ECOFROTAS FLEET FUEL SUBSTITUTION

Document prepared by WayCarbon and Ecofrotas

Project Title	Ecofrotas Fleet Fuel Substitution
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Grouped Project *Ecofrotas Fleet Fuel Substitution* involves the complete substitution of gasoline blends by ethanol in commercial flex-fuel fleets managed by Ecofrotas[1]. As a grouped project, it allows several instances of the same activity to be described under this single document. Besides, new instances can be included in the Grouped Project in the future, as long as they comply with the eligibility criteria. For this project, the flex-fuel vehicles that belong to each commercial fleet managed by Ecofrotas, identified by a code number, are considered an instance.

The management system adopted by Ecofrotas guarantees continuous monitoring of fuels consumed by vehicles from the project boundary through a system with constant registration of place (gas station), date, type and quantity of fuel used in the project activity. The monitoring system direct measurements are made by a fuel control card, which records every refueling transaction.

The Approved VCS Methodology VM0019 – Fuel switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets – was used to calculate the project emissions reductions. In order to calculate the baseline emissions for each instance, the historical fuel consumption pattern is considered for the calculation of a factor that expresses the ratio of gasoline to the total consumption of fuel by commercial fleet (instance). As the project area is not homogenous in terms of prices and availability of fuels, it was stratified into project regions (referred to as “clusters”), each with a specific fuel consumption pattern. Historical fuel consumption pattern is based on historical data of Ecofrotas.

The baseline emissions are then calculated by applying the above mentioned consumption pattern (ratio of gasoline to the total of fuels consumed during the historical reference period) to the amount of fuel used in the year of reference (year before the project instance start date) corrected by yearly fuel conversion factors. The fuel conversion factors determine the quantity of ethanol needed to substitute one liter of gasoline, keeping the same energy content.

The project emissions are calculated by applying the emission factor to the quantity of gasoline consumed in the project activity. Gasoline consumption in the project activity is limited to 5% of the fuel consumed by each commercial fleet per year, only allowed for the engine startup mechanism and emergency purposes.

The emissions reductions are calculated as a difference between the baseline emissions and the project emissions. No leakage emissions are attributed to this project type. This project is expected to reduce 456 tCO_2e/year.

Additionality is demonstrated separately for each instance and regional group by applying the latest version (05.0.0) of the CDM “Combined tool to identify the baseline scenario and

[1] Ecofrotas is a business unit within the company Embratec (Empresa Brasileira de Tecnologia e Administração de Convênios HOM Ltda.). It should be noted that, even though the company responsible for the Grouped Project is referred to as Ecofrotas throughout the Project Document, Embratec is the project proponent.

demonstrate additionality". Investment analysis consists in valuing the flexibility of vehicles within the fleets included in the Grouped Project, a feature that is lost in the project scenario. The investment analysis is performed within the framework of Real Option Analysis.

1.2 Sectoral Scope and Project Type

Sectoral scope 7 (Transport) is applicable to the Grouped Project *Ecofrotas Fleet Fuel Substitution*.

1.3 Project Proponent

1.3.1 Empresa Brasileira de Tecnologia e Administração de Convênios HOM Ltda. (Embratec)

50 Machado de Assis St., Building 2 – Santa Lúcia – Campo Bom/RS – Brazil
CEP 93700-000
+55 51 3590 7900
http://www.embratec.com.br/
Mrs. Amanda Hatem Massimo Kardosh <amanda.kardosh@ecofrotas.com.br>

Embratec is responsible for obtaining and keeping the register of parameters directly related to its operation: monthly consume of ethanol and gasoline, divided by year, project region and fleet. This register must be kept for at least two years after the end of the last crediting period. It is also responsible for the annual transmission of this information to WayCarbon.

1.4 Other Entities Involved in the Project

1.4.1 WayCarbon Soluções Ambientais e Projetos de Carbono Ltda.

770/210 Professor José Vieira de Mendonça St., BH-Tec Institutional Building - Engenho Nogueira – Belo Horizonte/MG – Brazil
CEP 31310-260
+55 31 3401 1074
http://www.waycarbon.com/
Mr. Fabio Weikert Bicalho <fbicalho@waycarbon.com>

WayCarbon is responsible for preparing the Project Description (PD) and for delivering the PD and the Monitoring Report to the Validation/Verification body according to VCS guidelines and procedures. It is also in charge of keeping the register of parameters annually sent by Ecofrotas: monthly consumption of ethanol and gasoline, divided by year, project region and fleet. It is responsible for obtaining and keeping the register of all external parameters referenced in this document and for calculating the emission reductions year by year during the whole crediting period. The register of all parameters and calculation sheets must be kept for at least two years after the end of the last crediting period.

1.4.2 Commercial fleets owners

Other entities involved in the development of the project activity are Ecofrotas clients, owners of the commercial fleets included in the Grouped Project. Their historical data on fuel consumption will be used to develop the regional patterns, which shall be applied to their fleet, in case they adhere to the project, or to other potential new clients in the same region, in case they have no historical registers that allow the calculation of their own fuel consumption pattern (greenfield project activity instances).

These entities formally adhere to the project activity, if and when they wish to, by signing an agreement with Embratec, which clearly states the project eligibility conditions and the Verified Carbon Units (VCUs) property. The agreements state that the flex-fuel fleets included in the Ecofrotas program must consume exclusively ethanol and that Ecofrotas system will be used as a tool to control the fuel consumption and to measure the GHG emission reductions. Also, it emphasizes the client's responsibility to implement the policy of ethanol consumption among the program fleets. The document also establishes that the VCUs to be generated are held by Embratec, which compromises to pass on 50% of the generated credits to the fleet owner.

Only after such agreements are signed these entities commit to the exclusive consumption of ethanol in their flex-fuel fleets. The contact of the entities participating in this Grouped Project are presented below:

Biolab Sanus Farmacêutica Ltda. (Biolab)

242 Olimpíadas St. – Vila Olímpia – São Paulo/SP – Brazil
CEP 04551-000
+55 11 7882-7435
http://www.biolabfarma.com.br
Mr. Luiz Mauro Muhamad <lmuhamad@biolabfarma.com.br>

G4S Engenharia e Sistemas S.A. (G4S)

267 Catequese St. – Butantã – São Paulo/SP – Brazil
CEP 05502-020
+55 11 97346-6336
http://www.br.g4s.com/
Mr. Roberto Schiavo <roberto.schiavo@br.g4s.com>

Grupo ISS Brasil (ISS)

438 Dom Aguirre St. – Vila Sofia – São Paulo/SP – Brazil
CEP 04671-245
+55 11 99932-4125
http://www.br.issworld.com/
Mr. Felipe Stanev <felipe.stanev@br.issworld.com>

Furthermore, the specific addresses of the companies that compose the Group ISS in Brazil are displayed below.

ISS Manutenção e Serviços Integrados Ltda. (ISS MSI)

438/Room 4 Dom Aguirre St. – Vila Sofia – São Paulo/SP – Brazil
CEP 04671-245

ISS Servisystem do Brasil Ltda. (ISS Servisystem)

438/2nd floor Dom Aguirre St. – Vila Sofia – São Paulo/SP – Brazil
CEP 04671-245

ISS Biosystem Saneamento Ambiental Ltda. (ISS Biosystem)

1904 Onze de Agosto Av. – Nova Valinhos – Valinhos/SP – Brazil
CEP 13271-210

ISS Manutenção e Operação de Utilidades Ltda. (ISS Manutenção)

1090 Ambrósio Molina St. – Eugenio de Mello – São José dos Campos/SP – Brazil
CEP 12247-902

ISS Serviços de Logística Integrada Ltda. (ISS Logística)

1090 Ambrósio Molina St. – Eugenio de Mello – São José dos Campos/SP – Brazil
CEP 12247-902

Empresa Brasileira de Tecnologia e Administração de Convênios HOM Ltda. (Embratec)

273/6th floor 18 de Novembro St. - Navegantes - Porto Alegre/RS – Brazil
CEP 90240-040
+55 51 2123 5950
http://www.embratec.com.br/
Mr. Marcelo André Letti <marcelo.letti@embratec.com.br>

Renovias Concessionária S.A. (Renovias)

SP-340 Highway, Km 161, Southbound lane – Sobradinho - Mogi-Mirim/SP – Brazil
CEP: 13805-280
+55 19 3814-2025
http://www.renovias.com.br
Mr. Norberto Mazochi <norberto.mazochi@renovias.com.br>

1.5 Project Start Date

The project start date for each instance is the date *on which the instance began generating GHG emission reductions or removals*. For each instance within the Grouped Project to begin generating GHG emission reductions, the agreement that formalizes the adherence of the fleet to

the Grouped Project and establishes the ownership of the emission reductions must be signed. Hence, the start date of each instance is the date of signature of the agreement.

The Grouped Project start date is July 2nd, 2012, which is the date when that condition has been fulfilled by the first instance (number 7880, from Renovias).

1.6 Project Crediting Period

The project has a fixed crediting period of 10 years, from July 2nd, 2012, to July 1st, 2022.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	X
Large project	

Years	**Estimated GHG emission reductions or removals (tCO_2e)**
From 2nd July 2012	117
2013	431
2014	472
2015	472
2016	472
2017	472
2018	472
2019	472
2020	472
2021	472
Until 1st July 2022	235
Total estimated ERs	4559
Total number of crediting years	10
Average annual ERs	456

1.8 Description of the Project Activity

The project developer, Ecofrotas, is the first company in the country to provide complete fleet management solutions with a new concept based on sustainability. With many years of experience in fleet management, Ecofrotas has built up a portfolio of more than 9,000 corporate customers, with a combined fleet of 520,000 vehicles. These customers and their drivers carry out 22 million transactions a year through a nationwide network of gas stations and repair shops.

The proposed project activity was idealized to make feasible the substitution of the fossil fuel portion by biofuels in the operation of commercial fleets. In this specific case, ethanol will replace gasoline, contributing to mitigate the GHG emissions from this fuel from fossil sources in the daily operations of each commercial fleet involved in the project activity.

The project activity consists of replacing the historical fuel consumption pattern between gasoline and ethanol used in the flex-fuel vehicles of the commercial fleets included in the project activity.

The project activity reduces GHG emissions due to the renewable character of ethanol energy, thereby avoiding emissions from gasoline that would be consumed in the absence of the project activity.

The VCS project has a lifetime of 10 years, but the activity performed by Ecofrotas in its fuel control program has no limited lifetime, as the vehicles of the commercial fleets that adhere to the program can be replaced after degrading and the fleets can be reduced or expanded without changes in project additionality. Also, Ecofrotas clients may renew their agreements if they wish to and new clients can adhere at anytime.

The table below describes the instances involved in this grouped project, displaying their code number, its sector, the Brazilian federation units where they travel and the respective clusters.

Table 1 - Instances included in the Grouped Project

Instance Code	Company name	Start Date	Sector	Brazilian Federation Units	Clusters
7880	Renovias	02-Jul-12	Highway concession	GO; MG; RJ; SP	2,3
11670	Biolab	04-Jul-12	Pharmacy	AC; AL; AM; BA; CE; DF; ES; GO; MA; MG; MS; MT; PA; PB; PE; PI; PR; RJ; RN; RO; RS; SC; SE; SP; TO	1,2,3
42750	ISS MSI	01-Mar-13	Services	AL; BA; DF; ES; GO; MG; MT; PB; PE; PR; RJ; RO; RS; SC; SE; SP; TO	2,3
44152	G4S	25-Mar-13	Telephony	BA; DF; GO; MA; MG; MT; PR; RJ; RS; SC; SP	1,2,3
52397	ISS Servisystem	01-Mar-13	Services	AM; DF; ES; GO; MG; PE; PR; RJ; SC; SP	1,2,3
52398	ISS Logística	01-Mar-13	Services	BA; ES; MG; PB; PE; RJ; SE; SP	2,3
52399	ISS Manutenção	01-Mar-13	Services	GO; MG; MT; PR; RJ; RS; SC; SP	2,3
52400	ISS	01-Mar-13	Services	BA; ES; MG; PB; PE;	2,3

	Biosystem			RJ; SE; SP	
59866	Embratec	24-Aug-12	Information technology	AC; AL; AM; BA; CE; DF; ES; GO; MA; MG; MS; MT; PA; PB; PE; PI; PR; RJ; RN; RR; RO: RS; SC; SE; SP; TO	1,2,3

1.9 Project Location

The Headquarter of Ecofrotas is located in the city of Campo Bom, State of Rio Grande do Sul, Brazil, with geographic coordinates *-29° 40' 41.56", -51° 3' 27.50".* The commercial fleets are distributed all over Brazil with all fuel supply points being monitored. Vehicles can circulate throughout all of the 26 states of Brazil plus DC (Brasília).[2] Please find the geographic coordinates of the instances offices in Table 2 below.

Table 2 - Geographic coordinates of the instances

Company	Coordinates
Biolab	-23° 35' 44.16", -46° 41' 10.74"
G4S	-23° 34' 17.45", -46° 42' 22.23"
ISS	-23° 39' 34.60", -46° 41' 11.17"
Embratec	-29° 59' 53.47", -51° 11' 34.98"
Renovias	-22° 26' 10.18", -46° 58' 13.58"

Brazil's National Agency of Petroleum, Natural Gas and Biofuels (ANP- *Agência Nacional do Petróleo, Gás Natural e Biocombustíveis*), implanted by Decree 2,455/98, is the regulator of activities that integrate the industry of oil, natural gas and biofuels in Brazil. ANP is a Federal agency, linked to the Ministry of Mines and Energy (MME). ANP is responsible for the execution of the national policy of the energetic sector of oil, natural gas and biofuels, according to the Oil Law (Law 9,478/97). In that sense, the regulatory framework for fuels is nationally established, without region specificities. Hence, the geographical boundary for the proposed project is Brazil.

[2] Even though no vehicle of the instances described in this PD is currently in the state of Amapá (AP), the commercial fleets may be located in any Brazilian Federation Unit.

