

Kitambar Switching Fuel Project

MONITORING REPORT Version 03

Monitoring period: January 1st, 2007 to September 30th, 2008

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SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Kitambar Ceramic Switching Fuel Project

Version 03

Monitoring report completed in 14/01/2008

A.2. Description of the small-scale project activity:

The project is applied at *Kitambar* Ceramic, which is a small and prototypical ceramic industry that produces structural ceramic devices like roof tiles, destined for the regional market. This project consists on utilizing renewable biomasses to feed their eight “Round” kilns rather than using native wood from areas without sustainable forest management from the *Caatinga* biome, which is a pioneer practice in the region. This type of wood is considered a non- renewable biomass, once it is not originated from areas without reforestation activities.

As renewable biomasses, the *Kitambar* Ceramic utilizes mainly *Algaroba* wood¹, and cashew tree residues². In addition, the coconut husk is also utilized; however the technological difficulty in its burning limits its use.

This fuel switching project reduces the greenhouse gases (GHG) emissions through the substitution of native wood without sustainable management for renewable biomasses to generate thermal energy. The project activity also indirectly helps in reducing the Brazilian deforestation rates, the main source of greenhouse gas emissions in Brazil.

The *Caatinga* is a biome with a strong propensity to desertification and its deforestation consequently brings forward an increase in this possibility. With the loss of natural vegetation, the exposed soil becomes more susceptible to erosion and salinization. These processes are responsible for changing the system of rivers, which makes the water supply of local communities and family farming scarce.

In developing countries like *Brazil*, the deforestation rate is directly proportional to the greenhouse gases concentration in the atmosphere, which intensifies global warming.

The calculations regarding the quantity of non-renewable wood required in the burning process were done according to the efficiency of the kilns on the production, which would require around 2.6 m³ or 2.28 tonnes to produce 1,000 ceramic devices. Another way of confirming this value is through the efficiency of the kilns, requiring around 109 m³ of wood from deforestation areas in each burning cycle. The “Round” kilns have the efficiency between 1.5 to 2 m³ of wood per thousand of pieces³, therefore concluding that the kilns operated a little above the expected efficiency due to the lack of technology in the region and the indiscriminate use of the deforestation wood.

In the baseline scenario, according to historical experience, the ceramic utilized approximately 28,800 m³ of native wood per year from *Caatinga* biome in their eight “Round” kilns to

¹ The wood from afforestation in the northeast region of Brazil is mainly consisted of *Algaroba* (*Prosopis juliflora*).

² The cashew tree’s pruning occurs due to its fructification, which happens more intensely in new branches.

³ Source: TAPIA, R. E. C. et al. Manual para a indústria de cerâmica vermelha. Rio de Janeiro: SEBRAE/RJ, 2000. (Série Uso Eficiente de Energia).

maintain the temperature of 920°C for 50 hours producing around 11,100,000 ceramic devices per year.

In the absence of this project activity, the identified baseline scenario would be the consumption of around 32,700 m³ of non-renewable native wood per year to feed their kilns to sustain an annual production of 12,600,000 ceramic devices. This increase in the production occurred chiefly to attend the market demand. In addition, the production in the ceramic was monitored and is detailed on this monitoring report.

The fuel substitution required some period to find out the correct burning process of the new biomasses and to get the final product with the same quantity and quality than in the baseline scenario. Thus, the ceramic had to find the best procedure to handle with the new biomass, which is far different when compared with the use of wood.

As a result of the fuel switch, capacitating and training courses were required for the staff in order to clarify new measures linked to the machinery in order to sustain the quality of the final product and find a burn cycle standard.

Another arduous barrier faced by the project developer was the employees' resistance of the changes, who were very used to the standard situation.

A initial investment was performed in order to adapt the burning with the new fuel, especially for the acquisition of new equipments as thermocouples, oxygenation machines and molten iron grills. With the project implementation, the ceramic had to withstand more costs than if it had continued employing native wood from deforestation areas as fuel, namely in the form of payment for the biomass transportation, which includes driver, diesel, freight and costs with the truck maintenance. Furthermore, there is spending with electrical energy.

The total spending has increased and the income from the commercialization of the carbon credits is essential to maintain the fuel switch, as this change needs more resources than previously to maintain operations. This disparity obviously puts the ceramic in a less competitive situation, which would make the fuel switching and the continued use of the needed machinery unfeasible without the existence of the carbon markets.

