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THE SUSTAINABLE CARBON COMPANY

MONITORING REPORT

Version 03

Argibem, São Sebastião and *Vulcão* Ceramics Fuel Switching Project

Monitoring period April 01st, 2006 to September 30th, 2008

CONTENTS

SECTION A. General description of small-scale project activity

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

Argibem, São Sebastião and *Vulcão* Ceramics Fuel Switching Project.

Monitoring report completed in May 15th, 2009 – Version 03

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

The project activity promotes a fuel switch at *Argibem, São Sebastião and Vulcão* ceramics, which are small and prototypical ceramic industries that produce structural ceramic devices, like bricks, destined for the regional market of *Rio de Janeiro*.

The activity of this grouping consists on utilizing wood from afforestation and woody residues, which are renewable biomasses, to feed their kilns rather than using a non-renewable fuel like heavy oil. As renewable biomasses, *Argibem* Ceramic utilizes sawdust, *Vulcão* Ceramic utilizes afforestation wood residues that were both refused or wasted in industries (such as the tip of the tree and its branches) and *São Sebastião* Ceramic utilizes wood residues from wood industries, pallets, residues from city gardens, construction residues wood, among others.

The objective of the implementation of this project activity in the ceramics is to stop using the heavy oil and completely substitute it with renewable biomasses to feed their kilns and cook their ceramic pieces so that they can minimize environmental impacts related to the fossil fuel consumption.

This fuel switching project is reducing the greenhouse gas (GHG) emissions through the substitution of heavy oil for renewable biomasses to generate thermal energy. It was concluded that this is feasible when considering the income derived from commercializing the resulting carbon credits. This move was originally unattractive due to the high investment costs of the adaptation of machineries to the new biomass and other barriers.

The emissions launched during the combustion of heavy oil were not compensated by carbon absorbance methods since fossil fuels had been stored for millions of years prior to their consumption. An opposite scenario occurs with the renewable biomasses utilized in this project activity since they are either provided from areas with sustainable forest management or are woody residues, such as pallets and construction residues.

Besides the global warming, the use of fossil fuels brings forward concerns about the security of the oil transportation that can result in huge environmental impacts, chiefly when this transportation is overseas.

The calculations regarding the quantity of oil required in the burning process were done according to the efficiency of the kilns employed in the ceramics, which would require 97.7 liters to produce 1,000 ceramic devices in *Argibem* Ceramic, 200 liters of oil in *São Sebastião* Ceramic and 126.3 liters of oil in *Guaraí* Ceramic. These values are higher than the reference[1] because it considers advanced equipments of oil insertion, which did not represented the ceramics' baseline scenario.

The main difficulties for the ceramics due to the fuel-switch were the non-availability of human knowledge to operate and maintain the new technology implemented the internal logistic modification and the employee's resistance to the new technology.

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[1] *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).*

The ceramics lost production due to the adaptation to the use of biomasses and to the new machineries, as they added significant differences to the production process. Besides, these new equipments acquired as well as the construction of sheds to stock the biomass, added an additional cost for the ceramics, as the new fuel must be stored in covered sites in order to improve the kiln's efficiency.

Moreover, although there is currently a great amount of these types of biomasses available regionally, a demand and price increase has already been reported. Even if the price of the biomasses increase, the ceramics can not repass it through the ceramic pieces, once they would not have competitive prices in relation to other ceramics which did not made the fuel switch. The project approval will make the continue use of renewable biomasses feasible.

By diverging significantly from the identified baseline scenario, with the implementation of this project, the ceramics now generate thermal energy minimizing the damages caused by the use of fossil fuels and preserving oil reserves. Furthermore, the ceramics dispense the oil transportation, which could result in huge environmental impacts.

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 the project description document. The emission reductions due to the switching non renewable fuel (heavy oil) to renewable biomasses resulted in **45,046 tCO2e** during the monitoring period of 01/04/2006 to 30/09/2008.