Figure 1 - Geographical boundary of the proposed Grouped Project

1.10 Conditions Prior to Project Initiation

Prior to the project initiation, the flex-fuel fleets could consume any mixture blend of gasoline and ethanol, as there was no restriction for fuel use neither based on government regulations nor based on corporate mandatory use. Hence, fleet owners faced free choice between gasoline and ethanol, according to price attractiveness. Moreover, the project implementation does not generate any new GHG emission source; therefore it is clear that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is in compliance with local laws and regulations. As there is no restriction about the quantity of gasoline and/or ethanol that shall be used in flex-fuel vehicles, the only applicable law related to the project activity is the fraction of ethanol contained in the gasoline, as described in the following paragraphs.

Brazilian gasoline sold for vehicle use (gasoline C) is actually a blend of gasoline (gasoline A, pure) and ethanol (anhydrous ethanol), in proportions fixed at national level and periodically updated. This specific feature comes from the Alcohol National Program (Pró-Álcool, Decree 76,593, 14/11/1975[3]), which was created on 1975, in order to reduce dependency on oil imports. Nowadays, gasoline C composition is determined by the Ministry of Agriculture, Livestock and Supply (MAPA) and by ANP. During the period here assessed, the blend composition is as shown in Figure 2.

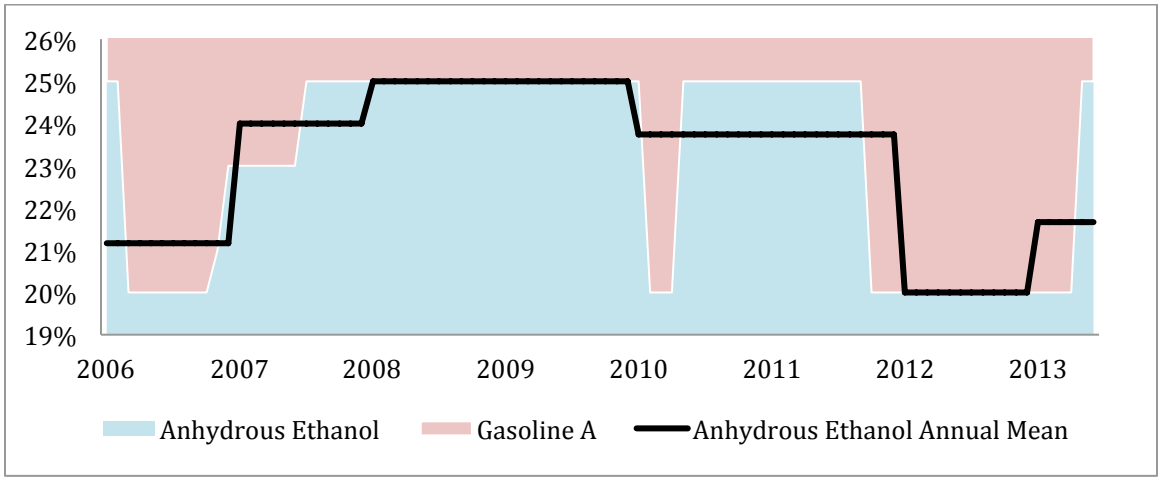


Figure 2 - Historical gasoline C composition in Brazil[4]

In that sense, the ethanol content in gasoline is properly addressed in all calculations of GHG reductions, as described in section 1.13.

1.12 Ownership and Other Programs

1.12.1 Right of Use

In respect of a GHG emission reduction or removal, the right of use is the unconditional, undisputed and unencumbered ability to claim that the relevant project, or jurisdictional program, will or did generate or cause such reduction or removal.

[3] Available at http://www2.camara.leg.br/legin/fed/decret/1970-1979/decreto-76593-14-novembro-1975-425253-publicacaooriginal-1-pe.html. Accessed on 15/10/2013

[4] Available at <http://www.agricultura.gov.br/arq_editor/file/MISTURA%20ETANOL%20ANIDRO-GASOLINA%20-%20%20CRONOLOGIA%20-%2020-01-2010%202.pdf>; <http://www.agricultura.gov.br/vegetal/noticias/2013/03/portaria-altera-para-maio-a-adicao-de-etanol-a-gasolina> and http://www.agricultura.gov.br/comunicacao/noticias/2011/09/governo-reduz-a-mistura-de-etanol-a-gasolina Accessed on 23/10/2013.

It is important to state that for the Grouped Project *Ecofrotas Fleet Fuel Substitution*, the ownership of the fleet does not necessarily mean the ownership of the vehicles, as there are cases where part of the fleet might be composed by rented cars. However, all vehicles (including the rented ones) are completely under the fleet owner's management. Moreover, the fleet owner is responsible for paying for the fuel consumed by the vehicles within its fleet. The right of use is evidenced by the agreement signed between Embratec and the fleet owners.

The agreements among fleet owners and Embratec establish that the VCUs to be generated are a property of Ecofrotas, which compromises to pass on 50% of the generated credits to the fleet owner. Such documents are an evidence of the VCU's proof of right, and are provided to the VVB.

1.12.2 Emissions Trading Programs and Other Binding Limits

Brazil, which corresponds to the project geographic boundaries, has neither emissions reduction mandatory programs nor binding limits on GHG emissions. Therefore, the net GHG emission reductions generated by the project will not be used for compliance with any emissions trading program or to meet binding limits on GHG emissions.

1.12.3 Participation under Other GHG Programs

The project has not been submitted to any other GHG program.

1.12.4 Other Forms of Environmental Credit

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions claimed under the VCS Program.

1.12.5 Projects Rejected by Other GHG Programs

No other GHG program has rejected the project.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

In order to include a Project Activity Instance to this Grouped Project, besides complying with the applicability conditions of the applied methodology, the following eligibility criteria should be pertained:

Table 3 - Eligibility criteria for inclusion of instances in the Grouped Project

Eligibility Criteria	Explanation	Criteria and Parameters	Evidence
i) Project Location	The geographical boundary of the instance must be consistent with the geographical boundary set for the Grouped Project.	The instance should provide documents that it holds an office within the project geographical boundary.	The office's address provided by the agreement between the fleet owner and Embratec.

ii) Compliance with same legislation and fuel incentives	The instance must be submitted to the same regulatory framework. Regional rules and legislation regarding fuel incentives should not differ from the project boundary.	The regulatory framework to which the instance is submitted should be described.	The office's address provided by the agreement between the fleet owner and Embratec.
iii) Proof of adherence to the Grouped Project	On the date of adherence to the Grouped Project the instance must be Ecofrotas client for at least one month. Its adherence to the project must be made through an agreement, as mentioned in section 1.4.2.	This agreement clearly shows the project applicability conditions and VCUs property. Also serves as an evidence of the project start date.	Information provided by the agreement between the fleet owner and Embratec; historical fuel consumption of the fleet available in Ecofrotas system.
iv) Proof of additionality	Each instance must meet the requirements pertaining to the demonstration of additionality.	The demonstration of additionality shall be demonstrated for each instance. Documentary evidence shall be provided in order to have a consistent argumentation.	Additionality is proven separately for each instance using public available data and the historical fuel consumption by the fleet as described in section 2.5.
v) Compliance with methodology applicability conditions	Each instance must meet the applicability conditions set out in the applied methodology *"Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets"* version (1.0)	Methodology applicability conditions are better described in section 2.2.	Where applicable evidence is provided to prove compliance with each condition.

Comments on how instances comply with the Grouped Project's eligibility criteria are provided in Table 4.

Table 4 - Compliance with eligibility criteria by instances

Instance	Eligibility Criteria				
	i)	**ii)**	**iii)**	**iv)**	**v)**
7880	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 02/Jul/2012 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 7880 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
11670	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 04/Jul/2012 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 11670 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
42750	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 01/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 42750 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
44152	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 25/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 44152 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.

52397	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 01/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 52397 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
52398	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 01/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 52398 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
52399	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 01/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 52399 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
52400	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 01/Mar/2013 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 52400 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.
59866	The office's address provided by the agreement (same as in section 1.4.2) proves that the geographical boundary of the instance is the same as the one set for the Grouped Project (Brazil).	The instance is submitted to the same regulatory framework as the Grouped Project, as the geographical boundary is the same and such framework is nationally set, without regional specificities.	The agreement signed in 24/Aug/2012 formalizes the instance's adherence to the Grouped Project. On that date, the instance already had historical consumption data in Ecofrotas' system.	Demonstration of additionality for instance 59866 is provided in section 2.5 and concludes that the project activity is additional.	All applicability conditions are fulfilled by the instance and by the Grouped Project, as described in Table 5.

Leakage Management

No leakage emissions are considered in the project.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

According to Pró-Álcool (described in section 1.11), the quantification of the project's net GHG emission reductions depends not only on its gasoline and ethanol consumption, but also on the mean gasoline blend composition of each year. In that sense, all gasoline parameters mentioned in this document refer to gasoline A, thus its consume was obtained through multiplying the annual consume of gasoline C (recorded by the fuel control card) by the annual mean fraction of gasoline A in gasoline C.

The net GHG emission reductions are also dependent on the region of consumption and on the fleet that consumed it. The region of consume determines "how additional" is the fuel substitution, as the parameters that determine fuel choice (price and availability) differ from region to region. The fleet that consumes the fuel has also an influence over this, as specific policies of fuel choice within Ecofrotas' clients may exist before the establishment of the project, differing the consumption pattern among the project fleets. These two subjects are solved through Real Option Analysis, applied in the additionality assessment, and through stratification of the project area into project regions, for further determination of region and fleet specific consume patterns.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The methodology applied to the project is "Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets", reference number VM0019 (Version 1.0).

2.2 Applicability of Methodology

The project aims at complete substitution of blends of gasoline by ethanol in commercial fleets of Ecofrotas. The methodology VM0019 (Version 1.0) is applicable as the following conditions are satisfied:

Table 5 - Applicability conditions and how they apply to the Grouped Project

Applicability condition	How it applies to the Grouped Project
Project boundary contains commercial fleets that consist exclusively of flex-fuel vehicles;	The system used in the Ecofrotas program ensures that only commercial flex-fuel vehicles are used both in the baseline scenario and in the project activity.

Only existent fleets of flex-fuel vehicles are eligible;	Only existent fleets of flex-fuel vehicles are included in the Grouped Project.
In the baseline scenario, the vehicles use gasoline or blend of any proportion of ethanol and gasoline (0-99%);	The baseline scenario encompasses only flex-fuel vehicles that use gasoline or blend of any proportion of ethanol and gasoline.
Fuel consumed in project activity is exclusively ethanol; up to 5% of gasoline can be used per fleet and per project given year, for emergency cases and for the startup mechanism as required by the flex-fuel motor technology;	The system used for the Ecofrotas program records all the fueling transactions to ensure the 5% gasoline usage limit per given year per instance imposed by the project activity. The given year is defined further, on Table 6.
The project activity fuel (ethanol) is available at the same gas stations as the baseline fuel (gasoline or blend of ethanol and gasoline) for at least 50% of the gas stations available in the project region;	In Brazil, ethanol and gasoline are both available in every state, although in different levels. According to ANP[5], ethanol is available at more than 50% gas stations available in the project region.
Gasoline, ethanol and their blends comply with relevant regulations;	Gasoline, ethanol and their blends are in compliance with national laws and regulations. As there is no restriction about the quantity of gasoline and/or ethanol that shall be used in flex-fuel vehicles, the only applicable law related to the project activity is the fraction of ethanol contained in the gasoline as mentioned in 1.11.
Ethanol used in the project is produced from renewable resources;	In Brazil, ethanol is produced from sugarcane, which is a biomass source known for its renewable character, as described in section 5.
Ethanol used in the project shall have lower lifecycle emissions than the gasoline used in the baseline;	Several lifecycle analyses have concluded that ethanol has lower lifecycle emissions than gasoline. On this regard, the UNEP study "Towards sustainable production and use of resources: Assessing Biofuels" is used to demonstrate compliance with this applicability condition[6].
The monitoring system is designed to allow measurement of the fuel consumption for each vehicle in each fleet within the project boundaries continuously (on each fueling operation), over the whole project crediting	The Ecofrotas system allows constant monitoring of the consumption of ethanol and gasoline used by each vehicle of the commercial fleets within the project boundary.

[5] Available at: <http://www.anp.gov.br/postos/consulta.asp>. Accessed on: 08/Mar/13.

[6] Pages 52-56 of the referred study: "Bioethanol from sugar cane shows the highest potential for GHG savings of the four bioethanol types studied. Higher values (beyond 100%) are due to co-products. This reflects the recent trend in Brazilian industry towards more integrated concepts combining the production of ethanol with other non-energy products and selling surplus electricity to the grid." (UNEP, 2009, p.52-56). Available at: <http://www.unep.fr/scp/rpanel/pdf/assessing_biofuels_full_report.pdf>. Accessed on: 17/Oct/13.

period and during the period to which the historical consumption pattern refers;	
The system of measurement (direct and indirect) shall guarantee that 95% of the fuel consumed per fleet and per given year under the project activity is ethanol;	Direct measurement is used for the Grouped Project. The method adopted by the project activity is robust enough to ensure that the data obtained, processed and registered is reliable.
No legal requirement exists to use exclusively ethanol fuel in commercial fleets in the relevant national market;	There is no legal requirement about exclusive use of ethanol in the national market.
Where the project proponent is not the owner of the commercial fleet vehicles, there shall exist a contract between the project proponent and each fleet owner to establish clear ownership of the emission reductions;	The contracts between the project proponent and each fleet owner, which adhered to the project, establish clear ownership of the emission reductions.
As in the CDM baseline and monitoring methodologies related to the biofuel production (i.e., AMS.III-T, AMS.III-AK, and AMS.III-AQ discussed above), "the retailer, the final users, and the producer are bound by a contract that states that the final consumers and retailers shall not claim emission reductions resulting from its consumption", the contract between the project proponent and the fleet owner shall include a clause stating that, to avoid double counting in the supply chain, the commercial fleet owner must not participate in any other emission reduction project associated with a biofuel producer or retailer. Only the commercial fleet owner or manager can claim emissions reductions under this methodology.	The above mentioned contract of adherence to the project includes the following clause stating that the commercial fleet owner shall not participate in any other emission reductions project: "1.6 Emission reductions resulting from the adherence to the Ecofrotas Program and therefore from the utilization of ethanol in the dual fuel light fleet will not be linked to any emission reduction project, according to the applicability condition of the methodology, other than the project developed by Ecofrotas".[7] Besides, as final users of the biofuel consumed under this project activity, commercial fleets of flex-fuel vehicles included in this Grouped Project are not bound to the producers by any contract stating that they shall not claim emission reductions resulting from its consumption. Furthermore, according to the same contract of adherence to the project, which is also the proof of right, only the commercial fleet owner or manager can claim emissions reductions.

