-industrial wastes and residues in the targeted region <sup>4</sup> has been validated and completed.  2.1.3 Studies into agro-industrial production processes, potential business models for biogas and organizational structures for biogas initiatives undertaken as input for project developers and end-users.  2.1.4 Analyses carried out for the adaptation of international biogas technology (designs) to fit local technical, production, economic, financial, and environmental requirements.  2.1.5 Existing capacity/skills/number of prospective biogas project developers and other supply chain actors enhanced through the provision of training and targeted information.	GEFTF	1,950,000	9,850,000
	Inv		2.1.6 Product development of biogas equipment (prototypes and testing thereof), development of industrial production facilities, transfer of technology (patents,	GEFTF	900,000	11,530,000

<sup>4</sup> Paraná and other states to be confirmed during the PPG phase.

			licenses), etc. undertaken.			
3. Demonstration of a biogas-based system for rural areas.	TA	3.1 Biogas system demonstrated to be viable in a commercial context.	3.1.1. Pre-feasibility studies updated, followed by selection of pilot site.  3.1.2 Detailed feasibility study (including environmental and social assessments) for the biogas-based system carried out.  3.1.3 Detailed technical studies, operational plans, business model and ownership constellation developed.  3.1.4. Development and application of a tailored MRV mechanism including monitoring on operational aspects.	GEFTF	2,250,000	7,200,000
	Inv		3.1.5 One demonstration biogas system (tentatively: local mobility) installed and made operational.	GEFTF	750,000	10,000,000
4. Monitoring and Evaluation	TA	4.1 A monitoring and evaluation plan has been prepared and carried out.	4.1.1 A monitoring plan (incl. ESSP and gender aspects) has been established and agreed upon.  4.1.2 Project progress on defined indicators and compliance with UNIDO and GEF guidelines has been monitored.  4.1.3 Project progress report(s) are carried out, including mid-term and final evaluation.	GEFTF	120,000	168,000
Subtotal					6,670,000	41,448,000
Project Management Cost (PMC) <sup>5</sup>				GEFTF	330,000	800,000
<b>Total Project Cost</b>					<b>7,000,000</b>	<b>42,248,000</b>

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ( )

<sup>5</sup> For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

**C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE**

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	Ministry of Science, Technology and Innovation (Technology Development and Innovation Secretariat)	In-kind	700,000
Recipient Government	Various government entities	Grants	15,400,000
Others	Itaipu Binacional	Grants	8,000,000
Others	Itaipu Binacional	In-kind	6,100,000
Private Sector	Various companies	Unknown <sup>6</sup>	3,070,000
Private Sector	Various companies	In-kind	4,100,000
Others	Bilateral donor/s (e.g. ADA)	Grants	650,000
Others	PROBIOGÁS	In-kind	4,000,000
GEF Agency	UNIDO	Grants	128,000
GEF Agency	UNIDO	In-kind	100,000
<b>Total Co-financing</b>			<b>42,248,000</b>

**D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS <sup>a)</sup>**

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) <sup>b)</sup>	Total (c)=a+b
UNIDO	GEFTF	Brazil	Climate Change	N/A	7,000,000	665,000	7,665,000
<b>Total GEF Resources</b>					<b>7,000,000</b>	<b>665,000</b>	<b>7,665,000</b>

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

**E. PROJECT PREPARATION GRANT (PPG)<sup>7</sup>**

Is Project Preparation Grant requested? Yes  No  If no, skip item E.

**PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS**

Project Preparation Grant amount requested: \$200,000					PPG Agency Fee: 19,000		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee <sup>8</sup> (b)	Total c = a + b
UNIDO	GEF TF	Brazil	Climate Change	N/A	200,000	19,000	219,000
<b>Total PPG Amount</b>					<b>200,000</b>	<b>19,000</b>	<b>219,000</b>

<sup>6</sup> In the form of investments i.e. mixture of equity and loans.

<sup>7</sup> PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

<sup>8</sup> PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

## F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS<sup>9</sup>

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	<i>Hectares</i>
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	<i>Hectares</i>
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	<i>Number of freshwater basins</i>
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO <sub>2e</sub> mitigated (include both direct and indirect)	<i>3,570,000 metric tons</i>
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	<i>metric tons</i>
	Reduction of 1000 tons of Mercury	<i>metric tons</i>
	Phase-out of 303.44 tons of ODP (HCFC)	<i>ODP tons</i>
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	<i>Number of Countries:</i>
	Functional environmental information systems are established to support decision-making in at least 10 countries	<i>Number of Countries:</i>

## **PART II: PROJECT JUSTIFICATION**

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area<sup>10</sup> strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

- 1) The global environmental and/or adaptation problems, root causes and barriers that need to be addressed  
According to the Fifth Assessment Report of the International Panel for Climate Change (IPCC AR5), the atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. These emissions will continue to grow over the next few decades if current climate change mitigation policies and related sustainable development practices are kept up. Brazil is party to the United Nations Framework Convention on Climate Change (UNFCCC) and as such committed to reducing greenhouse gas (GHG) emissions through active mitigation measures such as greater deployment of renewable energy.

<sup>9</sup> Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

<sup>10</sup> For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

Brazil has today one of the cleanest energy matrices in the world. In 2008, renewable energy accounted for 45% of the primary energy supply (against a global average of 12.9%) and 85% of the electricity supply (MME, 2009). More than three fourth of the electricity produced is attributable to large hydroelectric power plants (above 30 MW). As a result, emissions from electricity production in Brazil are very low (0.029 tCO<sub>2</sub>/MWh) compared to other countries such as China (0.890 tCO<sub>2</sub>/MWh) and the USA (0.587 tCO<sub>2</sub>/MWh). Nevertheless, Brazil is the fourth largest emitter of GHG in the world (3.2-4.5% of global emissions in 2010)<sup>11</sup>. Agriculture is the second largest GHG emitting sector after deforestation, and is projected to account for 29% of the base case emissions in 2030.

To address rising GHG emissions while meeting national energy demand, the Government of Brazil (GoB) is investing in large-scale hydro power plants and targeting other renewable sources such as wind power, small hydro and biomass, which have become competitive for large-scale generation expansion. The integration of a wider range of renewable energy options into Brazil's electricity matrix is considered key for a secure energy supply under a low-carbon development pathway. Among several efforts made by the GoB to support alternative energy sources, the most prominent has been the 'Programme of Incentives for Alternative Electricity Sources' (PROFINA), approved in 2002 to feed-in more biomass energy into the national grid, as well as biodiesel, but only few smaller and medium-sized operators have benefitted. Current programmes focus on the generation of electricity and heat.

Support for renewable energy systems for decentralized use and self-supply, as an alternative to fossil-fuel based systems, has been weak. Such systems are highly relevant for the agro-industrial sector. Particularly biogas technology is still facing a range of barriers, which are briefly described in the table below:

Type of Barrier	Description
1. Regulatory Barriers	<ul style="list-style-type: none"> <li>The policy and regulatory framework recognizes biogas as an energy option for self-supply, dispatch of electricity and green gas. However, there is no pro-active, supportive policy for biogas as such. This adversely affects the economic viability of business models and inhibits large-scale financing.</li> </ul>
2. Technology Barriers	<ul style="list-style-type: none"> <li>The supply chain is incipient with product quality, design and know-how below international best standards.</li> <li>Adaptation of international best standard technology to Brazilian conditions (allowing for lower capital investment) has not taken place.</li> </ul>
3. Economic Barriers and Business Model	<ul style="list-style-type: none"> <li>Grid-connected electricity generation and cogeneration are hampered by contract modalities and low prices on the electricity markets. Viable business models for biogas-to-energy are therefore limited to electricity self-supply, heating and cooling (offsetting fossil fuel), and localized mobility solutions (offsetting diesel).</li> <li>Potential business models are affected by weak economic drivers, lack of innovative business models, lack of successful showcases (demonstration) and lack of a body of experiences allowing optimization of technology and operation.</li> <li>Opportunities for internalizing external costs of value chains (avoided effluents from pig breeding; methane capture from sewage systems, etc.) are not taken benefit of, and not adequately supported.</li> </ul>
4. Financial Barriers	<ul style="list-style-type: none"> <li>Generalized difficulties for agro-industries (especially SME) to access investment capital due to borrower's credit profile and due to systemic barriers in the public and commercial banking sector (high transaction costs and fees, lack of knowledge to assess RE projects)</li> </ul>
5. Information-related Barriers	<ul style="list-style-type: none"> <li>Need for more detailed analysis of feedstock availability and characterization.</li> <li>General lack of promotion and awareness-raising. Considering the incipient status of the market, end-users, prospective manufacturers, project developers and financiers would benefit from adequate technical and economic information.</li> </ul>

<sup>11</sup> Source: World Resources Institute.