A.3. Current status of the project activity:

The VCS PD project has been validated by the Designated Operational Entity TÜVNord CERT GmbH and this present monitoring report will be verified by the same DOE.

The monitoring data was kept according to monitoring plan described in PDD. The emission reductions due to the switching non renewable biomass (native wood) to renewable biomass resulted in **73,749 tCO₂e** during the monitoring period of January 1st, 2007 to September 30th, 2008.

SECTION B. Application of monitoring methodology and results**B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 from February 01 of 2008 onwards)

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

B.2. Monitoring period

This report refers to the data registered during January 1st, 2007 to September 30th, 2008.

B.3. Data and parameters applied:

Data / Parameter:	EF_{projected fossil fuel}
Data unit:	tCO ₂ /TJ
Description:	CO ₂ Emission factor of residual fuel oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf . Page 2.18. Table 2.3.
Value applied:	77.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the baseline scenario, the probable fossil fuel that would be consumed in the absence of native wood without sustainable forest management would be the heavy oil. This fuel is more expensive than wood, however it can be a more plausible of substitute of wood than natural gas due to risks involving natural gas distribution.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	NCV non-renewable wood
Data unit:	TJ/ton of wood
Description:	Net Calorific Value
Source of data to be used:	Value average checked at: -IPCC: Intergovernmental Panel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS - chapter3 – Table 3A.1.9-2-
Value of data applied for the purpose of calculating expected emission reductions	0.019
Description of measurement methods and procedures to be applied:	This value provides the energy generated by the amount of wood that would be used in the absence of the project. The species used to calculate the average value are typical trees of <i>Caatinga</i> Biome that are usually utilized as fuel in the ceramic industries of the region.
Any comment:	IPCC default values shall be used only when country or project specific data are not available or difficult to obtain, according to "Guidance on IPCC default values" (Extract of the report of the twenty-fifth meeting of the Executive Board, paragraph 59). Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	ρ_{wood}
Data unit:	ton/ m ³
Description:	Specific gravity
Source of data to be used:	National data
Value of data applied for the purpose of calculating expected emission reductions	0.88 ton/ m ³ Value average checked at: -IPCC: Intergovernmental Panel on Climate Change. Orientación del IPCC sobre las buenas prácticas para UTCUTS - chapter3 – Table 3A.1.9-2 - LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002. - <i>Estrutura anatômica da madeira e qualidade do carvão de Mimosa tenuiflora</i> (Willd.) . Available in: http://www.scielo.br/pdf/rarv/v30n2/a18v30n2.pdf - Poder Calorífico da Madeira e de Resíduos Lignocelulósicos. Available in: http://www.renabio.org.br/arquivos/p_poder_lignocelulosicos_11107.pdf - http://www.ibama.gov.br/lpf/madeira/caracteristicas.php?ID=195&caracteristica=139
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of wood used in the baseline was measured in volume units. This value was used for the unit conversion.
Any comment:	The species used to calculate the average value were typical trees of <i>Caatinga</i> Biome and usually utilized as fuel in the ceramic industries of the region. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	BF_y
Data unit:	ton of wood per thousand of devices
Description:	Consumption of non-renewable biomass per thousand of ceramic devices produced per year
Source of data used:	Historical data from project developer
Value of data	2.28
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value was acquired through the average consumption during the years when the ceramic used to consume non sustainable wood. This value is in accordance with the data acquired in other ceramics that employ the same type of kilns. The value is employed to calculate the real amount of wood displaced to maintain the ceramic production in the baseline scenario.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

B.4. Data and parameters monitored:

Data / Parameter:	$f_{NRB,y}$
Data unit:	Percentage
Description:	Fraction of biomass (wood) used in the absence of the project activity in year y can be established as non renewable biomass using survey methods
Source of data used:	Survey methods.
Value of applied:	99.7%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Before the project activity, wood from areas without forest management was offered with low prices and high viability to the ceramics owner. Thus, the totality of fuel employed in the baseline scenario is from non-renewable origin. However, considering that 0.3% of Caatinga biome has sustainable forest management plan, the fraction of non-renewable biomass is 99.7%. Source: http://www.cnip.org.br/planos_manejo.html
Any comment:	It will be employed in order to estimate the amount of non renewable biomass. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.