For the project activity, the given year is defined as the first full year after the start date of the project and subsequently, as depicted in Table 6 below:

[7] The clause has been translated from Portuguese: "*1.6 As reduções de emissões resultantes da adesão ao Programa Ecofrotas e, portanto, da utilização de etanol na frota leve bicombustível, não serão associadas a nenhum outro projeto de redução de emissões, conforme condição de aplicabilidade da metodologia, que não o projeto desenvolvido pela Ecofrotas.*"

Table 6 - Project years and corresponding calendar periods

Project year	Calendar period	
	From	To
1	7/2/12	6/30/13
2	7/1/13	6/30/14
3	7/1/14	6/30/15
4	7/1/15	6/30/16
5	7/1/16	6/30/17
6	7/1/17	6/30/18
7	7/1/18	6/30/19
8	7/1/19	6/30/20
9	7/1/20	6/30/21
10	7/1/21	7/1/22

2.3 Project Boundary

The project boundary encompasses flex-fuel vehicles from the project commercial fleets. The project area includes all the gas stations used by the project commercial fleets as a part of the project activity.

The only emission source included in both baseline and project scenarios is the gasoline consumption by the commercial fleet within the project boundary:

Table 7 - Emissions sources included in the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Gasoline Consumption	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
		Other	No	Excluded for simplification. This is conservative
Project	Gasoline Consumption	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative
		N_2O	No	Excluded for simplification. This is conservative
		Other	No	Excluded for simplification. This is conservative

A flow diagram of the project boundary, physically delineating the project activity is depicted in Figure 3.

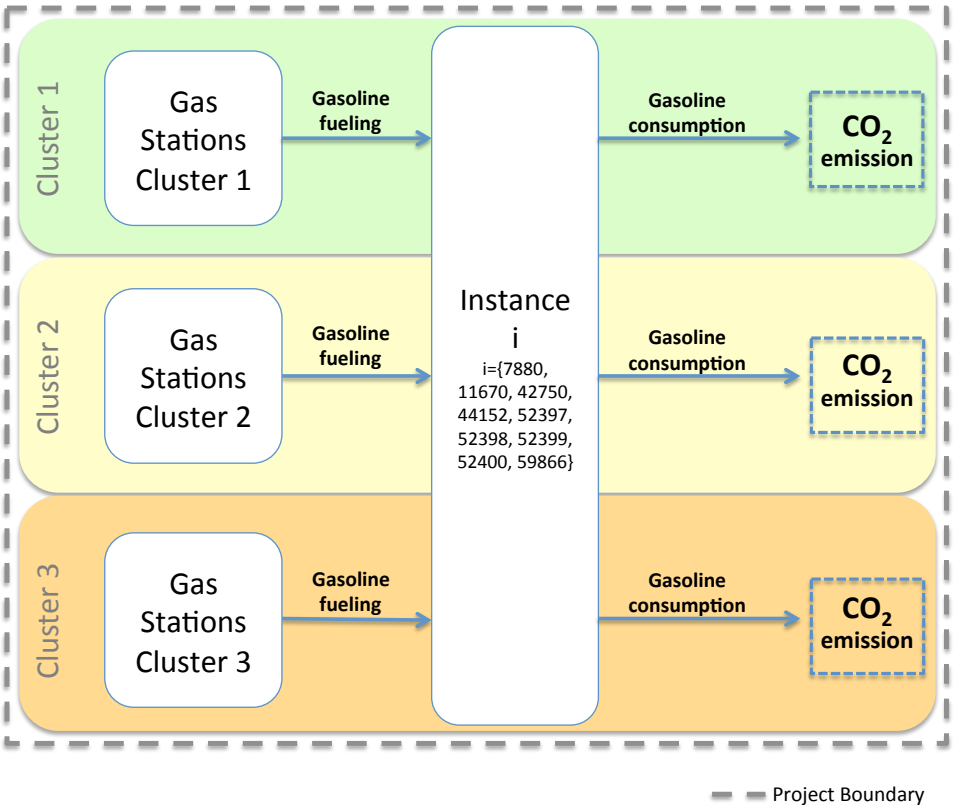


Figure 3 - Project boundary. Monitored variables are depicted. Emissions consist of CO_2 emissions from gasoline consumption.

2.3.1 Stratification of the project area into the project regions

In order to guarantee the accuracy and precision of baseline emissions calculation, a stratification of the project region was carried out. The stratification of the project area was conducted through cluster analysis, or clustering, based on publicly available data. According to the applied methodology, the obligatory variables for the cluster analysis of the project regions are fuel availability, prices and regulatory framework.

ANP, implanted by Decree 2455/98, is the regulator of activities that integrate the industry of oil, natural gas and biofuels in Brazil. Federal agency, linked to the Ministry of Mines and Energy (MME), ANP is responsible for the execution of the national policy of the energetic sector of oil, natural gas and biofuels, according to the Oil Law (Law 9,478/97). In that sense, the regulatory framework for fuels is nationally established, without region specificities, allowing the exclusion of such variable from the cluster analysis.

In Brazil, ethanol and gasoline are both available in every state, although in different levels. In order to assess the availability variety among the states, the data used were the total number of gas stations and the number of gas stations that sell hydrous ethanol and gasoline C, for each

state. These values were obtained from ANP[8], responsible for issuing the retail dealer registration for gas stations to resale fuels, according to ANP Ordinance 116/00, modified by ANP Resolutions 15/07 and 33/08. The availability variable was calculated, for each state, as the difference between the number of stations that sell ethanol and the number of stations that sell gasoline, divided by the total number of gas stations.

Finally, the only variable left for analysis is fuel price. The data used in the analysis were obtained from ANP[9], and refer to historical series of hydrous ethanol and gasoline C monthly prices (R$/L), for each one of Brazilian states, from January 2006, characterized as the beginning of the year when the production of flex-fuel vehicles in Brazil increased substantially, overcoming the production of gasoline vehicles[10], to June 2012, which is the last month before the start date of the Grouped Project These series were brought to present terms according to monthly values of the Extended National Price Index (IPCA – *Indice de Preços ao Consumidor Amplo*)[11]. These values were then converted to R$/Mcal through dividing price by fuel density and net calorific value, which were also obtained from ANP yearly values[12]. This conversion was made in order to reflect the actual price difference between the two fuels, as gasoline is more efficient than ethanol. After conversion of the prices to an energy basis, the differences between the prices were obtained (gasoline minus ethanol) and the mean value for each state was used as the price variable.

Both variables were standardized, so that they had the same weight on the clustering analysis. In general terms, for both variables, the positive values suggest that ethanol is more attractive (cheaper/more available) in that state, the negative suggest that gasoline is more attractive and values near zero indicate that both fuels had a similar tendency to be chosen.

The clustering process was made through IBM® SPSS® Statistics 16, a software for advanced statistical analysis. The clustering technique applied is based on the squared Euclidean distance, which was chosen for being the most common metric. The method used was the agglomerative hierarchical, based on Ward method, for being based on a measure with strong statistical character and for generating groups that possess high internal homogeneity[13]. The dendrogram generated (Figure 4) was used to determine the number of clusters to be applied in the project activity: the sudden increase in the size of the difference in adjacent steps was taken as an indication of the appropriate number of clusters to consider[14]. In that sense, three clusters were considered.

[8] Available at: <http://www.anp.gov.br/postos/consulta.asp>. Accessed on: 08/Mar/13.
[9] Available at: < http://www.anp.gov.br/preco/prc/Resumo_Mensal_Index.asp>. Accessed on: 08/Mar/13.
[10] Available at: < http://www.realoptions.org/papers2008/Bastian-Pinto%20Carlos%20-%20The_Ethanol_Gas_Flex_Fuel_car_What_is_the_option_value_of_choosing_your_own_Fuel.pdf>. Acessed on 11/Oct/13
[11] Available at: <http://www.ibge.gov.br/home/estatistica/indicadores/precos/inpc_ipca/defaultinpc.shtm>. Accessed on: 08/Mar/13.
[12] Available at: <http://www.anp.gov.br/?id=661>. Accessed on: 08/Mar/13.
[13] Manning, CD., Raghavan, P., Schütze, H. (2008). Introduction to Information Retrieval. Cambridge University Press. Available at: <http://nlp.stanford.edu/IR-book/completelink.html>. Accessed on: 08/Mar/13.
[14] Landau, S; Everitt, BS. A Handbook of Statistical Analyses using SPSS. Chapman & Hall/CRC. 2004.

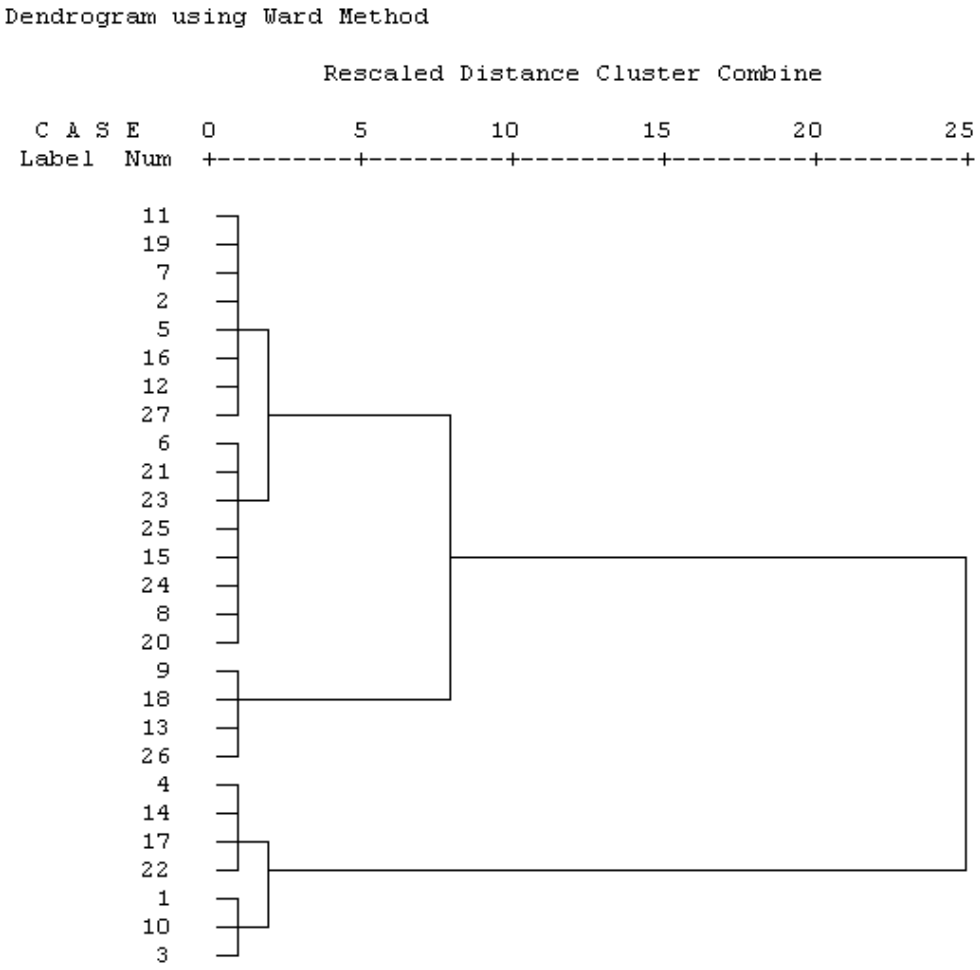
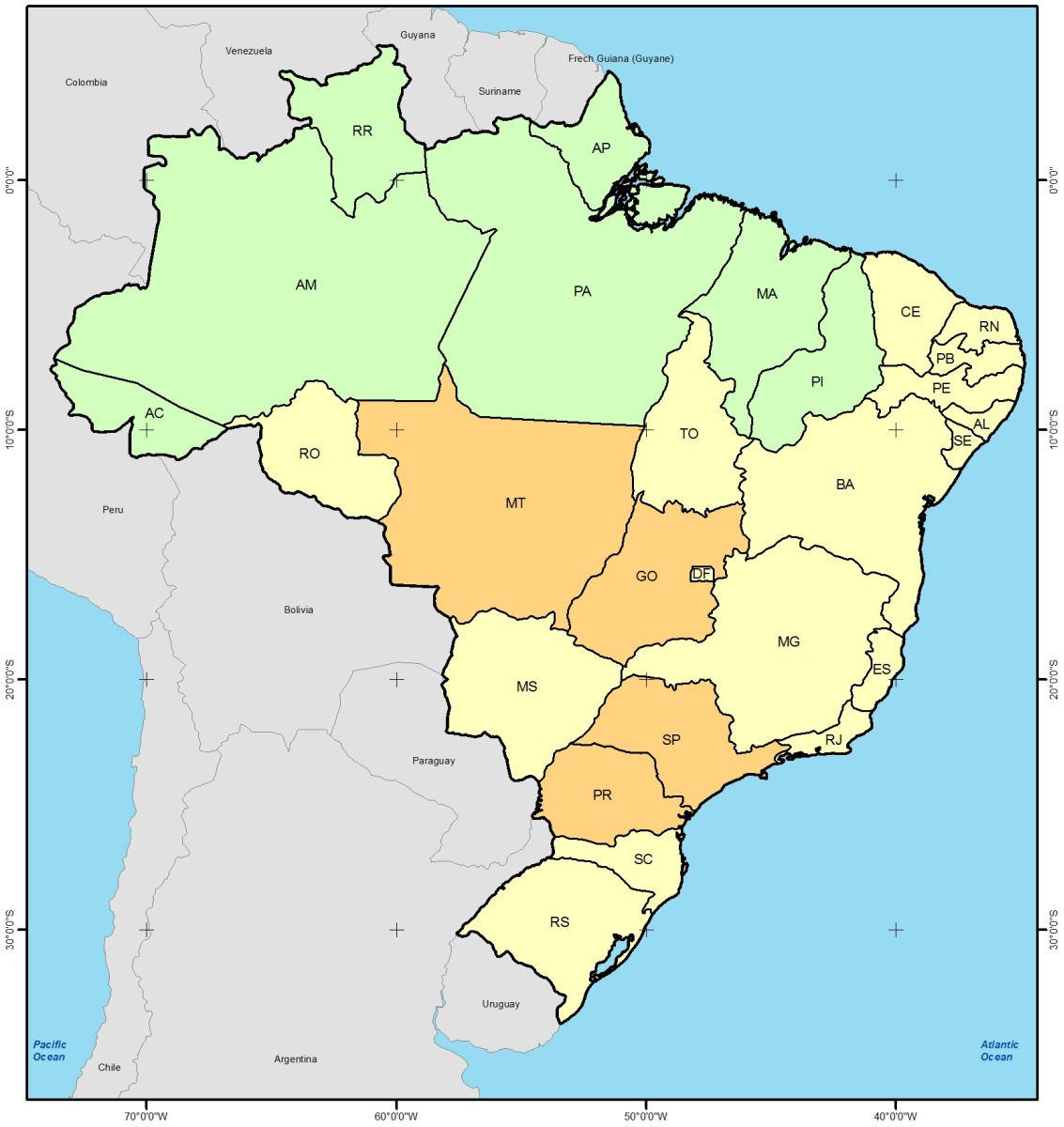


Figure 4 - Dendrogram for clustering with Ward linkage and squared Euclidean distance

The distribution of Brazilian states within the clusters is depicted in Figure 5.