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 Category AMS-I.C.:** Thermal energy for the user with or without electricity – Version 13 from March 14th 2008.
- This is a grouped project activity.

This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels.

B.2. Monitoring period

This report refers to the data registered during April 1st, 2006 to September 30th, 2008 (Days included).

B.3. Data and parameters applied:

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO2/TJ
Description:	CO2 Emission factor of residual fuel oil
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied:	77.4 tCO2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	The fuel that would have been used in the baseline scenario for this project activity would be heavy oil. The non-renewable wood would be provided from the *Atlantic Forest* biome. However, this fuel is not viable considering the inaccessibility of this Biome and its unavailability in the region. The natural gas has an inconstant distribution, bringing forward a lot of risks associated.
Any comment:	Applicable for stationary combustion in the manufacturing industries and construction. 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_{oil}**
Data unit:	TJ/tonne of oil
Description:	Net Calorific Value
Source of data used:	Value average checked at: - IPCC : Intergovernmental Pannel on Climate Change: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf, table 1.2
Value applied:	0.0404 TJ/Tonne
Justification of the choice of data or description of	This value provided the energy generated by the amount of heavy oil that would be used in the absence of the project.

measurement methods and procedures actually applied :	
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 / Parameter:	**ρ oil**
Data unit:	ton/L
Description:	Specific gravity of fossil fuel
Source of data used:	Value average checked at: -Faculdade de Engenharia Mecânica UNICAMP - http://www.fem.unicamp.br/~em672/GERVAP2.pdf
Value applied:	0.000978 ton/L
Justification of the choice of data or description of measurement methods and procedures actually applied :	The amount of oil used in the baseline was measured by volume units.
Any comment:	

Data / Parameter:	**BFy**
Data unit:	L of oil per thousand of devices
Description:	Consumption of fossil fuel per thousand of ceramic devices produced per year
Source of data to be used:	Historical data from project developer
Value of data	<table><tr><th>Ceramic</th><th>*Argibem*</th><th>*São Sebastião*</th><th>*Vulcão*</th></tr><tr><td>BFy</td><td>97.76</td><td>200</td><td>126.316</td></tr></table>
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 ceramics used to consume heavy oil. 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 heavy oil displaced to maintain the ceramic production in the baseline scenario. As *São Sebastião* ceramic is building a "Tunnel" kiln and deactivating the current "Hoffman" kiln, in the next verification, when the "Tunnel" kiln be operating, it will be monitored the efficiency gain/loss and biomass use in the next monitoring report.
Any comment:	

Data / Parameter:	**ηth**
Data unit:	Percentage
Description:	The efficiency of the ceramics using fossil fuel that would have been used in the absence of the project activity

Source of data used:	Historical data from project developer
Value applied:	<table><tr><th>Ceramic</th><th>Argibem</th><th>São Sebastião</th><th>Vulcão</th></tr><tr><td>ηth</td><td>100%</td><td>100%</td><td>100%</td></tr></table>
Justification of the choice of data or description of measurement methods and procedures actually applied :	Efficiency should be calculated as total energy produced (electricity and steam/heat extracted) divided by thermal energy of the fuel used. As the ceramics did no use to monitor the energy produced due to the heavy oil burning, the ηth could not be calculated. Despite the fact that is impossible to any industry achieve the maximum efficiency to generate thermal energy, the efficiencies of the ceramics using heavy oil in the absence of the project activity were adopted as 100%, as this value is the most conservative one. Furthermore, the ηth is in accordance with the methodology applied, which states that the efficiency of the baseline units shall be determined by adopting one of the criteria. The criterion adopted was the maximum efficiency of 100%, which is the most conservative of the options showed in the methodology.
Any comment:	

B.4. Data and parameters monitored:

Data / Parameter:	$Q_{renbiomass}$
Data unit:	Tonnes
Description:	Amount of renewable biomass
Source of data to be used:	Measured by the project developer
Value of data	<table><tr><th>Ceramic</th><th>Argibem</th><th colspan="2">São Sebastião</th><th>Vulcão</th></tr><tr><td>Biomasses</td><td>Sawdust</td><td>Woody Residues</td><td>Afforestation wood</td><td>Afforestation wood</td></tr><tr><td>April 2006 to December 2006</td><td>3,819.0</td><td>996.6</td><td>203.2</td><td>4,050.4</td></tr><tr><td>2007</td><td>4,949.5</td><td>1,748.6</td><td>267.2</td><td>6,154.2</td></tr><tr><td>January 2008 to September 2008</td><td>4,263.0</td><td>1,538.8</td><td>201.2</td><td>4,924.9</td></tr></table>
Description of measurement methods and procedures to be applied:	The amounts of renewable biomasses were monitored in accordance to the weight described in the receipts or invoices 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><th>Biomass</th><th>Wood from afforestation</th><th>Woody residues</th><th>Sawdust</th></tr><tr><td>Specific gravity (tons/m³)</td><td>0.510</td><td>0.35</td><td>0.245</td></tr></table> The sources of these data are: Wood from afforestation -IPCC: Intergovernmental Pannel on Climate Change. Orientación del

	IPCC sobre las buenas prácticas para UTCUTS. Capítulo 3: Orientación sobre las buenas prácticas en el sector de CUTS- Woody Residues (pallets, construction residues wood, city garden residues, among others) - SIMIONI, F. J. **Análise diagnóstica e prospectiva da cadeia produtiva de energia de biomassa de origem florestal no planalto sul de Santa Catarina** - Curitiba: UFPR, 2007. 132p.: il. - Available at: <http://dspace.c3sl.ufpr.br/dspace/handle/1884/10294>. Last visit in: February 3rd, 2009. It was utilized the specific gravity for wood chips. Sawdust -Masses and Dead Loads of Concrete and Other Materials- <http://www.cca.org.nz/pdf/Masses.pdf>
QA/QC procedures to be applied:	Amount of biomass was checked according to receipts of purchase, and the biomass is monitored through its energetic balance, so the real quantity of fuel is better controlled.
Any comment:	The use of the renewable biomasses provides a more efficient process then when using wood. As *São Sebastião* ceramic is building a "Tunnel" kiln and deactivating the current "Hoffman" kiln, in the next verification, when the "Tunnel" kiln be operating, it will be monitored the efficiency gain/loss and biomass use in the next monitoring report.

Data / Parameter:	**PRy**
Data unit:	Unity of ceramic devices
Description:	Production of ceramic pieces
Source of data to be used:	Controlled by the project developer.
Value of data	

Production from April 1st, 2006 to September 30th, 2008	*Argibem*	*São Sebastião*	*Vulcão*
Ceramic Devices	48,431,546	23,673,958	41,646,373

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. Since the ceramics must have an internal control of the production and sale at the end of every month, the PRy value could not be manipulated.
Any comment:	

Data / Parameter:	**Origin of renewable biomass**
Data unit:	Not applicable
Description:	Renewable origin of the biomass
Source of data to be used:	Controlled by the project developer

Value of data	All the renewable biomasses employed in the monitoring period were already described in the project design document.
Description of measurement methods and procedures to be applied:	The documentation from official institutions is provided annually. The guarantee of acquiring sawdust, wood chips and wood from afforestation from renewable sources was achieved by invoices from the providers, as well as their tracking until their afforestation origin. Although all the providers of renewable biomasses for the ceramics work with wood from afforestation, such as Eucalyptus and Pinus, the provider Icomasar – *Indústria e Comércio de Madeiras ME* plant and cut the afforestation wood with their own resources without a link with IBAMA[2], thus it is not necessary to present a Forest Cut Authorization[3]. However, there is not a proof that the area will remain a forest after the trees are cut. Therefore, the quantity of afforestation wood that arrived at *Vulcão* ceramic from this provider was discounted from the total of carbon credits generated.
QA/QC procedures to be applied :	The biomasses were considered renewable as they were in accordance with the definition given by the Annex 18, EB 23 of UNFCCC definition.
Any comment:	