Data / Parameter:	Q renbiomass											
Data unit:	Tonnes											
Description:	Amount of renewable biomasses											
Source of data to be used:	Measured by the project developer											
Value of data		Wood from Cashew Tree	Coconut husk	Algaroba wood								
	Total – 2007	2,069	46	12,366								
	until September 2008	1,840	725	8,867								
	Total of the monitored period	3,908	771	21,233								
Description of measurement methods and procedures to be applied:	The amount of biomasses is monitored in accordance to the weight described in the receipts from the providers. The values in the receipts are described in m³, therefore it is necessary the conversion to tons through the specific gravity of each biomass. The specific gravity values of the renewable biomasses utilized in this project are: <table><tr><td>Biomass</td><td>Algaroba wood</td><td>Wood from cashew tree</td><td>Coconut husk</td></tr><tr><td>Specific gravity (tonnes/m3)</td><td>0.836</td><td>0.42</td><td>0.5</td></tr></table> The sources of these data are: <i>Algaroba wood:</i> -PEREIRA, J. C. D.; LIMA, P. C. F. Comparação da Qualidade da Madeira de seis Espécies de Algarobeira para a Produção de Energia. Colombo: Embrapa Florestas, 2002. p. 99-107. Available at: <http://www.cnpf.embrapa.br/publica/boletim/boletarqv/bolet45/pag-99_106.pdf>. Checked at 31/07/2008- <i>Wood from cashew tree:</i> -LORENZI, H. Árvores Brasileiras: Manual de Identificação e Cultivo de Plantas Arbóreas Nativas do Brasil, vol.1. 4.ed. Nova Odessa, SP: Instituto Plantarum, 2002.- <i>Coconut husk:</i> -PINHEIRO, G. F.; RENDEIRO, G.; PINHO J. T. Densidade Energética de Resíduos Vegetais. 2006. Available at: <www.ufpa.br/gedae/BIOMASSAEENERGIA2006.pdf>. Checked at: 31/07/2008.				Biomass	Algaroba wood	Wood from cashew tree	Coconut husk	Specific gravity (tonnes/m3)	0.836	0.42	0.5
Biomass	Algaroba wood	Wood from cashew tree	Coconut husk									
Specific gravity (tonnes/m3)	0.836	0.42	0.5									
QA/QC procedures to be applied:	Amount of biomass was checked according to the receipts of purchase. The energy balance was verified according to the amount of biomass applied.											
Any comment:	Any other biomasses might be used, once its renewable origin can be verified. Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.											

Data / Parameter:	PRy
Data unit:	Units of ceramic pieces

Description:	Production of ceramic devices		
Source of data to be used:	Controlled by the project developer.		
Value of data		January to December of 2007	January to September of 2008
	Ceramic Devices Produced	12,153,062	9,908,228
Description of measurement methods and procedures to be applied:	The amount was acquired by counting the total production of one period.		
QA/QC procedures to be applied:	The measurement was done by an internal control sheet monitored by the project developer, which was fed daily. As the ceramic must have an internal control of the production and sale at the end of every month, the PRy value cannot be manipulated.		
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits income for this project activity, whichever occurs later.		

Data / Parameter:	Biomass origin
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the project developer
Value of data	Renewable biomass
Description of measurement methods and procedures to be applied:	This information was given by the biomasses providers. The guarantee of acquiring renewable wood was achieved by invoices from the providers. The origin of the cashew tree pruning was evidenced with a declaration from the provider that the sustainable plan had been followed.
QA/QC procedures to be applied :	The biomass was considered as renewable provided that it is in accordance with the definition given by the applied methodology.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	Leakage of non-renewable biomass.
Data unit:	tCO ₂ e
Description:	Leakage resulted from the non-renewable biomass
Source of data to be used:	Monitored
Value of data	0
Description of measurement methods and procedures to be applied:	The three sources of leakages predicted in methodology applied were monitored. The sources provide information about the non-renewable biomass availability in the project activity's region.
QA/QC procedures to be applied :	Data available regarding the ceramic industry fuel consumption was utilized to monitor the leakage.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.