LEGEND:

Brazil

Others South American countries

Cluster:

1 (Sum: 07 UF)

AC, Acre
AM, Amazonas
AP, Amapá
MA, Maranhão
PA, Pará
PI, Piauí
RR, Roraima

2 (Sum: 16 UF)

AL, Alagoas
BA, Bahia
CE, Ceará
DF, Distrito Federal
ES, Espírito Santo
MG, Minas Gerais
MS, Mato Grosso do Sul
PB, Paraíba
PE, Pernambuco
RJ, Rio de Janeiro
RN, Rio Grande do Norte
RO, Rondônia
RS, Rio Grande do Sul
SC, Santa Catarina
SE, Sergipe
TO, Tocantins

3 (Sum: 04 UF)

GO, Goiás
MT, Mato Grosso
PR, Paraná
SP, São Paulo

N

IBGE: boundaries;
WayCarbon, 2013
Geographic coordinates
Horizontal DatumWGS84
Scale
1: 22.500.000

0 250 500 1000 (km)

Figure 5 - Distribution of Brazilian states within clusters

2.4 Baseline Scenario

As per VM0019 (Version 1.0), the latest version of the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 05.0.0, at the time of completion of the PD) shall be applied to identify the baseline scenario for every regional group and for every commercial fleet in the project boundary, including Greenfield instances. Therefore, the following steps were applied:

Step 1. Identification of alternative scenarios to the proposed VCS project activity that are consistent with current laws and regulations.

For every regional group and for every commercial fleet in the project boundary, the following scenarios were identified as the realistic and credible alternatives to the project activity:

S1. Adoption of the project scenario fuel consumption pattern without the carbon credits incentive;

S4. Continuation of the existing fuel consumption pattern.

The alternatives are in compliance with all mandatory applicable legal and regulatory requirements, even laws and regulations with objectives other than GHG reductions (e.g. to mitigate local air pollution.) National and local policies that do not have legally binding status are not considered.

Outcome of Step 1: Realistic and credible alternative scenarios that are in compliance with all mandatory systematically enforced regulations are: S1) the adoption of the project scenario fuel consumption pattern without the carbon credits incentive; and S4) the continuation of the existing fuel consumption pattern.

2.5 Additionality

As per VM0019 (Version 1.0), additionality shall be demonstrated for each regional group by applying the latest version of the "Combined tool to identify the baseline scenario and demonstrate additionality" *(*Version 05.0.0, at the time of completion of the PD*).*

For every regional group and for every commercial fleet in the project boundary, the following steps were applied:

Step 2: Barrier analysis to eliminate alternatives to the project activity that face prohibitive barriers

This step serves to identify barriers and to assess which alternative scenarios are prevented by these barriers. The latest approved version of the "Guidelines for objective demonstration and assessment of barriers" (Version 01, at the time of completion of the PD) has been taken into account when applying this step.

Step 2a: Identify barriers that would prevent the implementation of alternative scenarios

No barriers that would prevent the implementation of the alternative scenarios have been identified for the regional groups and commercial fleets in the project boundary.

Outcome of Step 2a: *No barrier preventing one or more alternative scenarios to occur has been identified.*

Step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

As no barriers that would prevent alternative scenarios have been identified in Step 2a, neither the adoption of the project scenario fuel consumption pattern without the carbon credits incentive nor the continuation of the existing fuel consumption pattern is eliminated from further consideration.

Outcome of Step 2b: *The alternative scenarios to the project activity that are not prevented by any barrier are: S1) the adoption of the project scenario fuel consumption pattern without the carbon credits incentive; and S4) the continuation of the existing fuel consumption pattern.*

Outcome of Step 2: As there is more than one alternative scenario that is not prevented by any barrier and the proposed project activity is not the first-of-its-kind, Step 3 (investment analysis) is performed.

Step 3: Investment Analysis

The objective of the investment analysis is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2. The latest approved version of the "Guidelines on the assessment of investment analysis" (Version 05.0, at the time of completion of the PD) has been taken into account when applying this step.

As all alternative scenarios remaining after Step 2 should be included in the investment analysis, the suitable financial indicator is calculated for both (S1) the adoption of the project scenario fuel consumption pattern without the carbon credits incentive and (S4) the continuation of the existing fuel consumption pattern.

The investment analysis consists in demonstrating that scenario (S1) is less economically or financially attractive than scenario (S4). As the project activity and the alternative scenarios generate no financial or economic benefits other than the carbon credits income, a simple cost analysis is performed in order to demonstrate that there is at least one alternative scenario that is less costly than the project activity.

The comparison of the attractiveness of scenarios (S1) and (S4) corresponds to the valuation of the fuel flexibility offered by flex-fuel vehicles to fleet owners in the scenario of continuation of the existent consumption pattern (which does not exist in the project scenario). Such flexibility faced by the owners of vehicles is a switch option, which can be exercised at each fueling operation. As pointed out by Bastian-Pinto, Brandão & Alves[15], "given the uncertainty on future prices of ethanol

[15] Bastian-Pinto, C., Brandão, L., Alves, M. (2010). Valuing the switching flexibility of the ethanol-gas flex-fuel car. Annals of Operations Research, 176(1), pp.333-348. Available at: <http://www.iag.puc-rio.br/~brandao/Pos%20MBA%20OR/Brandao/Bastian,%20Brandao,%20Alves%20-%20Valuing%20the%20Flex%20Fuel%20Car%20-%20ANOR%202009.pdf>. Access on 11/06/13.

and gas, this option adds value to the owner since he can always opt for the cheaper fuel whenever he fills ups his car". Therefore, flexibility of flex-fuel vehicles can be assessed from the perspective of Real Options Analysis (ROA)[16].

Within the ROA framework, the method adopted to perform the investment analysis is the Dynamic Cash Flow Simulation. This approach has been adopted by Alves[17] and Bastian-Pinto, Brandão & Alves and consists in converting traditional cash flows of each scenario into dynamic cash flows by varying successively the key variables of the model: gasoline prices and ethanol prices. That way, behavior of prices of both fuels is modeled by Geometric Brownian Motion (GBM), a stochastic process.

The following data have been used in the analysis:

Prices of ethanol and gasoline: historical monthly prices of ethanol and gasoline (from January 2006, characterized as the beginning of the year when the production of flex-fuel vehicles in Brazil increased substantially, overcoming the production of gasoline vehicles, to the month before the start date of the project activity for each specific instance) were obtained from ANP and used to estimate the volatility of the prices of each fuel for each state. Available at: http://www.anp.gov.br/preco/prc/Resumo_Mensal_Index.asp.

Inflation: prices series of ethanol and gasoline have been deflated by the IPCA price index, which is a widely used Brazilian inflation index. The same vintage (January 2006 until the month before the start date of the project activity for the specific fleet) was used in order to allow for the consistency of the analysis. Available at: www.ipeadata.gov.br.

Risk-free rate: monthly values of TJLP (*Taxa de Juros de Longo Prazo* – Long Term Interest Rate), a basic cost of financing in Brazil, are used as risk-free rate. The same vintage (January 2006 until the month before the start date of the project activity for the specific fleet) was used in order to allow for the consistency of the analysis. Available at: http://www.receita.fazenda.gov.br/pessoajuridica/refis/tjlp.htm

Consumption: historical monthly consumption of ethanol and gasoline per state of Brazil, obtained from Ecofrotas database, are used to estimate future fuel consumption. The same vintage (the beginning of the fuel consumption historical records for the specific fleet or January 2006, whichever comes last until the month before the start date of the project activity for the specific fleet) was used in order to allow for the consistency of the analysis. In this case at least one-month consumption record under Ecofrotas system before the project start date is necessary.

Two traditional cash flows are calculated considering the states of Brazil for which historical fueling data are available. The period of analysis is 10 years from the start date of the Grouped

[16] In fact, according to Bastian-Pinto, Brandão & Alves (2009) the analysis of the flexibility of flex-fuel vehicles cannot be modelled by traditional valuation methods, such as discounted cash flow methods. The conditions presented by this problem (irreversibility of the investment on a flex-fuel vehicle, uncertainty about future behaviour of fuel prices and flexibility to choose the fuel with a better cost-benefit relation) require the adoption of option pricing methods.

[17] Alves, M. (2007). Flex-fuel car: a real option valuation, Pontícia Universidade Católica do Rio de Janeiro. Avaliable at: <http://www.maxwell.lambda.ele.puc-rio.br/Busca_etds.php?strSecao=resultado&nrSeq=10553@2>. Access on: 10/06/13.

Project. Each of these cash flows considers the exclusive consumption of one type of fuel by the fleet, as following:

(a): the fleet consumes only ethanol;

(b): the fleet consumes only gasoline.

Afterwards, both traditional cash flows are converted into dynamic cash flows by assuming that the prices of ethanol and gasoline behave in accordance with a Geometric Brownian Motion diffusion process.

These cash flows are calculated by multiplying the estimated price of the fuel in state of Brazil *s* in period *t+1* by the average fuel consumption of the fleet in the same state according to historical data. It is adopted the assumption that such average consumption is maintained throughout the whole period of analysis.

For each Brazilian state, the price of ethanol and gasoline in period *t+1* is estimated as the price of the fuel in period *t* multiplied by the exponential of the inverse function of a normal distribution, whose mean μ is given by the formula:

$$\mu_{fuel,state} = r - \frac{\left(\sigma_{fuel,state}\right)^2}{2}$$

Where:

$\mu_{fuel,state}$ = mean of the normal distribution for each fuel *f* and Brazilian state *s;*

r = risk-free rate;

$\sigma_{fuel,\,state}$ = standard deviation of the normal distribution for each fuel *f* and Brazilian state *s.*

The standard deviation $\sigma_{fuel,\,state}$ is estimated as the standard deviation of the historical volatility of the fuel price:

$$\sigma_{fuel,\,state} = \text{standard deviation}\left[\ln\left(\frac{p_{t,f\square el,state}}{p_{t-1,fuel,state}}\right)\right]$$

Where:

$p_{t,\,fuel,\,state}$ = price of the fuel *f* in Brazilian state *s* during in period *t*;

$p_{t\,-\,1,\,fuel,\,state}$ = price of the fuel *f* in Brazilian state *s* during in period *t -1*.

A third dynamic cash flow is calculated from the cash flow that considers exclusive consumption of ethanol and the one that considers only consumption of gasoline. In this cash flow, each month, the most financially attractive of the two previous cash flows (which refer to the less costly fuel at each month and state, taking into account the differences in the fuels' net calorific

values[18]) is chosen. The result is dynamic cash flow (c), which represents the continuation of the current scenario:

(c): the fleet consumes the fuel that is less costly.

Net Present Value is calculated for both dynamic cash flows (a) and (c), which represent scenarios (S1) the adoption of the project scenario fuel consumption pattern without the carbon credits incentive and (S4) the continuation of the existing fuel consumption pattern, respectively. TJLP is used as discount rate for both NPVs, in accordance with the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 05.0.0).

The comparison between both indicators is given by the difference between NPV(c) and NPV(a). Furthermore, it is calculated the percentage additional cost faced by the fleet owner due to the loss of the fuel switch option.

Afterwards, one thousand Monte Carlo iterations are performed, which corresponds to one thousand combinations of fuel prices according to the normal distribution of probabilities. As the dynamic cash flows are modified at each new iteration, NPVs and the percentage additional cost due to the loss of the switch option are calculated one thousand times. The expected result of the analysis consists in the mean of the results of all Monte Carlo iterations.

The results of the simulation for each cluster and for each instance are presented in Table 8. As, in some fleets and regional groups, the presence of outlier values in the superior part of the results distribution might have distorted the mean, the median of the distribution was considered as the most appropriate and representative result, which also consists in a more conservative approach.

Table 8 - Results of the Median additional cost due to the loss of fuel switch real option

Instance	Overall	Cluster 1	Cluster 2	Cluster 3
7880	5.5%	-	15.3%	5.4%
11670	24.7%	21.3%	24.2%	18.8%
42750	4.5%	-	3.3%	3.0%
44152	13.8%	15.3%	15.1%	9.7%
52397	13.3%	13.3%	11.1%	9.4%
52398	8.0%	-	15.9%	32.8%
52399	12.4%	-	16.2%	4.9%
52400	10.2%	-	11.9%	4.3%
59866	23.4%	18.6%	23.1%	16.3%

Sensitivity Analysis

[18] Usually the liter of ethanol costs less than the liter of gasoline, but the energy content per volume of gasoline is higher than the ethanol, i.e. although the gasoline price per volume is higher, this fuel can be less costly than ethanol when considering its net calorific value.

According to the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 05.0.0), a sensitivity analysis should be included in the investment analysis in order to assess whether the conclusion regarding the financial attractiveness of the project activity is robust to reasonable variations in the critical assumptions.