Although Brazil has one of the most advanced biomass energy markets in the world, biogas installations are not widespread. In 2014, only 25 biogas-based, grid-connected power plants existed, nine of which use substrates from the agricultural sector<sup>12</sup>. Five of these biogas power plants (20-160 kW<sub>el</sub>) are located in the southern state of Paraná and have been operational since 2009. The project owners won a tender to sell electricity to public energy provider Copel Distribuição SA at a feed-in tariff equivalent to the Brazilian reference value (VR). The VR constitutes an average of Brazilian electricity prices rather than a subsidized tariff, which is an impediment for financial viability of many non-conventional renewable energy technologies. In fact, there is no indication that Brazilian energy authorities will provide subsidies to any type of energy production technology, such as biogas.

Data on off-grid biogas plants is not readily available. Out of a list of 113 installations on the website of the Global Methane Initiative<sup>13</sup>, 12 are in the agricultural sector. The main purpose of these plants is sanitation and environmental protection, hence most are established at slaughterhouses and animal breeding facilities. The generated biogas is usually flared off, though on occasion it is used for electricity and/or heat production on-site.<sup>14</sup> The use of biogas as a vehicle fuel is rare, but exploited by 2 pilot projects (see sub-section 2 of the Project Description below for further details).

Nevertheless, Brazil has a very large potential for biogas production. Cattle, pig and chicken manure or dung is produced in large quantities especially in the southern Brazilian states of Paraná, Santa Catarina and Rio Grande do Sul, thereby creating substantial environmental and social challenges. The ‘Technical Note’ published in October 2014 by the Energy Planning Company (EPE), which is a part of the Ministry of Mines and Energy (MME), estimates the theoretical biogas potential based on agricultural waste at 4,135,000 tonnes of oil equivalent (toe) annually, produced by a stabled livestock of 4,025,000 heads of dairy cows, 14,607,000 heads of swine and 587,644,000 chicken in these three states. An overview of the primary energy potential of waste from livestock breeding in Brazil is given in the table below.

Energia Primária Disponível nos Resíduos em 2010 Brasil, Regiões e Unidades da Federação (ktep/ano)							
REGIÃO/UF	Bovinos de Leite	Suínos	Aves	REGIÃO/UF	Bovinos de Leite	Suínos	Aves
Rondônia	125	9	22	Minas Gerais	630	189	515
Acre	8	6	10	Espírito Santo	46	10	118
Amazonas	13	4	22	Rio de Janeiro	48	6	77
Roraima	2	3	5	São Paulo	172	64	1.176
Pará	88	28	66	<b>SUDESTE</b>	<b>896</b>	<b>268</b>	<b>1.887</b>
Amapá	1	1	0	Paraná	179	64	1.410
Tocantins	61	10	22	Santa Catarina	113	192	923
<b>NORTE</b>	<b>299</b>	<b>60</b>	<b>148</b>	Rio Grande do Sul	173	294	788
Maranhão	66	49	49	<b>SUL</b>	<b>465</b>	<b>549</b>	<b>3.121</b>
Piauí	18	36	52	Mato Grosso do Sul	61	40	137
Ceará	62	44	135	Mato Grosso	71	79	218
Rio Grande do Norte	30	7	24	Goiás	287	77	292
Paraíba	28	6	55	Distrito Federal	2	6	38
Pernambuco	67	16	179	<b>CENTRO-OESTE</b>	<b>422</b>	<b>202</b>	<b>684</b>
Alagoas	17	6	28	<b>BRASIL</b>	<b>2.651</b>	<b>1.312</b>	<b>6.580</b>
Sergipe	26	4	36				
Bahia	256	66	181				
<b>NORDESTE</b>	<b>570</b>	<b>233</b>	<b>741</b>				

Fonte: Elaboração Própria.

Source: EPE (October 2014). Nota Técnica DEA 15/14. Inventário Energético de Resíduos Rurais.

<sup>12</sup> <http://www.iea-biogas.net/country-reports.html?file=files/daten-redaktion/download/publications/country-reports/Summary/IEA%20Bioenergy%20Task%2037%20Country%20Report%20Summary%202014.pdf>

<sup>13</sup> Please see <https://www.globalmethane.org/activities/actsearchresultNew.aspx> for additional details.

<sup>14</sup> <http://www.iea-biogas.net/country-reports.html?file=files/daten-redaktion/download/publications/country-reports/Summary/Countryreport2013.pdf>.

According to FAOSTAT data, Brazil globally ranks second in terms of cattle breeding, third in pig and fourth in chicken live animals. Data from the Brazilian Institute of Geography and Statistics (IBGE, 2012) indicate a growth of 8% of cattle livestock, 20% of pigs and 35% of poultry in relation to the year 2003; a trend which is expected to continue. The total biomethane potential of agricultural value chains in Paraná is estimated at more than 5 billion m<sup>3</sup> per year.

With respect to mobility and transportation, the commitment of the GoB to the diffusion of ethanol as a fuel and, more recently, biodiesel, was mainly spurred by the oil price shocks of 1973 and 1979, which resulted in the “Proalcool” initiative to promote ethanol production for vehicle fuel usages. More recently, concerns with increasing levels of GHG emissions have driven legislations towards the use of more eco-friendly fuels. In 2003 the National Biodiesel Program mandated that diesel shall be mixed with 2% biodiesel. This has now been raised to 5%, while the requirement for blend bioethanol is currently 25%. Ethanol and biodiesel production are currently under the control of state-owned Petrobras. Furthermore, it is expected that in the medium-term natural gas vehicles will become widely available on the market in response to (EU) policies to curb vehicle emissions and low gas prices due to shale gas developments in the USA. It should be noted that the infrastructure (grid) for natural gas distribution in Brazil has a very low density and exists mainly in and between urban areas. While this situation seriously limits the use of natural gas in rural areas, it creates opportunities for the decentralized production of biomethane from agro-industrial waste as a fuel in natural gas vehicles, agricultural vehicles and other equipment.

Recent changes in national regulation are a tribute to the rising interest in biogas applications. Resolution No. 08 (30<sup>th</sup> January 2015) of the National Agency for Petroleum, Natural Gas and Biofuels (ANP) regulates the use and marketing of biomethane and allows biomethane from agricultural substrates to be fed into the natural gas grid and/or to be used as biofuel in Brazil. The EPE Technical Note 13/14 establishes definitions for distributed power generation (including from biogas) and the decentralized production of biofuels.