Data / Parameter:	**Leakage of fossil fuel**
Data unit:	tCO2e
Description:	Leakage resulted from the fossil fuel
Source of data to be used:	Monitored
Value of data	0
Description of measurement methods and procedures to be applied:	The source of leakage predicted in the methodology applied was monitored.
QA/QC procedures to be applied :	Receipts and invoices were used to prove that the new equipments were acquired. The old equipments located in the ceramic prove that no equipment was transferred.
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**
Data unit:	ton or m^3
Description:	Amount of renewable biomass available

[2] *Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). Available at: <http://www.ibama.gov.br/patrimonio/>. Last visit on: May 14th, 2009.*

[3] *According to: <http://www.idaf.es.gov.br/Download/Legislacao/DRNRE%20-%20Instru%C3%A7%C3%A3o%20normativa%20n%C2%BA%208,%20de%2024%20de%20agosto%20de%202004.pdf>. Last visit on: May 14th, 2009.*

<table>
<tr><td>Source of data to be used:</td><td>Monitored</td></tr>
<tr><td>Value of data</td><td>
<table>
<tr><th>Biomass surplus</th><th>Surplus</th><th>Year</th></tr>
<tr><td>Wood from afforestation in m³</td><td>7,776,095</td><td>2007</td></tr>
<tr><td>Woody Residues(sawdust/wood chips) in m³</td><td>5,737,174.08</td><td>2007</td></tr>
<tr><td>Industrial wood residues in tonnes</td><td>749,839</td><td>2006</td></tr>
<tr><td>Rice Husk in m³</td><td>131.38 thousands</td><td>2007/08</td></tr>
<tr><td>Elephant Grass</td><td>Not measured</td><td>-</td></tr>
</table>
Detailed information in section 4.1 – LEAKAGE.
</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>It will be used to calculate the leakage of renewable biomass.
The sources of leakages predicted in “General guidance on leakage in biomass project activities” of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, will be monitored. The measurement of the leakage will be based in national and internal articles and database every monitoring period. The sources will provide information about the biomass availability in the project activity’s region.</td></tr>
<tr><td>QA/QC procedures to be applied :</td><td>Data available regarding the ceramic industries fuel consumption will be employed to monitor the leakage.</td></tr>
<tr><td>Any comment:</td><td>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.</td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>Leakage of renewable biomass</td></tr>
<tr><td>Data unit:</td><td>Percentage</td></tr>
<tr><td>Description:</td><td>The percentage of use of a renewable biomass by the project activity in relation to the renewable biomass availability in the project activity’s region.</td></tr>
<tr><td>Source of data to be used:</td><td>Monitored according to national and international articles and database regarding the surplus of a specific biomass in the region of the project activity.</td></tr>
<tr><td>Value of data</td><td>
<table>
<tr><th>Leakage of renewable biomass</th><th>Percentage of use related to the availability</th></tr>
<tr><td>Wood from afforestation</td><td>0.139%</td></tr>
</table>
</td></tr>
</table>

		Woody Residues (sawdust/wood chips)	0.309%
		Industrial wood residues	0.19%
Description of measurement methods and procedures to be applied:	The sources of leakages predicted in "General guidance on leakage in biomass project activities" of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, were monitored. The measurement of the leakage was based in national and international articles and database every monitoring period. 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 industries fuel consumption was 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

The methodology applied is Category AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008, which is applicable for project activities that avoid greenhouse gases emissions by using renewable biomass instead of fossil fuels, in order to generate thermal energy.

The grouped project activity generates 6.98 MWthermal, which is less than the limit of 45 MWthermal for Type I small scale project activities.