Data / Parameter:	Renewable biomass surplus
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Data unit:	ton or m ³														
Description:	Amount of renewable biomass available														
Source of data to be used:	Monitored														
Value of data	<table><tr><th>Harvest</th><th>06/07</th><th>07/08</th></tr><tr><td><i>Algaroba</i> wood</td><td></td><td>2,500,000</td></tr><tr><td>Coconut Husk (Tonnes per year)</td><td></td><td>6,700,000</td></tr><tr><td>Residues from cashew trees (Tonnes pre year)</td><td></td><td>196,625</td></tr></table> Detailed information in section 4.1 – LEAKAGE.			Harvest	06/07	07/08	<i>Algaroba</i> wood		2,500,000	Coconut Husk (Tonnes per year)		6,700,000	Residues from cashew trees (Tonnes pre year)		196,625
Harvest	06/07	07/08													
<i>Algaroba</i> wood		2,500,000													
Coconut Husk (Tonnes per year)		6,700,000													
Residues from cashew trees (Tonnes pre year)		196,625													
Description of measurement methods and procedures to be applied:	It was used to calculate the leakage of renewable biomass. The sources of leakages predicted in methodology applied were monitored. The measurement of the leakage was based in national and internal sources. The sources provided information about the biomass availability in the project activity's region.														
QA/QC procedures to be applied :	Data available regarding the ceramic industry fuel consumption were employed to monitor the leakage.														
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.														

B.5. Calculation of emission reductions

Methodology AMS-IE: Switch from Non – Renewable Biomass for Thermal Application by the User – Version 01 from February 01 of 2008 onwards, which comprises project activities that avoid greenhouse gas emissions by using renewable biomass in order to generate thermal energy. The project's emissions from the combustion of native wood are accounted in the same way as fossil fuel combustion, once it is not renewable and emits CO₂.

The project activity has a maximum thermal capacity of 44.21 MW_{thermal} (without considering losses), which is less than the limit of 45 MW_{thermal} for Type I small scale project activities.

Baseline

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossilfuel} \quad (\text{Equation 01})$$

Where:

ER_y: Emission reductions during the year y in tCO₂e

B_y: Quantity of biomass that is substituted or displaced in tons

f_{NRB,y}: Fraction of non-renewable biomass (wood) used in the absence of the project activity in year y

NCV_{biomass}: Net calorific value of non-renewable biomass in TJ/ton

EF_{projected fossil fuel}: Emission factor for the projected fossil fuel consumption in the baseline in tCO₂e/TJ⁴.

By was determined using the following option:

Calculated from the thermal energy generated in the project activity as:

$$B_y = \frac{HG_{p,y}}{\eta_{old} \times NCV_{biomass}} \quad (\text{Equation 02})$$

Where:

HG_{p,y} : Quantity of thermal energy generated by the renewable energy in the project in year y in TJ.

η_{old} : Efficiency of the system being replaced

$$HG_{p,y} = SGE \times PR_y \quad (\text{Equation 03})$$

Where:

SGE: Specific energy which has to be generated in the process to produce a certain amount of ceramic devices in TJ/thousand of ceramic device.

PR_y: Amount of product produced in year y in thousand of ceramic devices

$$\eta_{old} = \frac{SGE}{SFE} \quad (\text{Equation 04})$$

Where:

SFE: Specific fuel energy needed for the process to produce a certain amount of ceramic devices in TJ/ thousand of ceramic device

$$SFE = BF_y \times NCV_{biomass} \quad (\text{Equation 05})$$

Where:

BF_y: Amount of native firewood needed to produce a certain amount of product in tonnes/thousand of ceramic devices

Using the Equations 3, 4 and 5 in the Equation 1, it results to:

$$B_y = PR_y \times BF_y \quad (\text{Equation 06})$$

⁴ The fossil fuel likely to be used by similar consumers is taken the IPCC default value of residual fossil fuel.

As shown in the calculations above, the η old and the NCV biomass are not required to calculate the Emission Reductions, thus they were excluded.

B.6. Monitoring results

Leakage (LE)

The methodology I.E (version 01) predicts the following possible three sources of leakage:

A) If the project activity includes substitution of non-renewable biomass by renewable biomass, leakage in the production of renewable biomass must be considered.

The leakage from biomass projects, like the project activity, shall also be estimated according to the “General guidance on leakage in biomass project activities” (attachment C of appendix B) of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on the type of biomass considered (described in the table below).