## 2) The baseline scenario or any associated baseline projects

The GoB embarked in 2010 on a range of relevant sectoral plans and initiatives<sup>15</sup>. Among these is the Low-Carbon Agriculture (ABC) programme to cut carbon emissions in the agricultural sector so that by 2020, they are up to 38% lower than in the baseline scenario. The ABC programme is divided into sub-programmes targeting various sustainable agriculture technologies with activities including technical assistance, training and financial instruments (e.g. differentiated credit lines). With regards to the treatment of animal waste, the programme seeks to valorize the waste from swine and other animals for producing energy (biogas) and organic compost. The national goal is that 4.4 million m<sup>3</sup> of residues are treated by 2020. However, the ABC programme has not yet been as effective as hoped. Technology adoption by the key beneficiaries has been slow and there is a lack of knowledge and understanding among farmers about the technologies being promoted. Training and technical assistance are in short supply and, in some cases, the upfront costs for investment remain high. The BiogasFert Network brings together biogas and biofertilizer researchers from EMBRAPA<sup>16</sup>, Itaipu Binacional and several Brazilian universities and institutions. The Network focuses on the development of technological solutions for the integrated production and use of biogas and organic biofertilizer from animal wastes of different agricultural production systems with the aim of contributing to low-carbon agriculture.

The PROBIOGÁS Brazilian-German technical cooperation project, coordinated by the Ministry of Cities (SNSA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), encompasses a network of partnerships in the governmental, academic and business spheres. To achieve its objective, PROBIOGÁS focuses on four main action lines during its project lifetime (2013-2018): (a) Survey on biogas potential, dissemination of basic information and improvement of framework conditions; (b) Capacity development: Support for professional training and capacitation of institutions and relevant agents for the consolidation of the theme in Brazil; (c) Academic and business partnerships: Support the development of academic and business

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<sup>15</sup> Please note that these sectoral plans are often considered NAMAs (see e.g. <http://mitigationpartnership.net/brazil-voluntary-namas-achieve-ghg-emission-reduction-between-361-and-389-2020-0> and [http://www.nachhaltigwirtschaften.at/iea\\_pdf/reports/iea\\_bioenergy\\_task37\\_country\\_report\\_summary\\_2014.pdf](http://www.nachhaltigwirtschaften.at/iea_pdf/reports/iea_bioenergy_task37_country_report_summary_2014.pdf)).

<sup>16</sup> Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), the Brazilian Agricultural Research Corporation, is a company for technological innovation linked to the Ministry of Agriculture, Livestock and Food Supply (MAPA), with the focus being on the generation of knowledge and technology for the Brazilian agricultural sector.



partnerships between Brazil and Germany; and (d) Good practice and reference projects: Technical support for potential reference projects for the sector. So far, the project has made significant contributions to advancing the use of biogas in Brazil focusing on the generation of renewable energy from agricultural and municipal solid waste (MSW) and the promotion of energy efficiency in sewage treatment plants. The results of PROBIOGÁS are summarized in Annex I. The activities benefit from a strong sectorial dialogue initiated by the Ministry of Cities, involving the Ministry of Mines and Energy (MME), the Ministry of Science, Technology and Innovation (MCTI), the Ministry of Environment (MMA), Ministry of Development, Industry and Foreign Trade (MDIC) and the Ministry of Agriculture, Livestock and Supply (MAPA). PROBIOGÁS has facilitated the first biogas laboratory in Concórdia (state of Santa Catarina) as well as a supra-regional network of five biogas laboratories. Recommendations formulated include: (i) the identification and dissemination of best-practice biogas projects; (ii) the development of further regulations and adaptations; (iii) the further promotion of biogas e.g. via VAT exemptions for renewable energy technologies; and (iv) investments in applied research for biogas production and usage in Brazil (substrates, applications, etc.).

The baseline project also includes initiatives targeting biogas mobility. The International Centre on Renewable Energy-Biogas (CIBiogás-ER), part of Itaipu Binacional and hosted at Itaipu Technology Park, in Foz do Iguacu, Paraná, supervises and monitors various biogas demonstration units in Paraná, which focus on the production of biogas from livestock residues. Besides biogas systems at big- and medium-sized farms, CIBiogás-ER has implemented the Ajuricaba project, in which 33 family farms are connected via a biogas pipeline. The biogas produced on-farm is fed into the pipeline and upgraded at a central point to vehicle fuel quality-biomethane. A follow-up project is the Haacke farm, where manure and dung from cattle and chickens are used to produce biogas. Here upgrading takes place on the farm itself. The thus generated biomethane is transported to the technological park of Itaipu for use as a vehicle fuel. The feasibility of biomethane as a vehicle fuel was proven in a second project, carried out in cooperation with truck manufacturer Scania and several other stakeholders. Demonstration projects are foreseen to test the viability of other substrates (e.g. kitchen waste, green-cut grass) for biomethane production for mobility applications.

Despite these ongoing initiatives and the recent advances, the development of biogas solutions for generating energy and biomethane as a vehicle fuel for mobility in rural areas is faced with the absence of a strong ‘market pull’ from the agro-industries due to an array of barriers. Under the prevailing situation, the use of anaerobic digestion will therefore mostly remain limited to treatment of effluents and the flaring of the biogas generated.

- 3) The proposed alternative scenario, with a brief description of expected outcomes and components of the project  
As described, several barriers are found to be in place impeding the widespread uptake of biogas in Brazilian agro-industries. These barriers range from the lack of proactive, supportive policy for biogas applications, over an incipient supply chain, technologies not adapted to local circumstances and conditions, to a lack of tested and viable business models. In order to overcome these barriers and the associated, perceived risks and to demonstrate the viability of biogas solutions for rural areas (especially to potential investors), the proposed project will pursue the following four components:

Component 1: Strengthening of the policy and institutional framework. This project component aims at fine-tuning policies, regulations and institutional coordination to facilitate greater uptake of biogas mobility and other biogas energy solutions. While Brazil has made significant advances with respect to energy policy development and the use of biomass-based fuels, policy developments have only recently started to focus more strongly on regulating the generation and use of biogas and biomethane (e.g. ANP 08/15 and EPE Technical Note 13/14). Nevertheless, biogas still lacks full recognition as a high-quality, stable and secure form of energy that fits into climate change mitigation strategies while contributing to environmental sanitation. There continues to be a need for targeted policies and regulations for industrial users wishing to utilize their waste products for inclusive and sustainable industrial development. This component encompasses an assessment of the policy framework for facilitating the uptake of biogas by agro-industries (output 1.1.1). Based on the results obtained, recommendations and proposals for secondary regulation will be prepared, validated and submitted to the government for adoption (output 1.1.2). On an operational level, this work will build on the outcomes of PROBIOGÁS, particularly the communication structures that have been set up across a range of ministries with a vested interest in renewable energy generation from agricultural waste and the promotion of smart approaches between climate change mitigation and industrial development. Additional synergies with PROBIOGÁS will be

further elaborated during the PPG phase, taking into account that an active exchange and validation of results, implementation of joint activities as well as synchronization and harmonization of planned actions will be to the advantage of the beneficiaries of both projects.

It is further envisaged to identify financing mechanisms that will support the deployment of biogas solutions on a larger scale, ultimately resulting in the long-term sustainability of the proposed alternative energy scenario. Hence, an analysis of the possible connections and synergies with initiatives and mechanisms (e.g. climate finance instruments, NAMAs, MRV systems, etc.) linked to the other national priority for GEF CCM support, namely the strengthening of results-based financing for climate change mitigation in Brazil, will be undertaken (output 1.1.3). In this way, an enabling framework for future investments and financing schemes is to be supported.

Component 2: Strengthening of the biogas technology base and supply chain. This component encompasses technical assistance and investment activities aiming to assure that the biogas utilization technologies and skill-sets available in Brazil match international best practice in terms of product quality, design and know-how while taking into consideration the local context. One of the primary outputs foreseen is the establishment of an operational Biogas Innovation Centre (BIC) at Itaipu Technology Park on the basis of a viable business plan (output 2.1.1). Via the proposed expertise centre, high-quality support to project developers, investors and the public sector shall be delivered. The BIC shall contribute to the development of biogas technology by systemizing knowledge, coordinating and implementing applied research (including prototyping), fostering South-South cooperation and collaboration between relevant national and regional organizations, by capacity building and dissemination activities and by active engagement with the national and international private sector. It is envisaged that, with growing market activity, the BIC becomes self-sufficient by providing consultancy services, training and technical assistance on a commercial basis<sup>17</sup>.