The calculations for the baseline were realized as established in the following equations:

$$BEy = HGy * EF_{CO2} / \eta th \qquad \textbf{(Equation 01)}$$

Where:

BEy: The baseline emissions from steam/heat displaced by the project activity during the year y in tCO2e.

HGy: The net quantity of heat supplied by the project activity during the year y in TJ.

EF_{CO2}: The CO2 emission factor per unit of energy of the fuel that would have been used in the baseline plant in (tCO2 / TJ), obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used.

ηth: The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.

The ceramic facilities did not use to monitor the energy generated by the fossil fuel consumed. However, it is well known the amount of fossil fuel consumed as well as the amount of fuel required to burn a thousand of pieces. Therefore, this project estimated the baseline emissions through the energy generated by the real consumption of fuel oil and assuming that ηth is 100%.

The thermal energy generated by the fossil fuel is estimated as follows:

$$HGy = Qoil \times NCV \times \rho \qquad \textbf{(Equation 02)}$$

Where:

Qoil: Amount of oil (L)

NCV: Net calorific value of oil (TJ/Tonne)

ρ: Specific gravity of oil (ton/L)

The quantity of heavy oil that would be used in the ceramics is calculated through the multiplication of the ceramics' production (in thousands of units) by the consumption of fossil fuel per thousand of ceramic devices (BFy) as stated below:

Qoil = (PRy/1000) x BFy (Equation 03)

Where:

Qoil: Amount of oil (L)

PRy: Production of ceramic pieces (units)

BFy: Consumption of fossil fuel per thousand of ceramic devices produced per year (L/thousand of units)

ERy = BEy – Leakage (Equation 04)

Where:

ERy: Emission reduction in the year "y" (tonnes of CO2 eq.)

BEy: Baseline emissions of CO2 that would be generated through native wood burning (tonnes of CO2 eq.)

Leakage: Emissions from the project activity's leakage, in the year "y" (tonnes of CO2 eq.)

B.6. Monitoring results

Leakage

The leakage predicted in the methodology employed is not applicable for this project activity as there was no transference of equipment in spite of new equipments had to be acquired. Furthermore, the old oil equipments are still in the ceramics, proving that these equipments were not transferred.

The leakage from biomass projects, like the project activity, shall also be estimated according to the "General guidance on leakage in biomass project activities" of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, which identifies different emission sources based on type of biomass being considered.

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	Existing forests	-	-	X

	New forests	X	X	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as a cropland/wetland	X	X	-
	In the absence of the project the land will be abandoned	-	X	-
Biomass residues or waste	Biomass residues or wastes are collected and use.	-	-	X

Observing the table above, the source of leakage of the present project is the competing use of sawdust; wood from afforestation and its residues; and industries and construction residues. All the ceramics utilize some kind of wood or wood residues and the providers are mainly wood industries. There are plenty of this kind of industries in the states of *Rio de Janeiro*, *São Paulo* and *Minas Gerais*, which means that the project activity did not disturb in any aspects the wood market once there is plenty of this kind of biomass available. The source of leakage of the present project is showed below according to each type of biomass:

Wood from Afforestation

The wood from afforestation utilized by this project activity was from *Eucalyptus* and *Pinus* wood. The area destined for afforestation in *Brazil* corresponds to 5.6 millions of hectares, where the *Eucalyptus* genus corresponds to 3.5 millions of this area, and can generate 23 to 25 tons of biomass per hectare[4]. The grand major of these cultivations were established in the middle of 1970 to 1980. The *Eucalyptus* and *Pinus* genuses correspond to 80% of the afforestation in *Brazil*. In addition, these genuses are mainly cultivated in the southeast region of the country, where the climate is more favorable for their growing[5].