Table 1. Sources of leakage according to the type of the biomass

Biomass Type	Activity/ Source	Shift of pre project activities	Emissions from biomass generation/ cultivation	Competing use of biomass
Biomass from forests	<i>Existing forests</i>	-	-	X
	<i>New forests</i>	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	<i>In the absence of the project the land would be used as a cropland/wetland</i>	X	X	-
	<i>In the absence of the project the land will be abandoned</i>	-	X	-
Biomass residues or waste	<i>Biomass residues or wastes are collected and use.</i>	-	-	X

Observing the table 1, the source of leakage of the present project is the competing use of wood from *Algaroba* and cashew tree wood. Although the wood from afforestation, which is mainly consisted of *Algaroba*, has been obtained from *Caruaru*'s region and from states that border the state of *Pernambuco*, this kind of biomass is plenty available in the region. The cashew tree is a typical fruit tree in the northeast region of the country. Therefore, the project activity does not disturb in any aspects these renewable fuel markets once there is plenty of this kind of biomasses available. The source of leakage of the present project is showed below according to each type of biomass:

Algaroba wood

According to Silva (2007)⁵, *Algaroba*⁶ (*Prosopis juliflora* (Sw.) D.C.) is a tropical tree legume fairly common in the semi-arid region of Brazil, which thrives in dry environments where other plants would hardly survive.

At the beginning of 40's, this specie was introduced in the Northeast region of Brazil with the aim of providing food to animals and to be utilized for reforestation actions. However, currently, due to its competitive skills, *Algaroba* spreads through several regions of Brazilian semi-arid areas⁷.

A research made by EMBRAPA⁸, which encompass the States of *Pernambuco* and *Bahia*, affirmed that *Algaroba* is characterized as an invasive exotic plant due to its fast expansion,

⁵ Silva, C. G. M, Melo Filho, A. B., Pires, E. F., Stamford M. Physicochemical and microbiological characterization of mesquite flour (*Prosopis juliflora* (Sw.) DC). *Ciênc. Tecnol. Aliment.*, Campinas, 27(4): 733-736, out.-dez. 2007.

⁶ *Algaroba* may also be known as mesquite

⁷ EMBRAPA, Projeto vai definir manejo para evitar invasão da *Algaroba* no ambiente semi-árido. Available at: <<http://www.embrapa.gov.br/imprensa/noticias/2002/agosto/bn.2004-11-25.4648301041/>>. Visited in: 14th December, 2008.

⁸ EMBRAPA is the Brazilian Agricultural Research Corporation's which its mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer.

which causes many environmental impacts⁹. This source stated that there were several centers of *Algaroba* operation highlighting the *San Francisco* Basin, which is comprised for many municipalities from the states of *Bahia* and *Pernambuco*, including this project region.

The research's author reported that wood from *Algaroba* exploration on *San Francisco* Basin is mainly commercialized as fuel for industries of vegetable oil, leather, ceramic and bakeries. On the other hand, *Algaroba* wood is not sold for stake¹⁰, pegs and poles uses.

The factors which contribute most to the expansion of *Algaroba* uses, as firewood in these industries sectors, were its wide availability in the region and its legal release extraction from IBAMA¹¹.

Furthermore, this research showed that *Algaroba* is not used as a unique source of fuel for thermal energy generation in these industries sectors, e.g. corresponding only for 30% of the fuel's source in bakeries of the region studied.

The same research estimated that in the Northeast semi-arid region there were about 500 hundreds hectares spread through every type of its region land. Moreover, according to EMBRAPA (1992)¹², wood's production by *Algaroba* is at least 5 m³/ha/year, i.e. the production in the project's region is about 2,500 thousands of m³ per year, what represents less than 0.01% the total of *Algaroba* used by Kitambar Ceramic per year¹³.

Therefore, this kind of fuel does not encompass any type of leakage since there is current a great amount of these renewable biomasses available locally as described before.

Cashew tree wood

Since Kitambar Ceramic utilizes wood residues from cashew trees, it is important to analyze the cashew scenario within Brazilian borders. The cashews cultivation is extremely important to Brazilian economy, where it is responsible for generate 150 million dollars per year. The cashew production is important especially in the northeast region, representing about 95% of Brazilian's cashew production. Besides, cashew production is responsible for generating job opportunities for 35,000 fieldworkers, 15,000 in the manufacturing process and 200,000 indirect job opportunities¹⁴. The Brazilian production achieved 143,000 tonnes of cashew-nuts in 2005 spread in an area of 650,000 Hectares¹. Besides, Brazilian's production presents the tendency of increasing so far, carried by the new technologies utilized and the higher national and international demand of cashew nuts¹⁵. This way, the Brazilian sources of residues from cashew trees will increase following the Brazilian production, due the fact that cashew cultivation request continuous cut of cashew trees. The cut of cashew trees is necessary in order to allow an appropriate formation of the tree and maintaining favorable conditions for the next harvest time.