Building upon baseline activities undertaken under the PROBIOGÁS project, this component will update and validate existing information (output 2.1.2). A geographic information system (GIS), wherein information about available substrates for biogas production is collected, shall be created for use as a planning tool with regards to future biogas production units and biogas developments in general. Additionally, studies into agro-industrial production processes, potential business models for biogas utilization and organizational structures for biogas initiatives shall be undertaken as input for project developers and end-users (output 2.1.3). These activities will be aligned with the PROBIOGÁS project to avoid doubling of efforts.. It is anticipated that CIBiogás-ER, which currently operates and monitors eleven national and one international biogas demonstration, will further assess and detail those models that are relevant for the agricultural sector. The possibilities for inclusion of fertilizer production within these business models will also be considered. Hence, research and pre-feasibility studies (focusing not only on technical aspects but also social, environmental, economic and legal framework dimensions) are to be conducted under this output; the results shall be made available through the BIC.

This component will further carry out analyses on how to best adapt international biogas technology (designs) to fit local technical, production, economic, financial, and environmental requirements (output 2.1.4). The analyses will be supported by applied research product development of biogas equipment and development of industrial production facilities (output 2.1.6). The BIC is expected to take the lead in testing and prototyping of equipment and systems, with external support as a and if required. The modalities regarding intellectual property rights (IPRs) governing technology transfer and prototype development may include patents and licenses. This aspect will be further detailed during the PPG phase. Among other options, prototypes may include mobile gas upgrading units and mobile gas filling stations. Financial instruments for this kind of research and development have been bundled in the GoB's Inova Energy Plan (2013), which draws upon resources from the National Social and Economic Development Bank (BNDES), the Funding Authority for Studies and Projects (FINEP) and the National Electric Energy Agency (ANEEL) to provide credit at reduced rates in addition to grants and non-repayable cash.

The BIC will also function as a hub for the development of training courses and materials (including in electronic format for distance education) on the topic of biogas applications (output 2.1.5). Close cooperation

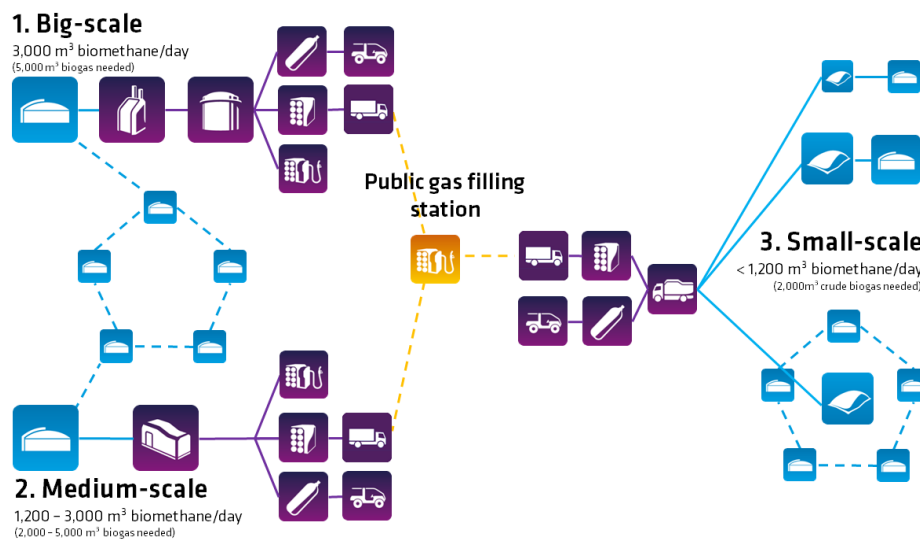
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<sup>17</sup> This implies that the costs of BIC services are included as project development costs or costs of due diligence procedures during a project's lifetime and ultimately reflected in the unit cost of energy of a project.

with existing training providers such as the National Service for Industrial Training (SENAI) is foreseen to make best use of existing dissemination structures. Here synergies with PROBIOGÁS could also be explored since within that project, a methodology to train operators of wastewater treatment plants ‘on-the-job’ has been developed, which could be adapted to biogas plants in agro-industrial settings. In addition, a biogas calculation tool is planned, which allows farmers to easily check their biogas potential as well as the feasibility of biogas production. Furthermore, training shall also target environmental agencies to assure that they are actively supported in verifying that biogas solutions are consistent with environmental protection guidelines. This output further encompasses a dissemination campaign providing targeted information to promote and facilitate adoption and up-scaling of biogas solutions.

**Component 3: Demonstration of a biogas-based system for rural areas.** This component encompasses the demonstration of a viable business model based on a mature technology in a commercial context. The biogas system to be demonstrated will envisagedly focus on local mobility. Biogas feedstock will be derived from agricultural and agro-industrial waste and residues, most likely manure from swine and/or chicken farms and potentially wastewater from slaughterhouses. Initially, relevant pre-feasibility studies undertaken under Component 2 shall be updated and based on the results, a pilot site and technological approach selected (output 3.1.1). Criteria to be considered in the assessment shall include technical and economic feasibility, social and environmental sustainability, innovative aspects, demonstration impact, potential for upscaling and replication in the area, as well as ownership and investment options.

A shortlist of potential demonstration projects shall be developed during the PPG phase. While the emphasis will be on biogas mobility, other business cases will also be considered. The following figure provides an indication of possible anchor points for biogas mobility applications in the rural areas.



Possible intervention options for demonstration biogas system

Following the selection of the biogas pilot, a detailed feasibility study (including environmental and social assessments) shall be conducted (output 3.1.2) and the related technical studies, operational plans, business model and operational constellation developed (output 3.1.3). The demonstration system will be installed and made operational (output 3.1.5) on the basis of the results of the aforementioned studies. Under the envisaged approach to agroindustrial waste valorization, the beneficiaries of the system will likely coincide with the suppliers of the feedstock, which creates opportunities for optimizing synergies.

This component will further facilitate linkages with the climate change targets of the GoB, namely the promotion of results-based financing for climate change mitigation. To this purpose, the development and application of a tailored mechanism for the demonstration biogas system has been included among the outputs to be achieved (output 3.1.4). Through active monitoring (including of operational aspects), it is expected that lessons learnt can be compiled, which will help contribute to the creation of an enabling framework for investments and financing, supporting the upscaling of biogas solutions.

Component 4: Monitoring and Evaluation. Monitoring of project progress is essential for the adequate and timely delivery of results. This project component covers project monitoring and oversight by UNIDO in close coordination with country counterparts and project partners (output 4.1.2), as well as mid-term review and terminal evaluation of the proposed project (output 4.1.3). A monitoring plan including consideration of ESSP and gender aspects – both of which will be looked into during the PPG phase – will be established at the onset to assure compliance with UNIDO and GEF guidelines (output 4.1.1).

4) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing

Baseline activities in Brazil in the field of biogas energy systems include policy development and a few small-scale installations mostly for heat and electricity self-supply. Information, business development and policy barriers are being addressed through PROBIOGÁS, but primarily targeting wastewater and MSW in an effort to valorize organic effluents by anaerobic digestion and generate energy instead of flaring the biogas produced. An important driver for anaerobic digestion and biogas technology is MMA's ABC Program aimed at curbing sector emissions through technical assistance and investment. CIBiogás-ER is one of the pioneers endeavouring into new business models and demonstrations thereof for this sector. Since prevailing low energy prices make biogas uneconomical compared to grid power and natural gas, innovative business models seek to exploit the added value of the energy services delivered by local biogas systems; among other options, the use of biogas as a vehicle fuel constitutes a promising niche market. CIBiogás-ER has established partnerships with international agencies and knowledge providers to further explore and demonstrate this option. Please refer to Part I. Table C for an overview of the baseline partners and the co-finance brought in by them.