In addition, sustainable management practices of the afforestation in *Brazil* (as the techniques of preparation, fertilization, control of weeds, improved seeds, cloning and reform) were introduced and constantly improved in order to increase its productivity[6]. As a consequence, *Brazil* withholds the best productivity taxes (in m³/ha/year) over the world due to the adaptation of these species to the Brazilian territory and the success of the experiments of genetic improvement[7].

[4] Brazilian *Society of Forestry. Source: <http://www.sbs.org.br/atualidades.php.>. Accessed at: January 19th, 2009.*

[5] *JUVENAL, T. L.; MATTOS, R. L. G.* ***O setor florestal no Brasil e a importância do reflorestamento.*** *BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit in: January 22nd, 2009.*

[6] *MCT/IPEF.* ***Silvicultura e Manejo.*** *Source: <http://www.ipef.br/mct/MCT_03.htm>.*

[7] *JUVENAL, T. L.; MATTOS, R. L. G.* ***O setor florestal no Brasil e a importância do reflorestamento.*** *BNDES Setorial, Rio de Janeiro, n. 16, p. 3-30, set. 2002. Available at: <http://www.bndes.gov.br/conhecimento/bnset/set1601.pdf>. Last visit in: January 22nd, 2009.*

The production of wood from afforestation in the state of *Rio de Janeiro* was of 368,710 m³[8] and in *São Paulo*, which is a bordering state, was of 7,407,385 m³[9] in 2007. As the consumption of this kind of fuel was around 10,328 m³ per year, it represented around 0.139% of the total of wood from afforestation produced in the region.

Woody Residues (Sawdust/ Wood Chips)

The production of wood generates a large amount of residues, which can be reused to generate thermal energy, considering that around 22% of the wood produced will generate sawdust/wood chips[10]. The production of wood log in the state of *Rio de Janeiro* was of 111,600 m³[11] and in *São Paulo*, which is a bordering state, was of 25,966,464 m³[12] in 2007. Thus, the production of sawdust/wood chips in the region was around 5,737,174.08 m³ per year. The woody residues consumption of this project activity was around 17,730 m³ per year, value that represented around 0.309% of the total of woody residues produced in the region.

Industrial and construction residues

In order to calculate the availability of these biomasses, and considering the lack of studies regarding the inventory of residues in the state of *Rio de Janeiro*, it was utilized other similar cities in order to obtain the inventory of both construction and industrial residues.

The construction residues wood corresponds around 85% of the total construction residues in *Sorocaba*, city of the state of *São Paulo*. The deficiency of a correct destination for this wood constitutes a huge problem[13].

The percentage of the wood residues (such as pallets) contained within the industrial solid residues in the region of *Curitiba*, which is the capital of the state of *Paraná*, is around of 5%. Furthermore, the city garden residues correspond around 3.2% of the total of industrial solid residues[14].

It was utilized these data to calculate the percentage of consumption of these residues in the project activity. Moreover, it was only considered the availability of industrial wood residues, which is 749,839 tons per year (around 5% of the total of industrial solid residues). The consumption of these kinds of biomasses of this project activity is around 1,428 tonnes per year, corresponding around 0.19% of the total. Initiatives like these should be stimulated in order to attenuate the solid residues final disposal in cities.

Therefore, the present project activity does not encompass any type of leakage.

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[8] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: http://www.ibge.gov.br/estadosat/temas.php?sigla=rj&tema=extracaovegetal2007*

[9] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2007*

[10] *BRITO EO. Estimativa da produção de Resíduos na Indústria Brasileira de Serraria e Laminação de Madeira. Rev. da Madeira. v.4. n.26. 1995, pp. 34-39.*

[11] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: http://www.ibge.gov.br/estadosat/temas.php?sigla=rj&tema=extracaovegetal2007*

[12] *According to IBGE(Geographic and Statistic Brazilian Institute) available at: http://www.ibge.gov.br/estadosat/temas.php?sigla=sp&tema=extracaovegetal2007*