⁹ Araujo, J. L. P., Correia, R. C., Araujo, E. P., Lima, P. C. F. *Cadeia Produtiva da Algaroba no Pólo de Produção da Bacia do Submédio São Francisco*. EMBRAPA. Petrolina -PE – Brazil.

¹⁰ Heavy pole to which cattle is tied.

¹¹ IBAMA (Brazilian Institute for Environment and the Renewable Natural Resource) is the environmental agency of Brazil affiliated with Ministry of Environment. The main missions of IBAMA are: Environmental Protection, Environmental Licensing, Environmental Quality and Sustainable Use of Forest Management and Animal Resources. More information about IBAMA is available at: <www.ibama.gov.br>.

¹² EMBRAPA, Comunicado Técnico Nº, Nov/92, p.1-2. Available at: <http://www.cpatsa.embrapa.br/public_eletronica/downloads/COT51.pdf>. Visited in: 14th December, 2008.

¹³ Kitambar Ceramic consumes approximately 21,200 m³ of *Algaroba* wood per year.

¹⁴ According with EMBRAPA (Brazilian Agricultural Research Corporation's) Available at: <<http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/index.htm>>

¹⁵ Checked at: <http://www.nordesteural.com.br/nordesteural/matLerdest.asp?newsId=2219>

This way, in cashew cultivation must be cut undesirable branches of the cashew trees¹⁶. Moreover, dry branches on the ground compound a considerable amount of residues from cashew trees cultivation.

There is no estimated amount of residues from cashew trees, however its abundant availability is well-known all over the country. Besides, in order to destine the great amount of residues from cashew trees, the Brazilian's government allowed the utilization of this residue as firewood.

According to “*Plantio do Caju*” cashew trees cultivation presents a density of 121 units of trees per hectare¹⁷, and the production of firewood residues from each tree is 2.5 kg per year¹⁸. The cultivation of cashew is located in an area of 650,000 hectares. This way, the Brazilian production of residues from cashew trees is around 196,625 tons per year. Therefore, the *Kitambar*'s consumption of residues from cashew trees (7600 tons per year) represents around 3.8 % of the total production of residues from cashew trees. Thus, the amount of residues from cashew trees necessary to provide thermal energy in *Kitambar*'s kilns represents a non-representative quantity of this kind of biomass, which avoids the possibility of leakage.

Coconut Husk

The coconut has diverse uses, which briefly is used for aliment, water, fiber among others. In the northeast region of Brazil, 6.7 millions of tons of coconut husks are generated yearly, which can be up to 70% of the solid residues of coastal cities¹⁹. This way, *Kitambar* ceramic utilizes just 0,025% of coconut husk availability²⁰. Therefore, this biomass is widely available in the region, once its use for generate thermal energy may be a solution for the solid waste disposal in these cities.

B) Leakage relating to the non-renewable biomass shall be assessed from ex-post surveys of users and areas from where biomass is sourced.

The following potential sources of this type of leakage could be identified:

- Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable biomass used by the non-project households/users attributable to the project activity then baseline is adjusted to account for the quantified leakage.
- Use of non-renewable biomass saved under the project activity to justify the baseline of other project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other project activity then baseline is adjusted to account for the quantified leakage.

¹⁶According with EMBRAPA(Brazilian Agricultural Research Corporation's). Available at: <http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Caju/CultivodoCajueiro/tratosculturais.htm>

¹⁷According with “Resposta Técnica” from CETEC (Technologic Center of Minas Gerais) considering a space of 10 meters from each tree. Available at: <http://sbrtv1.ibict.br/upload/sbrt4555.pdf?PHPSESSID=76a9111889defa6787039ca56b380c58>

¹⁸According with “Manual de Aplicação de sistemas descentralizados de Geração de Energia elétrica para projetos de Eletrificação rural” Available at: <http://www.cepel.br/~per/download/rer/rt-789-00.pdf>

¹⁹ Source: <www.sbpnet.org.br/livro/60ra/textos/SI-GoreteMacedo.pdf>.

²⁰ Considering that *Kitambar* ceramic utilized 1,650 tons of coconut husk per year, according to historical data.

- Increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable biomass outside the project boundary then baseline is adjusted to account for the quantified leakage.