Three assumptions have been identified as critical in the analysis: the volatility of ethanol prices; the volatility of gasoline prices; and the consumption of fuel. Variations of -10% and 10% have been applied to each of these parameters and one thousand iterations have been performed in order to obtain results comparable to the ones obtained in the first part of the investment analysis. The median results obtained after the Monte Carlo simulation applied to such variations are presented in Tables 8 to 10. It should be noted that, due to the randomness of the simulations, results from the sensitivity analysis are not always intuitive. Therefore, this step was performed taking into account both negative and positive variations in critical parameters.

Table 9 - Median additional cost after +10% and -10% variations in the volatility of ethanol prices

Instance Code	Cluster 1			Cluster 2			Cluster 3		
	Original	-10%	+10%	Original	-10%	+10%	Original	-10%	+10%
7880	-	-	-	15.3%	15.2%	15.6%	5.4%	4.5%	6.2%
11670	21.3%	21.9%	22.8%	24.2%	22.6%	0.0%	18.8%	17.4%	19.1%
42750	-	-	-	3.3%	3.3%	3.4%	3.0%	3.0%	3.5%
44152	15.3%	15.3%	15.9%	15.1%	14.5%	16.6%	9.7%	8.8%	10.3%
52397	13.3%	13.2%	12.4%	11.1%	12.4%	11.8%	9.4%	8.7%	10.5%
52398	-	-	-	15.9%	16.8%	16.4%	32.8%	33.5%	32.3%
52399	-	-	-	16.2%	15.6%	15.2%	4.9%	6.5%	5.4%
52400	-	-	-	11.9%	12.2%	11.3%	4.3%	11.3%	5.4%
59866	18.6%	17.1%	17.9%	23.1%	21.6%	24.5%	16.3%	14.6%	17.3%

Table 10 - Median additional cost after +10% and -10% variations in the volatility of gasoline prices

Instance Code	Cluster 1			Cluster 2			Cluster 3		
	Original	-10%	+10%	Original	-10%	+10%	Original	-10%	+10%
7880	-	-	-	15.3%	16.2%	15.8%	5.4%	4.9%	5.2%
11670	21.3%	21.1%	0.0%	24.2%	24.4%	23.9%	18.8%	17.4%	20.2%
42750	-	-	-	3.3%	3.1%	3.2%	3.0%	3.6%	2.9%
44152	15.3%	14.9%	15.9%	15.1%	16.6%	17.1%	9.7%	9.6%	9.6%
52397	13.3%	13.7%	12.2%	11.1%	11.6%	12.5%	9.4%	9.8%	9.2%
52398	-	-	-	15.9%	16.3%	16.3%	32.8%	36.6%	35.4%
52399	-	-	-	16.2%	15.1%	15.0%	4.9%	5.3%	5.7%
52400	-	-	-	11.9%	12.6%	11.7%	4.3%	5.7%	5.1%

59866	18.6%	16.9%	18.0%	23.1%	22.8%	23.4%	16.3%	18.4%	16.3%

Table 11 - Median additional cost after +10% and -10% variations in the fuel consumption

Instance Code	Cluster 1			Cluster 2			Cluster 3		
	Original	-10%	+10%	Original	-10%	+10%	Original	-10%	+10%
7880	-	-	-	15.3%	15.7%	15.4%	5.4%	5.1%	5.9%
11670	21.3%	22.1%	21.4%	24.2%	24.2%	23.8%	18.8%	18.7%	19.3%
42750	-	-	-	3.3%	3.4%	3.4%	3.0%	3.1%	3.0%
44152	15.3%	16.7%	15.5%	15.1%	16.0%	17.0%	9.7%	10.0%	10.2%
52397	13.3%	13.4%	12.6%	11.1%	12.2%	11.6%	9.4%	9.7%	8.8%
52398	-	-	-	15.9%	16.3%	49.9%	32.8%	33.8%	34.7%
52399	-	-	-	16.2%	15.0%	14.9%	4.9%	5.2%	6.5%
52400	-	-	-	11.9%	12.8%	10.9%	4.3%	5.8%	4.0%
59866	18.6%	17.6%	17.7%	23.1%	23.3%	23.3%	16.3%	18.9%	18.3%

As it consistently supports the conclusion that the alternative scenario is the most financially attractive,

Step 4: Common Practice Analysis

As per the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 05.0.0), the previous steps shall be complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and applicable geographical area.

As the grouped project activity falls under measure (i) fuel and feedstock switch, as described in definitions of the aforementioned tool, the "Guidelines on common practice" (Version 02.0, at the time of completion of the PD) shall be applied. The following steps shall be followed:

1. Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

For the calculation of the +/-50% range of the project activity, the amount of kilometers per year – considering the reference year "*y*", the full year before the project start date - was considered as a measure of the instances output.

For all the past years (from 2006-2012, period which includes all the reference years "*y*" for this Grouped Project instances) the most sold light vehicle in Brazil was VW Gol Ecomotion[19]; therefore, its efficiency was used as a reference for the present calculation. According to

[19] Available at <http://quatrorodas.abril.com.br/autoservico/top50/2011.shtml>, assessed on 15/10/2013

INMETRO[20] (National Institute of Metrology, Quality and Technology), this vehicle type presents an efficiency of 8.4 km/liter when running with ethanol and 12 km/liter when running with gasoline.

Considering the efficiency and the total ethanol and gasoline consumption of each instance of the Grouped Project, the total output of each instance was calculated by summing up the potential distance traveled using ethanol and the potential distance traveled using gasoline.

The output range (+50% and -50%) is finally calculated and depicted in Table 12.

Table 12 - Output range per instance of the Grouped Project

Instance	Fuel consumption reference year (l)		Output (km)		Total Output (km)	- 50% total output	+ 50% total output
	Ethanol	Gasoline	Ethanol	Gasoline			
7880	78,610	110,188	660,324	1,322,251	1,982,575	991,288	2,973,863
11670	245,675	1,516,524	12,738,800	2,948,095	15,686,895	7,843,448	23,530,343
42750	87,016	120,835	730,932	1,450,017	2,180,949	1,090,474	3,271,423
44152	255,991	4,091	2,150,321	49,089	2,199,410	1,099,705	3,299,115
52397	56,330	169,551	473,169	2,034,610	2,507,779	1,253,889	3,761,668
52398	6,440	34,528	54,093	414,339	468,432	234,216	702,649
52399	15,398	37,228	129,340	446,737	576,076	288,038	864,114
52400	13,916	38,088	116,890	457,055	573,945	286,973	860,918
59866	186,633	214,305	1,567,714	2,571,663	4,139,378	2,069,689	6,209,066

2. Identify similar projects (both CDM and non-CDM), which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

[20] Available at <http://www.inmetro.gov.br/consumidor/pbe/veiculos_leves_2012.pdf>, assessed on 15/10/2013

There have not been identified similar projects in Brazil which fulfill condition (c) above as the service of substituting the totality of the fuel consumption of commercial fleets from fossil fuels to ethanol and even maintaining such switch in off-season periods, when gasoline prices are more attractive than ethanol prices, is not offered by other fleet management companies. Therefore, there are not projects that fulfill all conditions above and it is not possible to apply Steps 3 to 5.

As per the "Guidelines on common practice" (Version 02.0), the proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor *F* (calculated in Step 5) is greater than 0.2 and the difference between N_{all} (calculated in Step 3) and N_{diff} (calculated in Step 4) is greater than 3. As it was not possible to apply such steps, such factors do not exist for the Grouped Project. Hence, it shall not be deemed as common practice.

Since all steps above have been satisfied, the project is additional.

2.6 Methodology Deviations

There are no methodology deviations.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The baseline emissions include exclusively the emissions from fossil fuel combustion by the commercial fleet that would have occurred in the baseline scenario.

The baseline emissions are calculated as follows:

$$BE_y = \sum_{i=x_1}^{x_n} BE_{FF,i,y} \quad (1)$$

Where:

BE_y	Baseline emissions in year *y* (tCO_2);
$BE_{FF,i,y}$	CO_2 emissions from gasoline combustion by commercial fleet *i* in year *y* (tCO_2e);
i	x_1, x_2, ..., x_n commercial fleets in the project activity.

The baseline emissions from fossil fuel combustion by a commercial fleet are calculated as follows:

$$BE_{FF,i,y} = COEF_{gas,y} \bullet \sum_{R=r_1}^{r_m} FC_{gas,i,R,y} \quad (2)$$

Where:

$BE_{FF,i,y}$	Baseline emissions from gasoline combustion by commercial fleet *i* in year *y* (tCO_2e);

$FC_{gas,i,R,y}$	Gasoline consumption by the commercial fleet *i* in the baseline scenario, in cluster *R* in year *y* (L);
$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L)
R	r_1, r_2, ..., r_m clusters where a fleet *i* has fueled during the year *y*.

The gasoline consumption by fleets in the baseline scenario are calculated as follows:

$$FC_{gas,i,R,y} = FC_{ethanol,i,R,y} \bullet P_{i,R,BSL} \bullet T_{ff,y} \quad (3)$$

Where:

$FC_{gas,i,R,y}$	Gasoline consumption by the commercial fleet *i* in the baseline scenario, in cluster *R* in year *y* (L);
$FC_{ethanol,i,R,y}$	Ethanol consumption by the commercial fleet *i* in the project activity in cluster *R* in year *y* (L);
$P_{i,R,BSL}$	Baseline fuel consumption pattern of commercial fleet *i* in cluster *R* in the baseline scenario (%);
$T_{ff,y}$	Conversion factor between gasoline and ethanol in year *y* (dimensionless).

The values applied for the baseline emissions calculation for each instance can be found in Table 13 below.

Table 13 - Baseline emissions calculation per instance

Instance code	Cluster (R)	$FC_{ethanol,i,R,y}$ (Liters)	$T_{ff,y}$	$FC_{gas,i,R,y}$ (Liters)	$BE_{FF,i,y}$ (tCO_2e)
7880	2	81.20	0.704	45.45	0
	3	78,528.80	0.704	28,198.42	39
11670	1	6,454.36	0.704	4,227.72	6
	2	106,411.34	0.704	59,555.35	82
	3	132,808.92	0.704	47,051.93	65
42750	2	25,021.18	0.702	13,948.91	20
	3	61,994.51	0.702	21,877.77	31
44152	1	0	0.702	0.00	0
	2	67,568.41	0.702	37,668.33	54
	3	188,422.16	0.702	66,493.91	95
52397	1	0	0.702	0.00	0
	2	7,238.48	0.702	4,035.34	6
	3	49,091.11	0.702	17,324.18	25
52398	2	40.00	0.702	22.30	0
	3	6,399.64	0.702	2,258.42	3

52399	2	1,757.42	0.702	979.73	1
	3	13,640.14	0.702	4,813.59	7
52400	2	4,016.85	0.702	2,239.33	3
	3	5,080.18	0.702	1,792.79	3
59866	1	6,355.44	0.703	4,152.07	6
	2	74,714.00	0.703	41,706.16	59
	3	105,563.21	0.703	37,301.66	52

3.1.1 Procedure to calculate the CO_2 emission coefficient ($COEF_{gas,y}$)

The CO_2 emission coefficient $COEF_{gas,y}$ is calculated based on net calorific value and CO_2 emission factor of gasoline, as follows:

$$COEF_{gas,y} = NCV_{gas,y} \bullet EF_{CO2,gas,y} \quad (4)$$

Where:

$COEF_{gas,y}$ CO_2 emission coefficient of gasoline in year *y* (tCO_2/L);
$NCV_{gas,y}$ weighted average net calorific value of gasoline in year *y* (GJ/L);
$EF_{CO2,gas,y}$ weighted average CO_2 emission factor of gasoline (tCO_2/GJ).

Values applied for each instance are displayed in Table 14.

Table 14 - Values applied for the calculation of emission coefficient of gasoline in year y

Instance code	$COEF_{gas,y}$ (tCO_2/L)	$NCV_{gas,y}$ (GJ/L)	$EF_{CO2,gas,y}$ (tCO2/GJ)
7880	0.0017	0.0303	0.0575
11670	0.0017	0.0303	0.0575
42750	0.0018	0.0304	0.0584
44152	0.0018	0.0304	0.0584
52397	0.0018	0.0303	0.0584
52398	0.0018	0.0304	0.0584
52399	0.0018	0.0304	0.0584
52400	0.0018	0.0304	0.0584
59866	0.0018	0.0304	0.0581

3.1.2 Procedure to determine the baseline fuel consumption pattern of a commercial fleet ($P_{I,R,BSL}$)

Proportion between the use of gasoline and the use of ethanol in the annual fuel consumption in the baseline scenario in a cluster characterizes the baseline fuel consumption pattern of a fleet in this cluster. The historical values of the fuel consumption patterns of Ecofrotas commercial fleets are adopted.

In case of commercial fleets with no at least 3-years historical data available, the historical data of a fleet from the same cluster is adopted.

Baseline fuel consumption pattern in a cluster is determined as follows:

$$P_{i,R,BSL} = \frac{FC_{gas,i,R,BSL}}{FC_{gas,i,R,BSL} + FC_{ethanol,i,R,BSL}} \quad (5)$$

Where:

$P_{i,R,BSL}$ Baseline fuel consumption pattern of a commercial fleet *i* in cluster *R* in the baseline scenario (%);

$FC_{gas,i,R,BSL}$ Total quantity of gasoline consumed by commercial fleet *i* in cluster *R* during the reference period (L);

$FC_{ethanol,i,R,BSL}$ Total quantity of ethanol consumed by commercial fleet *i* in project region *R* during the reference period (L).

For fleets with insufficient historical data, the proportion between the use of gasoline and the use of ethanol in the baseline scenario per cluster was calculated based on the Ecofrotas complete database of clients. The values used for the calculation are displayed in Table 15.

Table 15 - Values applied for the calculation of the baseline fuel consumption pattern for each cluster based on the Ecofrotas complete database

Cluster	$FC_{gas,i,R,BSL}$ (Liters)	$FC_{ethanol,i,R,BSL}$ (Liters)	$P_{i,R,BSL}$ (%)
Cluster 1	73,719,903	5,164,336	93.5
Cluster 2	604,461,640	187,053,805	76.4
Cluster 3	309,839,768	478,274,228	39.3

Values of baseline fuel consumption patterns applied for each instance are displayed in Table 16, considering the availability of historical data for each fleet.