Notwithstanding these efforts, the uptake of biogas-based solutions by agro-industries still faces substantial barriers. Specifically, adaptation of technology from the global resource base to create solutions suitable for Brazil will not take place in the absence of short-term market prospects. Local project developers (including CIBiogás-ER) lack the financial resources for demonstration of business cases and development of a project pipeline. Finance is difficult due to systemic barriers as well as the credit profile of smaller agro-businesses, and the risk profile of biogas projects is high given the lack of demonstrated, successful showcases and the lack of information among end-users and financiers.

The proposed UNIDO/GEF project aims to overcome these barriers by directly supporting the GoB, through the Ministry of Science, Technology and Innovation (MCTI) in its efforts to increase generation of renewable energy from agricultural wastes and residues and to promote climate-smart approaches amongst the industries concerned. The proposed project pursues to strengthen the biogas technology base and supply chain while developing and demonstrating viable business models (including local mobility), thereby offering biogas producers and off-takers<sup>18</sup> cost-effective alternatives to meet their energy demands while simultaneously treating their waste in an environmentally-friendly manner.

GEF assistance is requested for closing the identified gaps currently impeding the development of a market for biogas energy technology through financing of the proposed project outputs. Support to private sector involvement for technology and market development under this project will focus on mitigating financial risks that go beyond normal business practices, and under the condition that GEF-funded deliverables are for public domain. All the programmed activities are deemed fully incremental and eligible for GEF funding.

5) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

The proposed project aims to achieve global greenhouse gas (GHG) emission reductions through the implementation of one demonstration biogas-based system (tentatively: for local mobility), thereby offsetting fossil fuels for transport and potentially electricity and/or heat by renewable biogas sources and is aligned with national climate change policies pursuing local and national environmental benefits. The project will deliver direct reductions associated with the pilot investment and indirect reductions as a result of transformational change aimed at establishing a market for biogas energy applications in Brazil through policy development, capacity building, technology transfers and innovative business models.

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<sup>18</sup> Including cooperatives, independent farmers and independent agro-processing industries engaged with cattle, poultry and swine rearing.

Indicatively, assuming the installation of a European state-of-the-art biogas production, upgrading and gas filling station, a small system would avoid at least 85,000 tCO<sub>2</sub>eq per annum as a result of fuel switching from the baseline diesel option for energy generation and mobility. Over an economic lifetime of 20 years for the investment, this translates into avoided GHG emissions of about 1,700,000 tCO<sub>2</sub>eq. The GHG emission reductions shall be further detailed during the PPG phase, as well as additional emission reduction that can be achieved through methane avoidance.

The associated, indirect GHG emission reductions as a result of induced market transformation effects (replication of biogas energy and/or mobility projects) will also be evaluated in more detail during the PPG phase. Indicatively, based on available organic waste and/or agricultural residues, it can be expected that an additional 1-2 systems become operational per year. Conservatively assuming that only one such system becomes operational every year in the 10-year period after project termination, a total of about 4,675,000 tCO<sub>2</sub>eq could be offset. By conservatively applying a GEF causality of 40%<sup>19</sup>, the indirect GHG benefits claimed by the proposed project would be of the order of 1,870,000 tCO<sub>2</sub>eq. Evaluating associated GHG benefits will require adequate delimitation of project boundaries, and may extend to primary and secondary production processes. Only GHG benefits relevant to the GEF CCM-1 Program will be claimed by the proposed project. All GHG emission reductions achieved may be used to meet the voluntary national commitments of Brazil and/or may be integrated into systems developed to monitor Brazil's GHG emission reductions.

The valorization of process-own biogas will improve resource-efficiency of agricultural and agro-industrial enterprises. Potential benefits include: higher production yields per unit input, improved energy-efficiency, as well as reduced emissions from unmanaged or inadequately managed organic waste and wastewater. Since these benefits are specific for each production process, they will be assessed based on the individual design, once available.

6) Innovation, sustainability and potential for scaling up

The proposed project is innovative as it seeks to exploit the value of biogas energy solutions through the added value of the services delivered. This creates new opportunities for the productive utilization of biogas that would normally be lost in the context of a national energy sector characterized by low prices. The use of biogas as a transport fuel for local mobility has been identified as a promising business opportunity for which some initial, positive experiences exist (Ajuricaba project, Haacke-Scania pilot). The project aims to adapt existing (mostly foreign) technology and reduce capital costs to match local circumstances. Biogas businesses will be developed along existing groups of agro-businesses and farmers (often clustered into cooperatives or villages) to optimize scaling and logistics.

The energy service approach lends itself to innovative business models such as ESCO-based models that can take away project risks for the local agro-businesses by assuming investment and operational risks. As such, the proposed project engages with all stakeholders within a framework that significantly reduces the risk profile of each of the actors involved. As another innovative element, the “one stop-shop” model will be explored covering the whole value chain for biogas / biomethane solutions (technology – finance – promotion – commercialization) which can facilitate biogas utilization by agro-businesses and substantially improve market prospects for these technologies.

The proposed project directly contributes to the transfer of state-of-the-art, innovative biogas technology to Brazil and assists in strengthening the economic performance of the agricultural sector by valorization of waste flows, thereby creating opportunities for income generation along a low-carbon development path. Economic viability of the business models deployed is a key condition for sustainability, which, as indicated, expectedly exists for a number of (niche) markets such as local mobility. Constraints concerning technical, social or environmental sustainability are not foreseen. The large market potential for biogas in Brazil has been outlined in sub-section 1 of the Project Description. The proposed project will initially focus on one state (i.e. Paraná), taking benefit of current baseline activities and the involvement of CIBiogás-ER and Itaipu Binacional in the area. The three southern states together constitute a very large area concentrating the majority of pig breeding in

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<sup>19</sup> In conformity with the Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects, GEF/C.33/Inf.18, April 16, 2008.

Brazil. The pursued business models are also relevant for the states of Mato Grosso, Minas Gerais, Goias and Mato Grosso do Sul, as well as other countries in Latin America and other regions.

2. *Stakeholders*. Will project design include the participation of relevant stakeholders from [civil society](#) and [indigenous people](#)? (yes  /no  ) If yes, identify key stakeholders and briefly describe how they will be engaged in project design/preparation.

The project will engage with a broad range of key stakeholders on a national, regional as well as international level. Engagement with indigenous people is, however, specifically not foreseen for this project.

### **Main project stakeholders**

Ministry of Science, Technology and Innovation (MCTI): The project will be guided by the General Coordination of Sectoral Technologies (CGTS) of the Technology Development and Innovation Secretariat (SETEC). The CGTS is responsible for the management of public policies for technology development and innovation in selected knowledge areas and areas of economic interest such as energy, fuel, oil and gas as well as mineral resources. Focus lies on the development of knowledge, technologies, infrastructure and human capacity for these areas while promoting the harmonization and integration with other sectoral policies (economic, industrial, environmental, energy and mineral).

Itaipu Binacional: Besides operating one of the largest hydropower plants in the world, this entity actively invests in the promotion of renewable energy, directly financing CIBiogás-ER and the Itaipu Technological Park Foundation (FITP). It is anticipated that Itaipu will assume the role of executive secretariat of the project through CIBiogás-ER. In addition to engaging in the biogas sector, it also supports the development of electric solutions for all vehicle classes. The existing know-how in the field of mobility as well as existing infrastructure could be utilized by the Biogas Innovation Centre within the framework of the proposed Project.