To ensure that the project activity in *Kitambar Ceramic* does not cause the type of leakage described in item B, *CantorCO2e Brasil* made a research about the ceramics industries in the state of *Pernambuco*, and the result was that there are around 150 ceramic facilities in the state, nevertheless around 90% use native wood without sustainable management²¹. Therefore, it can be concluded that the wood which was avoided by the present project activity is not being used by other ceramists.

In spite of the fact that the ceramic industries do not represent the main share of wood consumption, the project activity contributes significantly to wood conservation since it switches the use of wood to renewable biomass. The implementation of this project in *Kitambar Ceramic* is breaking the culture of wood burning in the state of *Pernambuco* and consequently, several ceramics are becoming interested in implementing this project, given them the possibility of receiving incomes derived from the sale of carbon credits. The possibility of spreading the use of renewable biomass to other ceramics presents huge possibilities for sustainable development in the region.

The project activity does not displace the use of renewable biomass of a non-project user, due to the likely decrease in the use of non renewable biomass in the region.

With the implementation of the project activity, the ceramic avoids the consumption of about 32,700 m³ per year of non-renewable wood helping the conservation of forests in *Caatinga* biome, besides the ecological and social benefits to the region.

This leakage was monitored in order to guarantee the project conservativeness.

C) If the equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

The leakage is not applicable for this project activity in *Kitambar Ceramic* as there is no transference of equipment, in spite of new equipments had to be acquired.

Due to all the explanations described above, the present project activity does not encompass any type of leakage.

Amount of Biomass, By and BEyResults

Table 2. Amount of biomass used during the crediting period in m³

Period	Cashew Tree Wood	Algaroba wood	Coconut Husk
From January to December of 2007	4,925.9	14,791.34	92
From January to September of 2008	4,379.9	10,606.91	1,449

²¹ Programa de Apoio à Competividade das Micro e Pequenas Indústrias (PROCOMPI) – Tecnologia Cerâmica. SENAI (PE), 2008.

Table 3. Production, By and BEy results for 2007 and 2008

Period of 2007	Production of ceramic devices in pieces	By (tonnes)	BEy (tCO₂e)	Period of 2008	Production of ceramic devices in pieces	By (tonnes)	BEy (tCO₂e)
January	1,111,235	2,534	3,715	January	1,036,619	2,363	3,465
February	887,443	2,023	2,967	February	979,836	2,234	3,276
March	1,038,693	2,368	3,472	March	1,095,269	2,497	3,661
April	955,245	2,178	3,193	April	1,123,401	2,561	3,755
May	1,115,825	2,544	3,730	May	1,177,874	2,686	3,938
June	1,045,917	2,385	3,496	June	1,111,979	2,535	3,717
July	1,153,345	2,630	3,856	July	1,161,289	2,648	3,882
August	1,118,613	2,550	3,739	August	1,165,430	2,657	3,896
September	913,466	2,083	3,054	September	1,056,531	2,409	3,532
October	1,013,425	2,311	3,388	-	-	-	-
November	900,928	2,054	3,012	-	-	-	-
December	898,927	2,050	3,005	-	-	-	-
Total	12,153,062	27,709	40,627	Total (Jan. to Sep. 2008)	9,908,228	22,591	33,122

Emission Reduction

The crediting period according to the V-C-S 2007, standard which the project follows the rules, starts in the end of March 2006, this way the credits contemplates from January 2007 to September 2008:

Table 4. Emission reductions due to the project activity.

Period	ERy
From January to December of 2007	40,627
From January to September of 2008	33,122
Emission Reductions from 01.01.2007 to 30.09.2008	73,749

Therefore, based on Category AMS-I.E: Switch from Non – Renewable Biomass for Thermal Application by the User (Version 01 from February 01 of 2008 onwards) and on monitored data as well considering the high contribution to sustainability, the request for carbon credits due to emissions reductions achieved by the project activity is **73,749 tCO₂e**.

The contribution to sustainability was monitored applying the Social Carbon methodology, which is based in six main pointers: Technology; Natural; Financer; Human; Social and Carbon Resources. This Social Carbon Reports will be available at TZ1 registry (<http://www.tz1market.com/registrypublic.php>) once the project is registered.

B.7. Date of completion of the monitoring report and the name of the responsible person(s)/entity(ies)

The responsible for project monitoring is Mr. *Antônio Marcos Tavares Barbosa*, director of the ceramic company.

The monitoring report was completed in January 14th, 2008 by *Marcelo Hector Sabbagh Haddad* and *Flávia Yumi Takeuchi*, from CantorCO₂e Brasil.