Table 16 - Values applied for the calculation of the baseline fuel consumption pattern for each fleet

Instance code	Cluster (R)	At least 3-years historical data?	$FC_{gas,i,R,BSL}$ (Liters)	$FC_{ethanol,i,R,BSL}$ (Liters)	$P_{i,R,BSL}$ (%)
7880	2	No	-	-	76.4
	3	Yes	123,863	119,099	51.0
11670	1	No	-	-	93.5
	2	No	-	-	76.4
	3	No	-	-	39.3
42750	2	No	-	-	93.5
	3	No	-	-	76.4
44152	1	No	-	-	93.5
	2	No	-	-	76.4
	3	No	-	-	39.3
52397	1	No	-	-	93.5
	2	No	-	-	76.4
	3	No	-	-	39.3
52398	2	No	-	-	93.5
	3	No	-	-	76.4
52399	2	No	-	-	93.5
	3	No	-	-	76.4
52400	2	No	-	-	93.5
	3	No	-	-	76.4
59866	1	No	-	-	93.5
	2	No	-	-	76.4
	3	No	-	-	39.3

3.1.3 Procedure to determine the conversion factor between gasoline and ethanol ($T_{ff,y}$)

The conversion factor between gasoline and ethanol is calculated as a relationship between net calorific values (NCV) of these fuels. It shows the volume of ethanol necessary to substitute one liter of gasoline in the project activity.

The conversion factor between gasoline and ethanol is calculated as follows:

$$T_{ff,y} = \frac{NCV_{ethanol,y}}{NCV_{gas,y}} \quad (6)$$

Where:

$T_{ff,y}$	conversion factor between gasoline and ethanol in year *y*;
$NCV_{ethanol,y}$	weighted average net calorific value of ethanol in year *y* (GJ/L).
$NCV_{gas,y}$	weighted average net calorific value of gasoline in year *y* (GJ/L).

3.2 Project Emissions

Project emissions include consumption of gasoline in the project activity for emergency cases and for engine startup mechanism. The project emissions from ethanol consumption that is renewable fuel are considered zero.

Project emissions are calculated as follows:

$$PE_y = \sum_{i=x_1}^{x_n} PE_{FC,i,y} \quad (7)$$

Where:

PE_y	Project emissions in year *y* (t CO_2/yr)
$PE_{FC,i,y}$	Project emissions from gasoline combustion by commercial fleet *i* in year *y* (t CO_2/yr)
i	x_1, x_2,..., x_n commercial fleets in the project activity.

Project emissions from gasoline combustion are calculated as follows:

$$PE_{FC,i,y} = FC_{gas,i,y} \bullet COEF_{gas,y} \quad (8)$$

Where:

$PE_{FC,i,y}$	Project emissions from gasoline combustion in year y (tCO_2);
$FC_{gas,\ i,\ y}$	Gasoline consumption by commercial fleet *i* in the project scenario in year *y* (L);
$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L), according to Procedure 3.1.1.

As the project activity consists of the complete substitution of gasoline blends by ethanol (it is permitted to use maximum 5% of the volume of gasoline), it was not possible to calculate ex-ante project emissions.

3.3 Leakage

No leakage emissions are considered in the project.

3.4 Summary of GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e/yr)
BE_y = Baseline emissions in year *y* (tCO_2e/yr)
PE_y = Project emissions in year *y* (tCO_2/yr)
LE_y = Leakage emissions in year *y* (tCO_2/yr)

Table 17 - Summary of ex-ante GHG Emission Reductions per instance per year y

Instance code	BE_y	PE_y	LE_y	ER_y
7880	38	0	0	38
11670	134	0	0	134
42750	43	0	0	43
44152	125	0	0	125
52397	24	0	0	24
52398	2	0	0	2
52399	6	0	0	6
52400	5	0	0	5
59866	103	0	0	103

The ex-ante calculation (estimate) of baseline emissions/removals, project emissions/removals, leakage emissions and net emission reductions and removals are provided in the table below:

Table 18 - Summary of GHG Emission Reductions per year

Years	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
From 2nd July 2012	117	0	-	117
2013	431	0	-	431
2014	472	0	-	472
2015	472	0	-	472
2016	472	0	-	472
2017	472	0	-	472
2018	472	0	-	472
2019	472	0	-	472
2020	472	0	-	472

2021	472	0	-	472
Until 1st July 2022	235	0	-	235
Total	4,559	0	-	4,559

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	$P_{i,R,BSL}$
Data unit:	dimensionless
Description:	Fuel consumption pattern of fleet *i* in project region *R*, in the baseline scenario
Source of data:	Calculated *ex ante*
Value applied:	Please refer to Table 15 and Table 16.
Justification of choice of data or description of measurement methods and procedures applied:	Calculated according to Procedure 3.1.2.
Any comment:	-

Data Unit / Parameter:	$FC_{gas,i,R,BSL}$
Data unit:	liters
Description:	Total quantity of gasoline consumed by commercial fleet *i* in project region *R* during the reference period before the start of the project activity
Source of data:	Historical values
Value applied:	Please refer to Table 15 and Table 16.
Justification of choice of data or description of measurement methods and procedures applied:	The historical values of the fuel consumption patterns of Ecofrotas commercial fleets are adopted. In case of commercial fleets with no historical data available, the historical data of a fleet from the same cluster is adopted. Direct measurement is used. This measurement is performed by the metering pumps of automotive fuels located at gas stations and used in all fueling operations. Pumps are composed of four sets of

	components: pumping, metering, indication and fueling. After being pumped from the underground tank by the engine, being filtered and having the air and gases eliminated, the liquid fuel enters the metering unit, where the measuring device is located. The measuring device must match the model approved by the National Institute of Metrology, Standardization and Industrial Quality (*Instituto Nacional de Metrologia, Padronização e Qualidade Industrial* - INMETRO) and have the following characteristics: a) Support the maximum pressure developed by the fluid without external leakage; b) Have proper locations for the application of seals, preventing access to the interior; c) Have a regulating device; d) Have a flow rate of no more than 200 l / min. After being measured, the fuel is sent to the fuel tank of the vehicle through a hose and nozzle. Information are processed and sent to the indicating device, which displays the volume supplied and the price to be paid by the consumer. The volume displayed by the indicating device, which is typed by the gas station attendant in the POS terminal in order to perform the financial transaction, is the data that is transmitted to the Ecofrotas system. These data are then used to calculate baseline emissions, project emissions and emission reductions without conversions or statistical estimations. Compliance of measurement equipment with the applicable regulations, including calibration of the fuel dispensers following the manufacturer's specifications, is annually verified by the Institute of Weights and Measures (*Instituto de Pesos e Medidas* - IPEM) in each Brazilian federation unit. Fuel dispensers may also be subject to eventual verifications. Provided that keeping measuring devices in proper working conditions is enforced by Brazilian Law and taking into account the scale of the gas station network accredited to the Ecofrotas' Good Card (which comprises about

	15,000 gas stations spread across all 27 Brazilian Federation Units), it is assumed that all fuel dispensers operating in the gas stations under Ecofrotas' network are in accordance with INMETRO regulations at the moment of the fueling operations.
Any comment:	-

Data Unit / Parameter:	$FC_{ethanol,i,R,BSL}$
Data unit:	liters
Description:	Total quantity of ethanol consumed by commercial fleet *i* in project region *R* during the reference period before the start of the project activity
Source of data:	Historical values
Value applied:	Please refer to Table 15 and Table 16.
Justification of choice of data or description of measurement methods and procedures applied:	The historical values of the fuel consumption patterns of Ecofrotas commercial fleets are adopted. In case of commercial fleets with no historical data available, the historical data of a fleet from the same cluster is adopted. Direct measurement is used. This measurement is performed by the metering pumps of automotive fuels located at gas stations and used in all fueling operations. Pumps are composed of four sets of components: pumping, metering, indication and fueling. After being pumped from the underground tank by the engine, being filtered and having the air and gases eliminated, the liquid fuel enters the metering unit, where the measuring device is located. The measuring device must match the model approved by the National Institute of Metrology, Standardization and Industrial Quality (*Instituto Nacional de Metrologia, Padronização e Qualidade Industrial* - INMETRO) and have the following characteristics: a) Support the maximum pressure developed by the fluid without external leakage; b) Have proper locations for the application of

	seals, preventing access to the interior; c) Have a regulating device; d) Have a flow rate of no more than 200 l / min. After being measured, the fuel is sent to the fuel tank of the vehicle through a hose and nozzle. Information are processed and sent to the indicating device, which displays the volume supplied and the price to be paid by the consumer. The volume displayed by the indicating device, which is typed by the gas station attendant in the POS terminal in order to perform the financial transaction, is the data that is transmitted to the Ecofrotas system. These data are then used to calculate baseline emissions, project emissions and emission reductions without conversions or statistical estimations. Compliance of measurement equipment with the applicable regulations, including calibration of the fuel dispensers following the manufacturer's specifications, is annually verified by the Institute of Weights and Measures (*Instituto de Pesos e Medidas* - IPEM) in each Brazilian federation unit. Fuel dispensers may also be subject to eventual verifications. Provided that keeping measuring devices in proper working conditions is enforced by Brazilian Law and taking into account the scale of the gas station network accredited to the Ecofrotas' Good Card (which comprises about 15,000 gas stations spread across all 27 Brazilian Federation Units), it is assumed that all fuel dispensers operating in the gas stations under Ecofrotas' network are in accordance with INMETRO regulations at the moment of the fueling operations.
Any comment:	-

4.2 Data and Parameters Monitored

Data Unit / Parameter:	$NCV_{gas,y}$
Data unit:	GJ/L
Description:	Weighted average net calorific value of gasoline

	in year *y*
Source of data:	Calculated by the PP using data from ANP (National default values from 2012, available at http://www.anp.gov.br/?pg=66833)
Description of measurement methods and procedures to be applied:	National default values are adopted and reviewed annually.
Frequency of monitoring/recording:	Annually
Value applied:	Please refer to Table 14.
Monitoring equipment:	Not applicable.
QA/QC procedures to be applied:	Verify if the value is within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the value fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO 17025 accreditation or justify that they can comply with similar quality standards.
Calculation method:	The parameter is provided by ANP in kcal/kg, the conversion to GJ/L is made through conversion factors and through the density (ton/m^3), both provided by ANP annually.
Any comment:	-

Data Unit / Parameter:	$NCV_{ethanol,y}$
Data unit:	GJ/L
Description:	Weighted average net calorific value of ethanol in year *y*
Source of data:	ANP (National default values)
Description of measurement methods and procedures to be applied:	National default values are adopted and reviewed annually.
Frequency of monitoring/recording:	Annually
Value applied:	0.02
Monitoring equipment:	Not applicable.
QA/QC procedures to be applied:	Verify if the value is within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the value fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have

	ISO 17025 accreditation or justify that they can comply with similar quality standards.
Calculation method:	The parameter is provided by ANP in kcal/kg, the conversion to GJ/L is made through conversion factors and through the density (ton/m^3), both provided by ANP annually.
Any comment:	-

Data Unit / Parameter:	$FC_{ethanol,i,R,y}$
Data unit:	liters
Description:	Ethanol consumption by the commercial fleet *i* in the project scenario in project region *R* in year *y*
Source of data:	On-site registry
Description of measurement methods and procedures to be applied:	Direct measurement through Ecofrotas fuel control cards is used. This measurement is performed by the fuel dispensers located at gas stations and used in all fueling operations. After being measured, the fuel is sent to the fuel tank of the vehicle through a hose and nozzle. Information are processed and sent to the indicating device, which displays the volume supplied and the price to be paid by the consumer. The volume displayed by the indicating device, which is typed by the gas station attendant in the POS terminal in order to perform the financial transaction, is the data that is transmitted to the Ecofrotas system. These data are then used to calculate baseline emissions, project emissions and emission reductions without conversions or statistical estimations.
Frequency of monitoring/recording:	Every transaction
Value applied:	Please refer to Table 13.
Monitoring equipment:	The monitoring equipment is composed of the fuel control cards (Good Cards), fuel dispensers from the gas stations, points of sale terminals and Ecofrotas systems, BI and Good Manager (user interface). Pumps are composed of four sets of components: pumping, metering, indication and fueling. After being pumped from the underground tank by the engine, being filtered and having the air and gases eliminated, the liquid fuel enters the

	metering unit, where the measuring device is located. The measuring device must match the model approved by the National Institute of Metrology, Standardization and Industrial Quality (*Instituto Nacional de Metrologia, Padronização e Qualidade Industrial* - INMETRO) and have the following characteristics: a) Support the maximum pressure developed by the fluid without external leakage; b) Have proper locations for the application of seals, preventing access to the interior; c) Have a regulating device; d) Have a flow rate of no more than 200 l / min.
QA/QC procedures to be applied:	The system of measurement and registry of data statistically guarantees that the data obtained, processed and registered satisfies 95% confidence interval, since direct measurement is used and no statistical estimation or conversion is used to obtain the fuel consumption in liters. The BI (Business Intelligence) system corresponds to the Ecofrotas internal system, which records and controls the fueling transactions. This system is integrated to the Good Manager, which is the system adopted by the fleet managers. As both systems use the same data source, it is possible to cross check their extracted information, as described in the Monitoring Plan. Compliance of measurement equipment with the applicable regulations, including calibration of the fuel dispensers following the manufacturer's specifications, is annually verified by the Institute of Weights and Measures (*Instituto de Pesos e Medidas* - IPEM) in each Brazilian federation unit. Fuel dispensers may also be subject to eventual verifications. Provided that keeping measuring devices in proper working conditions is enforced by Brazilian Law and taking into account the scale of the gas station network accredited to the Ecofrotas' Good Card (which comprises about 15,000 gas stations spread across all 27 Brazilian Federation Units), it is assumed that all fuel dispensers operating in the gas stations under Ecofrotas' network are in accordance with INMETRO regulations at the

	moment of the fueling operations.
Calculation method:	Ethanol consumption of the fleet *i* was calculated as the sum of the ethanol consumption of each vehicle in project region *R* in given year *y* (Please refer to Table 6*)*, which is the raw data stored by the Ecofrotas system.
Any comment:	-

Data Unit / Parameter:	$EF_{CO2,gas,y}$
Data unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of gasoline
Source of data:	Calculated by the PP using data from IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories and ANP.
Description of measurement methods and procedures to be applied:	IPCC default values are adopted.
Frequency of monitoring/recording:	Any future revision of the IPCC Guidelines will be taken into account.
Value applied:	Please refer to Table 14.
Monitoring equipment:	Not applicable.
QA/QC procedures to be applied:	Not applicable.
Calculation method:	Not applicable.
Any comment:	-

Data Unit / Parameter:	$COEF_{gas,y}$
Data unit:	tCO_2/L
Description:	CO_2 emission coefficient of gasoline in year *y*.
Source of data:	Calculated by the PP using data from ANP and IPCC.
Description of measurement methods and procedures to be applied:	Not applicable.
Frequency of monitoring/recording:	Annually
Value applied:	Please refer to Table 14.
Monitoring equipment:	Not applicable.