CIBiogás-ER: The International Centre of Renewable Energy - Biogas (CIBiogás-ER) is legally constituted by an association of 17 institutions and its mission is to develop biogas as a technically and economically viable energy product in Brazil, considering economic environmental and social aspects. Currently, the Centre is undertaking research into existing biogas potential as well as undertaking monitoring, laboratory testing and teaching of operators. One of the centre's primary focus areas is "Labiogas", hosted at the Itaipu Technology Park, where work is undertaken on the enhancement of biogas into a high value product. Moreover, Labiogas actively contributes to knowledge diffusion, training of students and the fostering of a network on biogas.

Private sector: Companies from the Brazilian private sector form the main beneficiaries of the project, including SMEs in the agro-industrial sector as well as engineering companies that supply biogas technologies especially with a view to productive uses and mobility applications as well as consultancy services. Special attention will be given to the training and employment of women during the finalization of the project design in the PPG phase. In addition, exchange with the international private sector is expected with regards to missing key technologies of the biogas infrastructure. Here, it is anticipated that Spirit Design, a strategic design and consulting company headquartered in Vienna and specialized in innovative and sustainable solutions for customers in the mobility, IT, energy, industrial and consumer sectors, will take a leading role due to their expertise in the field of future mobility concepts (including biogas cleaning and filling infrastructure, transportation needs, retrofitting and industrialization platforms).

Academic and/or research institutions: National and regional universities and institutes such as the Itaipu Technological Park Foundation (FITP) are envisaged to become involved by contributing to the generation of knowledge as well as the research activities that will be carried out to start developing stronger technological resources for the country. One of the academic or research institutions could also serve as a host to the Biogas Innovation Centre that is to be established. Moreover, the National Service for Industrial Training (SENAI), a network of not-for-profit secondary level professional schools established and maintained by the Brazilian Confederation of Industry that provides formal training for specialized workers in industry, is envisaged to become involved in the planned training activities. Close cooperation with international research bodies such as the University of Natural Resources and Life Sciences (BOKU), Vienna, Austria and the Austrian Institute of Technology (AIT), Vienna, Austria are also foreseen.

## Other project stakeholders

Ministry of Cities (SNSA): Main proponent of the PROBIOGÁS project, which is part of the baseline project. The Ministry of Cities, through the National Secretariat of Sanitation (SNSA/MCIDADES), and the government of Germany, through the “Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH”, is currently undertaking the afore-mentioned technical cooperation project, which focuses on the promotion of the energetic use of biogas from different sources in Brazil.

Other Ministries: As the proposed project is characterized by a wide range of environmental, energy, agricultural and industrial aspects, other Ministries in Brazil will be indirect beneficiaries and/or will be involved directly or indirectly in the proposed project, such as the Ministry of Mines and Energy (MME), the Ministry of Agriculture, Livestock and Supply (MAPA), the Ministry of Agrarian Development (MDA), the Ministry of Environment (MMA), the Ministry of Development, Industry and Foreign Trade (MDIC) and the Ministry of Foreign Affairs (MRE). Further definition of the roles of these ministries will be determined during the PPG phase.

National Organizations linked to the Ministry of Mines and Energy (MME): The National Electric Energy Agency (ANEEL) is the regulatory agency for electricity, supports research and development projects in the electricity sector. In 2012, it launched a strategic call for the execution of projects focusing on the analysis of technical and commercial arrangements for the insertion of biogas energy from waste and sewage into the Brazilian energy mix. It is anticipated that the proposed project will coordinate closely with ANEEL’s R&D projects in the regulated biogas market, providing opportunities for sharing of information, training courses, technical assistance and the like. A similar cooperation is anticipated with the National Agency for Petroleum, Natural Gas and Biofuels (ANP), which is linked to the Ministry of Mines and Energy (MME). The Energy Planning Company (EPE), which was created in 2004 to help the government plan its energy supply, is responsible for projecting energy supply and demand, supporting the government and power regulator ANEEL in implementing policies, as well as carrying out studies for new power projects to be offered at government auctions. In 2014, it published several technical notes directly relevant for the proposed project including ones that establish the theoretical biogas potential of agricultural waste streams and of organic municipal waste as well as analyzing the respective economic feasibility (Notes no. 15/14, 16/14, 17/14 and 18/14). Active dialogue and/or technical collaboration with EPE during the course of the proposed project is thus anticipated.

Trade associations and chambers of commerce and industry of the export and industrial sector: These associations gather companies in the manufacturing and export sector and are an important channel to disseminate knowledge and valuable information among the different companies that belong to them as members. The most relevant of these associations for the project will be identified during the PPG phase and closely cooperated with, especially for dissemination activities. Furthermore, activities will be coordinated with the two national biogas associations: the Brazilian Association for Biogas and Methane (ABBM) and the Brazilian Association of Biogas and Biomethane (ABiogás) as well as relevant international ones.

NGOs and social organizations: Organizations related to land use planning and environmental aspects are particularly relevant during the establishment of sustainable supply chains. Moreover, specialized associations such as the National Institute of Metrology, Standardization and Industrial Quality (INMETRO) shall be engaged to assure that any renewable energy solution meets local as well as international standards in the field.

3. *Gender Considerations*. Are [gender considerations](#) taken into account? (yes  /no  ). If yes, briefly describe how gender considerations will be mainstreamed into project preparation, taken into account the differences, needs, roles and priorities of men and women.

During the PPG phase, gender relevant aspects will be paid particular attention to in order to assure that the final project design fully accounts for its implications on men and women. That is, the gender relevance of the proposed project will be further assessed and the gender context of the proposed project analyzed. This shall include the identification of the differentiated needs and roles of women and men with respect to the energy interventions of the project. For these purposes, women’s groups, associations or stakeholders concerned with gender and energy will be consulted and a portion of the PPG funds allocated to specialized expertise to verify that the final project logframe is gender mainstreamed.



UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. In addition to the ‘UNIDO Policy on Gender Equality and the Empowerment of Women’ (2009), which provides overall guidelines for establishing a gender mainstreaming strategy, UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives. All energy interventions are expected to have an impact on people and are, therefore, not gender-neutral<sup>20</sup>. In fact, due to diverging needs and rights regarding energy consumption and production, women and men are expected to be affected differently by the project (in terms of their rights, needs, roles, opportunities, etc.). Therefore, the project aims to demonstrate good practices in mainstreaming gender aspects into this biogas project, wherever possible, and avoid negative impacts on women or men due to their gender, ethnicity, social status or age. Consequently, gender dimensions will be considered to be included during the whole project cycle. Guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access, participate in, and benefit from the project, without compromising the technical quality of the project results.

In practical terms: (a) Gender-sensitive recruitment will be practiced at all levels where possible, especially in selection of project staff. Gender responsive TORs will be used to mainstream gender in the activities and tasks of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained and their awareness raised regarding gender issues. (b) All decision-making processes will consider gender dimensions. Also at the level of project activity implementation, efforts will be made to consult with stakeholders focusing on gender equality and women’s empowerment issues. This is especially relevant in policy review and formulation as well as for capacity building activities. (c) To the extent possible, efforts will be made to promote participation of women in training activities, both at managerial and technical levels. (d) When data collection or assessments are conducted as part of project implementation, gender dimensions will be considered. This can include sex-disaggregated data collection, performing gender analysis as part of environmental and social management plans or impact assessments (ESIAs), etc.