QA/QC procedures to be applied:	Not applicable.
Calculation method:	Calculated according to Procedure 3.1.1
Any comment:	-

Data Unit / Parameter:	$T_{ff,y}$
Data unit:	Dimensionless
Description:	Conversion factor between gasoline and ethanol in year *y*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	Not applicable.
Frequency of monitoring/recording:	Annually
Value applied:	Please refer to Table 13.
Monitoring equipment:	Not applicable.
QA/QC procedures to be applied:	Not applicable.
Calculation method:	Calculated according to Procedure 3.1.3
Any comment:	-

Data Unit / Parameter:	$FC_{gas,i,R,y}$
Data unit:	Liters
Description:	Gasoline consumption by the commercial fleet *i* in the project scenario in year *y*
Source of data:	Refueling transactions database
Description of measurement methods and procedures to be applied:	Direct measurement through Ecofrotas fuel control cards is used. This measurement is performed by the fuel dispensers located at gas stations and used in all fueling operations. After being measured, the fuel is sent to the fuel tank of the vehicle through a hose and nozzle. Information are processed and sent to the indicating device, which displays the volume supplied and the price to be paid by the consumer. The volume displayed by the indicating device, which is typed by the gas station attendant in the POS terminal in order to perform the financial transaction, is the data that is transmitted to the Ecofrotas system. These data are then used to calculate baseline emissions, project emissions and emission reductions without

	conversions or statistical estimations.
Frequency of monitoring/recording:	Every transaction
Value applied:	Please refer to Table 13.
Monitoring equipment:	The monitoring equipment is composed of the fuel control cards (Good Cards), fuel dispensers from the gas stations, points of sale terminals and Ecofrotas system (Good Manager), as described in the Monitoring Plan. Pumps are composed of four sets of components: pumping, metering, indication and fueling. After being pumped from the underground tank by the engine, being filtered and having the air and gases eliminated, the liquid fuel enters the metering unit, where the measuring device is located. The measuring device must match the model approved by the National Institute of Metrology, Standardization and Industrial Quality (*Instituto Nacional de Metrologia, Padronização e Qualidade Industrial* - INMETRO) and have the following characteristics: a) Support the maximum pressure developed by the fluid without external leakage; b) Have proper locations for the application of seals, preventing access to the interior; c) Have a regulating device; d) Have a flow rate of no more than 200 l / min.
QA/QC procedures to be applied:	The system of measurement and registry of data statistically guarantees that the data obtained, processed and registered satisfies 95% confidence interval, since direct measurement is used and no statistical estimation or conversion is used to obtain the fuel consumption in liters. Compliance of measurement equipment with the applicable regulations, including calibration of the fuel dispensers following the manufacturer's specifications, is annually verified by the Institute of Weights and Measures (*Instituto de Pesos e Medidas* - IPEM) in each Brazilian federation unit. Fuel dispensers may also be subject to eventual verifications. Provided that keeping measuring devices in proper working conditions is enforced by Brazilian Law and taking into account the scale of the gas

	station network accredited to the Ecofrotas' Good Card (which comprises about 15,000 gas stations spread across all 27 Brazilian Federation Units), it is assumed that all fuel dispensers operating in the gas stations under Ecofrotas' network are in accordance with INMETRO regulations at the moment of the fueling operations.
Calculation method:	Gasoline consumption of the fleet *i* was calculated as the sum of the gasoline consumption of each vehicle in project region *R* in year *y*, which is the raw data stored by the Ecofrotas system.
Any comment:	When the $FC_{gas,i,y}$ represents more than 5% of the sum of $FC_{ethanol,i,R,y}$ and $FC_{gas,i,y}$ for an individual fleet in a given year (Please refer to Table 6) year, the project activity instance corresponding to this fleet shall be definitely excluded from the project activity, with no possibility to be reinserted and no right to reduction credits derived from such transgression year.

4.3 Description of the Monitoring Plan

Ecofrotas uses a system to control the fueling of the fleet, the performance of the vehicles and their drivers online in real time, using the Ecofrotas Fuel Control card (Good Card), which is accepted at gas stations throughout the country.[21]

Good Card was created in 1999 and is the only national card brand with nationwide coverage for multi-emitters. Nowadays, it is the largest company of multi agreements in Brazil, summing with the other issuers more than 3.5 million cards, in a net of 1.8 million authorized establishments.

Ecofrotas Fuel Control card functioning can be explained through 4 basic steps, as shown in Figure 6.

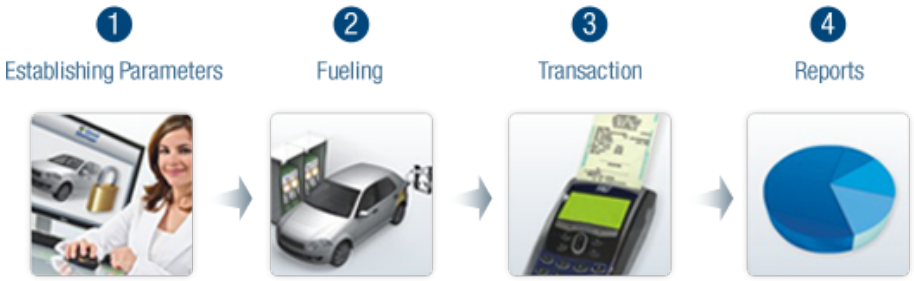


Figure 6 - Monitoring steps of Ecofrotas Fuel Control card

[21] A description of the fuel control system's mechanisms to prevent the occurrence of frauds along the fueling process is provided in Appendix 1.

1. **Establishing Parameters**. A Relationship Consultant from Ecofrotas provides face-to-face training to the fleet owners through on-site visits, in order to guide the Fleet Manager regarding all procedures that involve interaction with the system. Later, the fleet owner defines, in the Good Manager (system management interface), the control necessary for each of the operational parameters involved in transactions, such as: minimum and maximum performance (km/L); minimum and maximum liters per vehicle (for each fuel); tank capacity; minimum and maximum R$/L for each fuel (and city); time interval between transactions; date, hour and weekday allowed; transaction quantity per vehicle (per day, week and month); refueling place (city/state); and allowed services (washing, geometry, etc).

2. **Fueling**. In this case, the fleet owners provide training to the drivers regarding the fueling rules established in step 1 for each vehicle. Some material is offered by Ecofrotas[22]. Then, the fleet vehicle driver refuels at a Good Card authorized gas station, following the established rules.

3. **Transaction**. After the vehicle refueling, the card is used in the machine and the following data are informed in the point of sale: mileage (odometer); fuel volume sold; fuel price; registration, license plate and/or password; and fuel type. Based on the data provided, the system checks in the database the vehicle registry; credit limit; parameters inconsistencies and restrictions. If all data are correct and the refueling operation within the established parameters, the transaction is approved. Otherwise, the transaction is protected. All purchase attempts protected by the parameters are registered and the system identifies the driver, the gas station and the reason why the purchase was not allowed (km/L, tank capacity, among others).

   Note: For fleets that are instances in the project activity, the card is restricted to ethanol transactions only.

4. **Reports**. Immediately after the purchase, the transaction data are made available in the Good Manager. Furthermore, the client receives on a daily basis a report of inconsistencies and the historic of transactions approved but outside the informative parameters. There is also the possibility of receiving a custom report with indexes available in the Good Manager.

   Ecofrotas Fuel Control system enables easy integration between the databases of Ecofrotas (BI) and the fleet owner (Good Manager), allowing the information captured by the Ecofrotas system to be imported into the fleet owner's internal system, using the preferred format. The advantages of such system include elimination of typing errors and manual data transfer and processing; definition of the layout according to the fleet owner specific needs; and importing of information without human intervention, allowing total control over the operation. As both systems utilize the same data source (records from fueling transactions), it is possible to cross check the information when comparing data from the Ecofrotas internal system (BI) and the costumer system (Good Manager).

   Ecofrotas is responsible for the operation and maintenance of the Fuel Control system, and for the storage of the data collected from all fleets under the project activity. In that sense, Ecofrotas

[22] Some of the material used can be found at <http://www.ecofrotas.com.br/hotsites/direcaoconsciente/>. Accessed on 21/10/2013.

is responsible for the historical parameters ($FC_{gas,i,R,BSL}$ and $FC_{gas,i,R,BSL}$) and for monitoring $FC_{ethanol,i,R,y}$ and $FC_{gas,\ i,\ y}$. Such parameters are annually sent to WayCarbon, which is responsible for monitoring all other parameters and for all emission reductions calculation.

All data collected and calculated as part of the monitoring process will be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data indicated in the tables above will be monitored.

Internal auditing is held at least once a year in Ecofrotas considering all processes, in order to ensure quality to the delivered service and product. Extra auditing should be conducted for critical processes or for processes that present a higher number of non-conformities. The auditing team is responsible for informing all the opportunities for improvement and the non-conformities to each manager responsible for the different areas. Later each responsible manager must investigate, determine and conduct the corrective actions.

All the staff is stimulated to observe and identify non-conform products, and communicate to the supervisors, managers or internal auditors as the latter have the authority to characterize a "Non-Conform Product". The non-conformity events and detailed information are registered, and reports are developed and analyzed every three months. Corrective actions that are possibly made necessary should be conducted.

5 ENVIRONMENTAL IMPACT

Environmental Licensing is the major tool to implement environmental policies in Brazil. The main objective is to standardize environmental impacts assessments and establish control plans for polluting enterprises. According to the CONAMA (National Council of Environment) Resolution 001/86, activities that utilize natural resources and that are considered as entrepreneurships with high degradation or pollution potential must have their environmental impact assessment and environmental impact report elaborated to obtain the environmental licenses.

In that sense, the project activity is not listed among the activities that must develop an environmental impact assessment and therefore no significant negative environmental impact is identified due to the project activity implementation.

Nevertheless, many questions regarding the sustainability of biofuels production have been made, mainly concerning uncertainties in GHG emission reductions and land-use change (e.g. concurrence with food production, deforestation due to new agricultural boundaries). In answer to those questions, many entities and organizations are conducting studies and publishing information about the subject, which will be used here to assess Brazilian sugarcane ethanol sustainability.

5.1 GHG Emissions

In February 2010, US EPA (United States Environmental Protection Agency) has published an analysis [23], under its Renewable Fuel Standard Program, recognizing that biofuels from

[23] United States Environmental Protection Agency. *Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis*. 2010. Available at: <http://www.epa.gov/otaq/renewablefuels/420r10006.pdf>. Accessed on: 22/Nov/11.

sugarcane reduce CO_2 emission in 61% in relation to gasoline. The GHG emissions calculation accounted for all life cycle of the biofuels: not only agricultural and industrial production emissions, but also the ones associated to direct and indirect land use change.

European Union Directive 2009/28[24] defines a reduction of 71% in the emission of GHG through the use of sugarcane ethanol. With its approval, it was "officially" introduced a calculation of the direct effect of land use change in biofuels production. The value cited above takes into account the carbon stock (above and below soil) change, with a relatively simple calculation proposal, supported by default IPCC parameters (considering the absence of sufficient and reliable data for soil carbon contents, in many regions). The value also includes the emissions from transport of ethanol to the place of consume.

Finally, UNEP (United Nations Environment Programme) defines a reduction value from 70% to 143%, in its "Assessing Biofuels" report[25]. The report data are result of a compilation of existing studies and, instead of a fixed value, they suggest a variation interval for the GHG emission reductions through use of biofuels. The GHG savings greater than 100% are due to the co-generation of products.

5.2 Land-Use Change

IEF (International Energy Forum), the world's largest gathering of Energy Ministers, has published in 2010 a report[26] regarding production and use of biofuels. According to the document, "*Within the first generation of biofuels, there is a clear consensus that only one is acceptable […]: this is ethanol produced from sugarcane in Brazil, provided that the expansion of future sugarcane farming for ethanol production continues to follow current practice and avoids extension to areas that might raise the issue of harmful direct and indirect land use changes.*"

Many scientists have lately assessed the effects of land use change regarding sugarcane expansion in Brazil. It can be shown[27] that:

- Land use change for sugarcane production for ethanol in Brazil (in the last 25 years) must be considered only from 2002 on, because ethanol production kept constant (around 12 million m^3 a year) from 1984 until 2002. In that period, surveys from many independent sources show that the occupation of areas with tree vegetation (Cerrado, forests) was less than 2% of the total, as the change was made essentially over areas of pasture and annual crops;

[24] European Parliament and the Council of the European Union. *Directive 2009/28/EC, on the promotion of the use of energy from renewable sources*. 2009. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:en:PDF>. Accessed on: 24/Nov/11.

[25] United Nations Environment Programme. *Towards sustainable production and use of resources: Assessing Biofuels*. 2009. Available at: <http://www.unep.fr/scp/rpanel/pdf/assessing_biofuels_full_report.pdf>. Accessed on: 24/Nov/11.

[26] International Energy Forum. *Assessment of Biofuels Potential and Limitations*. 2010. Available at: <http://www.ief.org/PDF%20Downloads/Bio-fuels%20Report.pdf>. Accessed on: 22/Nov/11.

[27] Brazilian Sugarcane Industry Association (UNICA). *Ethanol and Bioelectricity: Sugarcane in the Future of the Energy Matrix*. 2010. Available at: <http://www.unica.com.br/download.asp?mmdCode=537E4CA9-8260-4D6C-8DF4-681BE91A4EE6>. Accessed on: 24/Nov/11.

- Information about carbon contents in soil for the replaced crops and for sugarcane show values that do not differ a lot from IPCC default values and that indicate that unburned sugarcane may increase soil equilibrium carbon contents. If the change conditions remain (that is the expectation, considering the current livestock intensification), the direct effect of land use change will be positive.

As shown in *Figure 7*[28], according to official data from Campinas State University (Unicamp), Brazilian Institute of Geography and Statistics (IBGE) and Sugarcane Technology Center (CTC), the Amazon forest is not threatened by sugarcane. Sugarcane production is concentrated in Center-South (89%) and Northeast (11%) Brazilian regions[29].

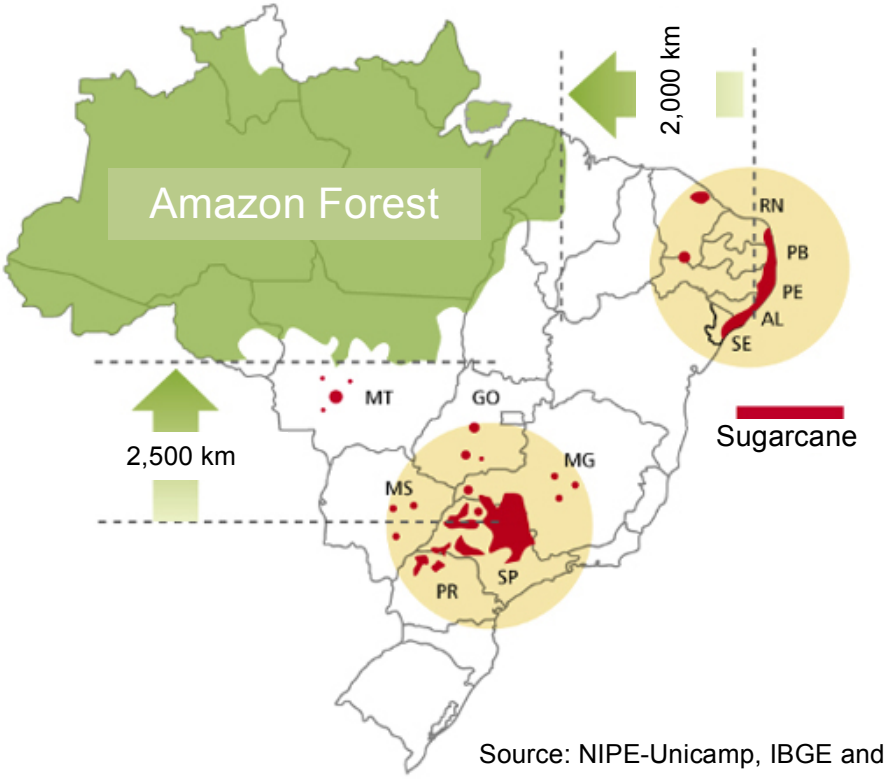


Figure 7 - Sugarcane production centers in Brazil

Further, former president Luiz Inácio Lula da Silva has approved, through Decree 6961/2009, that originated the law project 6077/2009, the agro-ecological zoning of sugarcane (ZAE Cana)[30]. ZAE

[28] UNICA. *Sugar Energy Sector – Production Map*. Available at: <http://www.unica.com.br/content/show.asp?cntCode=%7BD6C39D36-69BA-458D-A95C-815C87E4404D%7D>. Accessed on: 24/Nov/11.
[29] UNICA. Sugarcane processed by Brazilian Industries – 08/09 Harvest. 2010. Available at: <http://www.unica.com.br/downloads/estatisticas/PROCESSAMENTO%20DE%20CANA%20BRASIL.xls>. Accessed on: 24/Nov/11.
[30] Brazilian Ministry of Agriculture, Livestock and Environment (MAPA). *Agro-ecological Zoning of Sugarcane: expand production, preserve life and guarantee the future*. 2009. Available at: <http://www.cnps.embrapa.br/zoneamento_cana_de_acucar/ZonCana.pdf>. Accessed on: 24/Nov/11.

Cana was published in 2009, aiming at providing technical input to indicate the best areas destined to its growth expansion based in physical, biotic, socioeconomic and juridical-institutional factors.

Brazilian government demanded the generation of information about territory in a short period of time, aiming at implementing an internal process of decision-making regarding growth expansion and ordering. Thus, the main guidelines and a set of public policies were established and associated to ZAE Cana.

In that sense, ZAE Cana restricts the crop in 81.5% of Brazilian territory, including Amazon, Pantanal and Alto Paraguai basin. If the areas where the crop is not recommended are also taken into account, the value gets to 92.5% of the territory.

Finally, Embrapa (Brazilian Agricultural Research Company) estimates show that the country possesses 64 million hectares of areas suitable for the expansion of sugarcane growth, of which 37 million were occupied by pastures in 2002. Such account excludes:

1. Lands with slope over 12%, to allow mechanical harvest without burning;
2. Native vegetation coverage areas;
3. Amazon and Pantanal biomes;
4. Environmental protection areas;
5. Indigenous lands;
6. Forest remainings;
7. Mangroves;
8. Cliffs and rock outcrops;
9. Reforestation areas;
10. Urban and mining areas;
11. In Center-South region states, areas grown with sugarcane in harvest year 07/08.

The estimates show that the country does not need to incorporate new areas and areas with native cover to its productive process, having potential to expand the sugarcane growth area without directly affecting the land used for food production[30].

6 STAKEHOLDER COMMENTS

No stakeholder comments have been received. Relevant project documents were listed at VCS pipeline before the opening meeting between the validation/verification body and the project proponent.

APPENDIX 1: TAMPER-PROOF MECHANISMS

The Ecofrotas fuel control system comprises mechanisms to prevent the occurrence of frauds along all steps of the fueling process. The following pictures represent these steps and the flows of data involved in each fueling operation.

As displayed in *Figure 8*, a fueling operation is composed of four steps: 1) parameterization; 2) fueling; 3) transaction; and 4) reports.

Figure 8 - Operation flow

1) Parameterization

This step, displayed in *Figure 9*, includes the definition of information parameters and restriction parameters. The former consist of a set of criteria, which, if not met by the fueling operation, generates warning messages in the system's interface available to the fleet manager (Good Manager). That way, the manager can monitor critical variables of the fleet's fuel consumption, such as the type of fuel, the price paid and the period of time between fueling operations.

Restriction parameters are in turn the most important mechanism to prevent frauds in the fueling process. They are established by the fleet manager in order to block operations that are not in accordance with the company and the project's fueling policies. Hence, not only are these operations prevented from occurring, but the fleet manager is also informed of the failed fueling attempts through Good Manager.

Information and restriction parameters are set at both the vehicle and the fleet levels. Therefore, any fueling operation must comply with the criteria set for the specific vehicle and for the company to which it belongs.

Figure 9 - Step 1: Parameterization

General restrictions are displayed in *Figure 10*. This is one of the screens available for the definition of parameters at Good Manager. At the left side, the manager sets the information parameters applied to a specific fleet and/or vehicle. At the right side, he sets the restriction parameters. In this example, the manager can determine: the amount of time between one fueling operation and another; if it is acceptable that the mileage displayed by the odometer is lower than the mileage it had displayed at the previous operation; if it is acceptable that the mileage displayed by the odometer is higher than the vehicle's range; minimum and maximum prices to be paid for the fuel at each operation; minimum and maximum amount of fuel (in liters) that can be consumed at each operation.

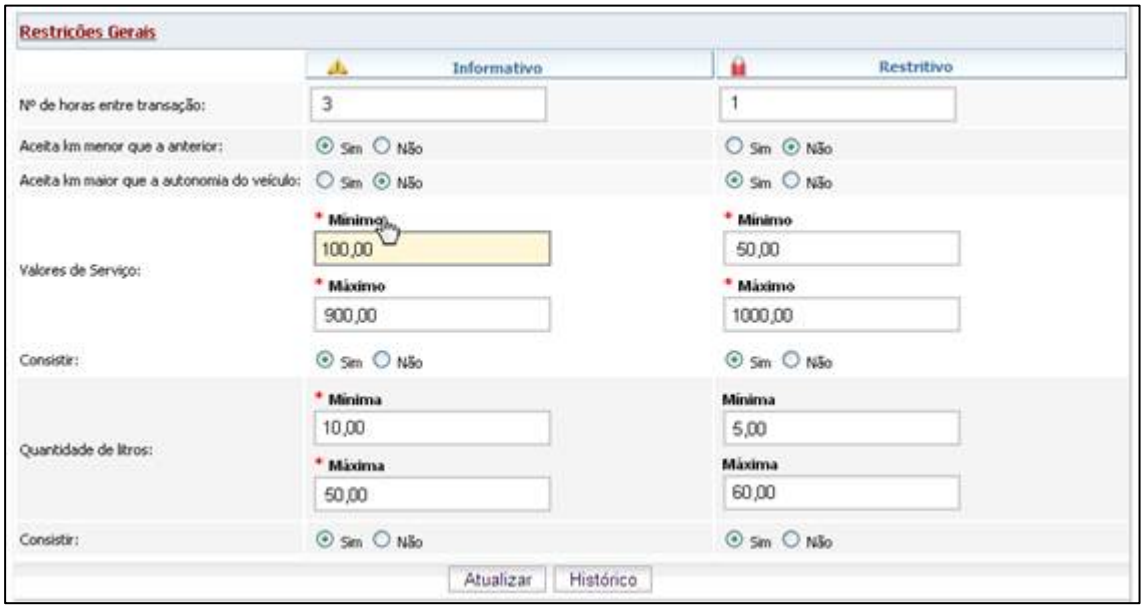


Figure 10 - General restrictions

At the fuel restriction screen, shown in *Figure 11*, the manager can set minimum and maximum fuel prices accepted for each fuel for a specific fleet and/or vehicle. In this example, attempts to perform an operation in which the price of ethanol is lower than R$0.50/liter or higher than R$3/liter will be blocked.

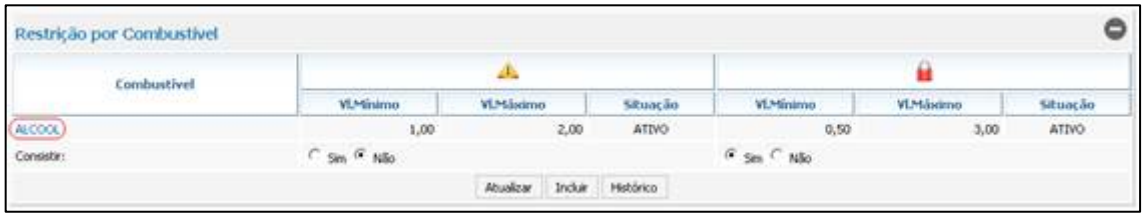


Figure 11 - Fuel restriction

At the place/fuel restriction screen (*Figure 12*), the manager can set minimum and maximum fuel prices accepted for each fuel for a specific fleet and/or vehicle at each town and/or state where it circulates. In this example, attempts to fuel a vehicle with gasoline in the town of Amparo/SP paying less than R$2.69/liter or more than R$2.84/liter will not succeed. Besides, the fleet manager will receive a warning at Good Manager in case any driver pays less than R$2.75/liter or more than R$2.80/liter of gasoline in the town of Amparo/SP.

Figure 12 - Place/fuel restriction

The establishment restriction screen (*Figure 13*) shows that the manager can set specific restrictions per gas station.

Figure 13 - Establishment restriction

At the screen displayed in *Figure 14*, the fleet manager determines how many transactions the vehicle can perform per day, per week and per month. In this example, the driver is not allowed to fuel his car more than 4 times a day, 16 times a week and 62 times a month.

A restriction parameter that is common to all fleets included in the Grouped Project is the type of fuel. As the project activity consists in the fuel switch from gasoline to ethanol, the purchase of gasoline is subject to quantitative restrictions.

Figure 14 - Restriction of number of transactions per vehicle

2) Fueling

Once determined the criteria to be met by the fleet, the driver proceeds to a Good Card authorized gas station to perform the fueling operation, as shown in *Figure 15*.

Figure 15 - Step 2: Fueling

3) Transaction

In this step, displayed in *Figure 16*, the gas station attendant types the details of the transaction in the POS terminal. Information typed include the mileage indicated by the vehicle's odometer, the quantity of fuel that has been put into the vehicle (liters), the total price paid (R$) and the fuel type (gasoline or ethanol).

After inserting his card in the POS terminal, the driver must type his password. That prevents the usage of the card in case it is stolen or cloned. The password is individual and must be typed at each fueling operation.

Figure 16 - Step 3: Transaction

Data typed in the POS terminal are checked with Ecofrotas system database (*Figure 17*), which contains the vehicle registry, its credit limit, the inconsistency and restriction parameters set by the fleet manager (*Figure 18*). If all data are correct and within the parameters established by the manager, the transaction is approved (*Figure 19*).

Figure 17 - Database

Figure 18 - Consultation

Figure 19 - Transaction approval

Finally, the driver must sign the transaction slip (*Figure 20*).

Figure 20 - Signature

In case the data typed by the gas station attendant are not in accordance with the parameters set by the fleet manager, the transaction is blocked. All attempts protected by the restrictions are registered by the system. It is possible then through Good Manager to identify details of such transactions, as the driver, the gas station where he tried to fuel his vehicle and the reason why the transaction was blocked.

After the fueling operation, transaction data are immediately made available through Good Manager, as shown in *Figure 21*. The manager can monitor the fueling operations of his fleet by receiving customized reports on the transactions performed by its vehicles, besides receiving a report of inconsistencies and the historic of transactions that do not comply with the informative parameters, on a daily basis.

Figure 21 - Step 4: Reports

Hence, the mechanisms described above are able to hamper and to prevent the occurrence of frauds in Good Card and in the Ecofrotas system. As informative and restriction parameters – as tank capacity, maximum and minimum prices per transaction, and fuel types – are set at the fleet and at the vehicle levels, any fraudulent operation would still have to comply with several restrictions at both levels. Besides, the attempt to perform a transaction out of the limits previously set would easily indicate the origin of the problem, since all information pertaining to the specific card are immediately made available to the fleet manager.

Finally, it should be noted that, since it consists the core business of Ecofrotas, the fuel control system used in the project activity has the continuous support of a large team of skilled information technology professionals. After all, ensuring data reliability is extremely important to ensure the company's purposes are achieved.