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

Main risks and proposed measures to address them:

Risks	Remedial actions
<p>Delay to implement improvements to the policy and institutional framework would affect uptake of biogas solutions.</p> <p><b>Likelihood: Low</b></p>	<p>The Government of Brazil (GoB) is strongly committed to the project. The further development of biogas applications and the related domestic production capabilities are considered key steps for increasing the use of renewable energy solutions based on the utilization of agro-industrial and urban waste streams, thus contributing to the reduction of GHG emissions. Hence, a delay with respect to the improvement of the policy and institutional framework is not expected. Moreover, important advances have been made especially as a result of the PROBIOGÁS project, upon which the GoB intends to build with this Project.</p>
<p>Lack of trust or interest of beneficiaries about the benefits of implementing biogas applications is sustained.</p>	<p>The planned operationalization of one main pilot (likely a local biogas mobility solution) under Component 3 of the project should prove the commercial and technical feasibility of biogas applications for Brazilian agro-industries. That is, it will show that technology which has been utilized successfully in other countries can also be implemented successfully in Brazil. Hence, it is not expected that the trust and interest regarding the benefits of implementing such technologies will not be sustained.</p>

<sup>20</sup> ENERGIA “Turning Information into Empowerment: Strengthening Gender and Energy Networking in Africa. Leusden, 2008; Joy Clancy “Later Developers: Gender Mainstreaming in the Energy Sector”, 2009



<b><i>Likelihood: Medium</i></b>	
Lack of adequate technology support would affect the success of the Project.	Agricultural and agro-industrial waste utilization for the generation of biogas for productive uses and mobility solutions encompasses technologies that demand a certain level of active management. Hence, it will be vital that any existing potential gaps and needs will be addressed within Component 2 of the project through the strengthening of the in-country knowledge base as well as through the creation of a Biogas Innovation Centre. That way, scaling-up and replication of the demonstrated technologies should be without technical disruptions.
<b><i>Likelihood: Medium</i></b>	
The outcomes of the Project would be affected by climate change, environmental and social considerations.	<p>The proposed project – specifically the biogas-based system to be implemented – is not expected to be negatively impacted by climate change since the planned investments are likely to be made in inland areas that are not prone to natural hazards linked to climate change. However, as there could potentially be climatic impacts on the waste streams to be utilized e.g. possible changes in farming behavior due to potential water shortages, this will be investigated further during the PPG phase and considered in the final design of the proposed project. Furthermore, as the proposed project aims to actively mitigate GHG emissions, it is expected that climate change implications, from e.g. methane that escapes and is not captured, are negligible.</p> <p>As any biogas-based solution to be implemented will need to obtain permits for operation, environmental implications are considered minor. Moreover, technology providers will receive training as part of the project which should further assure that any environmental risks related to the equipment and its operation are minimized. Furthermore, the proposed project is not expected to be interfering with natural habitats since agricultural activities have been long established in the region. As both men and women are to be involved in the project e.g. training activities, social risks are expected to be low also.</p>
<b><i>Likelihood: Low</i></b>	

5. *Coordination.* Outline the coordination with other relevant GEF-financed and other initiatives.

Being one of the countries with the most advanced biomass energy market, especially with respect to the use of sugarcane for biofuel and energy production (through direct combustion), the proposed project can build on a number of initiatives that have been conducted in Brazil in the field such as the GEF-funded project "Biomass Power Generation: Sugar Cane Bagasse and Trash" (GEF ID# 338; UNDP) as well as "Sugarcane Renewable Electricity (SUCRE)" (GEF ID# 2778; UNDP). Moreover, it is expected that the proposed project shall be able to explore synergies with the ongoing GEF project on "Low-Carbon Urban Mobility for Large Cities in Brazil" (GEF ID#4949; IADB), which – though focused on cities – could provide valuable insights. The respective implementing agencies will be contacted during the PPG phase to explore in detail possible linkages. The proposed project is also expected to benefit from the BiogasFert Network that brings together biogas and biofertilizer researchers from EMBRAPA, Itaipu Binacional and several Brazilian universities and institutions.

In addition, UNIDO has cooperated on a global GEF project with a focus on biofuels, which will also provide important lessons learnt for the proposed project: "Global assessments and guidelines for sustainable liquid biofuel production in developing countries". As part of this project, several case studies were undertaken including one in the region (Argentina). The results from the project provide a valuable resource in terms of information related to economic, social and environmental indicators that needs to be considered when implementing the proposed project. Lessons learnt will also help to promote best practice in Brazil. Furthermore, the project will draw on synergies from the UNIDO GEF-5 projects in Uruguay and Chile. The project "Towards a green economy in Uruguay: stimulating sustainable production practices and low- emission technologies in prioritized sectors" aims to transform the different kinds of waste generated in agriculture and agro-industry production chains in Uruguay into various types of energy and/or other by-products, aiming at the development of a low carbon sustainable production model, supported by an

adequate technology development and transfer. The project "Promoting the Development of Biogas Energy Amongst Select Small - and Medium-Sized Agro-Industries" focuses on reducing GHG emissions by promoting investment and market development of biogas energy technologies in select agro-industries in Chile. As far as feasible, joint activities between these projects to best use synergies will be promoted. UNIDO is also preparing a GEF-6 project in Argentina that will be focusing on the utilization of organic waste for energy generation. Due to the geographic and thematic closeness of the proposed project "Reducing Argentina's greenhouse gas emissions from the energy sector through the utilization of organic waste for energy generation in agriculture and agroindustries" as well as the here proposed project, synergies and joint activities will be further elaborated during the PPG phase and shall be included in the final project designs of each. Besides the possible forms of cooperation and coordination outlined so far, UNIDO has been actively involved with the creation of Brazil's first biogas laboratory (launched at Itaipu mid-2012) and it is expected that relevant project activities will be closely coordinated. Synergies with other UNIDO branches such as the Agri-Business Development and Environment Branch will also be explored.

Furthermore, there is great interest by the GoB to fully utilize the synergies that exist between the here proposed GEF project and the PROBIOGÁS project, which is a bi-lateral technical cooperation project between the Brazilian and German governments, specifically the Ministry of Cities and GIZ. PROBIOGÁS aims to expand the energetic use of biogas in Brazil, while contributing to the reduction of GHG emissions, particularly CH<sub>4</sub> and CO<sub>2</sub>. Sectoral dialogues with a variety of ministries as well as strategic bodies in the energy sector have been carried out within the framework of the project and it is expected that the GEF project could benefit from a participation in and continuation of these.

*6. Consistency with National Priorities.* Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes  /no  ). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

The proposed UNIDO/GEF project is consistent with the following national strategies and plans or reports and assessments under relevant conventions:

- First and Second National Communications;
- Brazilian Climate Change Law (Federal Law No. 12.187);
- National Climate Change Policy (NCCP);
- National Ten-Year Plan for Energy Expansion;
- Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy in Agriculture.

Brazil released its First National Communication in 2004, which emphasized that the profile of emissions in Brazil is different to that of developed countries as sectors such as agriculture and land-use change and forestry play a significant role. In the agricultural sector alone, CH<sub>4</sub> emissions reached 10 Tg, as a result of the phenomenon of enteric fermentation of ruminant herbivores (92%), which include the country's cattle herd, the second largest in the world. N<sub>2</sub>O emissions totaled 0.5 Tg and were due to various sources, among them, manure from grazing animals (43%). Despite the fact that Brazil is not an Annex 1 country and as such has no formal reduction commitment under the UNFCCC, the country is engaged in various programs (e.g. Energy Development Program for States and Municipalities – PRODEEM) that result in a considerable reduction of greenhouse gas emissions and contribute to the ultimate objective of the UNFCCC.

According to Brazil's Second National Communication to the UNFCCC (2010), the share of renewable energy sources in Brazil's energy mix is to grow significantly in the coming years. In fact, it specifically mentions the "modern use of biomass" as one of these sources (pg. 18). The "modern use of biomass" is understood to exclude the traditional uses of biomass, such as wood, and instead, includes the use of agricultural and forest residues, as well as solid waste (garbage), for generating electricity, producing heat and liquid fuels for transportation. There is a particularly great expectation in relation to the use of agricultural residues.

Furthermore, in 2009, during the 15th Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC), Brazil expressed the decision to contribute to an ambitious international effort to combat climate change. In December 2009, the Government of Brazil adopted the Brazilian Climate Change Law (Federal Law No. 12.187), which establishes the country's National Climate Change Policy (NCCP) and provides the

principles, objectives, guidelines and implementation mechanisms for climate change public policies. The law creates a supportive environment for federal, state and local governments' actions on climate change. Article 12 of the law 12.187 sets a voluntary national target of GHG reduction between 36.1 and 38.9 percent by 2020 relative to the business-as-usual (BAU) scenario (6-10% relative to 2005 levels). General means identified to reach the targets are (i) energy efficiency improvements, (ii) renewable energy support, and (iii) deforestation reduction.

The National Ten-Year Plan for Energy Expansion, which is updated annually, foresees an increase of energy consumption with a 5.3% growth rate in its version for 2020 (PDE 2020). The government thus aims to triple its use of renewable energy by 2020 with the majority of this coming from wind energy, small hydroelectric plants and bioelectricity (apart from large-scale hydro). That is, going from 9 GW of wind, biomass and small hydropower in 2010, Brazil intends to hit 27 GW by 2020. 16% of its electricity supply is to come from renewable in 10 years. In order to achieve this, Brazil is planning to invest around 191 billion Brazilian Real into the development of the energy sector with 70 billion of that targeted to renewable energies. The latest available National Ten-Year Plan for Energy Expansion i.e. the one for 2023 (PDE 2023) continues to view large scale hydropower as a significant contributor to Brazil's renewable energy capacity. However, it foresees the most significant increase in the share of renewables to be attained in the wind sector, predicting an increase from 1.1% to 8.1% in 2023 due to the expected capacity expansion of 20 GW in the next 10 years. Nevertheless, the biomass installed capacity expected to continue to increase as well.

Besides reducing GHG emissions through an increase in the share of renewables in its energy matrix, Brazil also foresees to achieve such reductions through the Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy in Agriculture. Here mitigation actions include the recovery of degraded pasture, replacing the use of nitrogen fertilizer as well as an increase in the use of technologies to treat approximately 4.4 million m<sup>3</sup> of manure (animal waste).

*7. Knowledge Management.* Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

Knowledge management is inherent to UNIDO's operating modality by sharing experiences across its interventions worldwide. This has been demonstrated through many high-quality publications, organization of events, webinars, and more. The establishment of and/or support to regional expert centres is one of the key elements to secure technology transfer, strengthen regional and global exchange and for locally building human capital and institutions. Examples are UNIDO's support for National Cleaner Production Centres, Small Hydropower Development (China), various Centres for Renewable Energy and Energy Efficiency in African regions (ECREEE, EACREEE, SACREEE) and the Caribbean (CCREEE), collaborating in the hosting of the Climate Technology Center and Network (CTCN), and others. In the proposed project, a national expertise centre on biogas innovation is envisaged to be set up with the objective to define a solid exit strategy, facilitate the flow of information and knowledge to national stakeholders and beneficiaries, as well as to recollect experiences from Brazil during and after the project. UNIDO will encourage and support the national expertise centre to play an active role in the international community of peer institutions, among which, the centre on waste-to-energy technology that is to be established in Argentina shall play a key role.

Moreover, a 'Knowledge Management Plan' will be designed and implemented under the proposed project, which will function as the basis for gathering and distributing all data, information and lessons learnt generated during the implementation of the project. The final aim is to create a community of knowledge around biogas and its implementation possibilities. As a first step, the plan will foresee a local, regional and international stock-tacking of available and relevant information, paying particular attention to the networks of the stakeholders involved (e.g. GoB, CIBiogás-ER, Itaipú Binacional, Parque Tecnológico de Itaipú, private sector companies, UNIDO, cooperatives that have already implemented biogas solutions, technological partners, universities, etc.). The plan will also include the development of a knowledge management system; the final format shall be decided taking into consideration the nature of the information gathered, but could constitute a website and associated platform with information accessible by the public as well as direct stakeholders.

A further key element of the aforementioned plan will be the incorporation of the training courses and materials to be developed (output 2.1.5). In addition to the knowledge management plan, a dissemination campaign will be launched, which shall encompass national and international activities such as e.g. the "International Seminar on

Biogas”, which was organized by CIBiogás-ER in Brazil in August 2014, the international workshop on "Biogas for productive uses, industrial and mobility applications" that was jointly organized by the European Biogas Association, CTCN, CIBiogás-ER and UNIDO in Austria in June 2015, or the publication of information materials and articles in relevant professional and general public media.

**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**



**A. RECORD OF ENDORSEMENT<sup>21</sup> OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):**

(Please attach the [Operational Focal Point endorsement letter](#)(s) with this template. For SGP, use this [SGP OFF endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Mr. Marcelo Moises de Paula	General-Coordinator for External Financing at the Secretariat of International Affairs (SEAIN)	MINISTRY OF PLANNING, BUDGET AND MANAGEMENT	06/19/2015

**B. GEF AGENCY(IES) CERTIFICATION**

**This request has been prepared in accordance with GEF policies<sup>22</sup> and procedures and meets the GEF criteria for project identification and preparation under GEF-6.**

Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation Division - PTC, UNIDO GEF Focal Point		07/28/2015	Ms. Nina Zetsche, Industrial Development Officer, PTC/ENE/RRE, UNIDO  	+43 (1) 26026 3569	n.zetsche@ unido.org

**C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)**

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

<sup>21</sup> For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

<sup>22</sup> GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF

## ANNEX I. SUMMARY OF ACHIEVEMENTS OF PROBIOGÁS.

Focus Area	Achievements	Contribution of PROBIOGÁS
<b>Regulations and technical standards</b>	ANP: Resolution on biomethane <ul style="list-style-type: none"> <li>➔ Public consultation took place on 03/12/2014</li> <li>➔ Resolution was approved in January 2015, allowing methane gas produced from agricultural residues to be fed into the gas grid and used as a biofuel</li> </ul>	ANP In-house workshop 06/2014 and ongoing consultancy (methodologies for siloxane measurement, etc.)
	Working Group on guidelines for biogas use in wastewater <ul style="list-style-type: none"> <li>➔ Objective: Facilitate biogas use and increase energy efficiency of wastewater treatment plants</li> </ul>	Translation of German regulations, moderation and technical support of discussions of working group
	MMA/CONAMA: Compost resolution <ul style="list-style-type: none"> <li>➔ Valorization of organic MSW, based on National MSW Policy (PNRS), compost as biogas by-product</li> </ul>	Workshop 11/2014, proposal for quality specifications and quality assurance system
<b>Biogas in the Brazilian energy matrix</b>	EPE Technical notes DEA 15-18/2014 on Energetic Use of Residues: <ul style="list-style-type: none"> <li>➔ Estimation of biomethane production and use for decentralized energy provision and fuel consumption</li> <li>➔ Publications of survey by EPE on the potential of biogas, research into possible commercial applications and a study on replacing diesel during peak load operation.</li> </ul>	Study on biogas business models, and barriers and solutions for the biogas sector as support for elaboration of EPE technical note on business models (ongoing)
	Reserve Energy Auction N° 08/2014 <ul style="list-style-type: none"> <li>➔ EPE: Analysis of documentation of registered projects, proposal of maximum price for energy from residues/biogas</li> <li>➔ Invitations to tender for biogas-based power generation projects by the regulatory authority ANEEL</li> </ul>	Support of EPE in activities related to the inclusion of biogas in energy auctions (ongoing)
<b>Biogas value chain development and business models</b>	Five biogas specific studies published: <ul style="list-style-type: none"> <li>➔ Concept Development for Wastewater Treatment of Biogas Production in Southern Brazil (June 2015)</li> <li>➔ Business opportunities for the commercialization of a CO<sub>2</sub> biogas plant (January 2015)</li> <li>➔ Business opportunities for marketing the solid fertilizer generated from the digested material at a biogas plant (January 2015)</li> <li>➔ Development of a blueprint for the implementation of a research model plant and biogas training in the Concordia / SC region (April 2015)</li> <li>➔ Catalogue of technologies and biogas companies (September 2014)</li> </ul>	Series of specific publications listed produced by PROBIOGÁS