[13] *MANCINI, S. D. et al.* ***Potencial de Reciclagem dos Resíduos da Construção Civil de Sorocaba-SP.*** *Available at: http://www.saneamento.poli.ufrj.br/documentos/24CBES/III-024.pdf. Last visit at: January 27th, 2009.*

[14] *Statewide inventory of industrial solid residues. Available at: <http://folio.mp.pr.gov.br/downloads/Meio_Ambiente/ri_iriap.pdf>. Last visit in: February 3rd, 2009.*

The quantity of heavy oil that would be used in the ceramics is calculated through the multiplication of the ceramics' production (in thousand of units) by the consumption of fossil fuel per thousand of ceramic devices (BFy).

It was considered that the BFy would be: 97.76 liters to produce 1,000 ceramic devices in *Argibem* Ceramic, around 200 liters of oil in *São Sebastião* Ceramic and 126.316 liters of oil in *Vulcão* Ceramic. The three ceramic companies have many years of operation, and the kilns had not been much modernized or upgraded since then. Usually, the ceramic's kilns have a very long-life cycle because they are made of resistant and special bricks and clay; thus, a ceramic industry can operate utilizing the same kiln for several years, without the necessity of changing it. Moreover, the use of heavy oil as fuel was manually done by an employee, who the most of times, fed the kilns with large quantities of fuel. The efficiency values are so different to each ceramic company due to the type and age of the kilns. *Argibem* Ceramic has a "Tunnel" kiln, which is more efficient than a "Hoffman" kiln. In addition, *Argibem* Ceramic made changes in their process that promotes a better efficiency of its Kiln, such as the installation of new equipment of control combustion, the improvement of efficiency and capacity of the ceramic devices dryer through the installation of temperature sensors and humidity control, and the use of an exhauster for a better utilization of heat from the kiln, reducing the time of burning in the Tunnel Kiln, as a result reduces the quantity of heavy oil used. These improvements were made during the year of 1996.

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 April 1st 2006 to September 30th, 2008:

Argibem Ceramic

Table 2. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Argibem* ceramic – Year of 2006

	Monthly Production	Qoil (liters)	ERy (tCO2e)
Apr	1,604,046	156,812	479.6
May	1,488,537	145,519	445.0
Jun	1,449,197	141,673	433.3
Jul	1,611,177	157,509	481.7
Aug	1,561,989	152,700	467.0
Sep	1,422,494	139,063	425.3
Oct	1,463,133	143,036	437.4
Nov	1,344,234	131,412	401.9
Dec	759,378	74,237	227.0
Total	**12,704,185**	**1,241,961**	**3,798**

Table 3. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Argibem* ceramic – Year of 2007

	Monthly Production	Qoil (liters)	ERy (tCO2e)
Jan	117,471	11,484	35.1
Feb	734,670	71,821	219.6
Mar	1,601,115	156,525	478.7
Apr	1,722,729	168,414	515.0
May	1,702,451	166,432	509.0
Jun	1,789,395	174,931	535.0

Jul	1,795,892	175,566	536.9
Aug	1,830,334	178,933	547.2
Sep	1,729,306	169,057	517.0
Oct	1,766,870	172,729	528.2
Nov	1,711,106	167,278	511.6
Dec	1,341,616	131,156	401.1
Total	**17,842,955**	**1,744,327**	**5,334**

Table 4. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Argibem* ceramic – Year of 2008

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Jan	1,765,654	172,610	527.9
Feb	1,895,944	185,347	566.8
Mar	1,940,886	189,741	580.3
Apr	1,999,744	195,495	597.9
May	2,069,398	202,304	618.7
Jun	1,902,440	185,983	568.8
Jul	2,121,462	207,394	634.2
Aug	2,098,029	205,103	627.2
Sep	2,090,849	204,401	625.1
Total	**17,884,406**	**1,748,380**	**5,347**

São Sebastião Ceramic

Table 5. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *São Sebastião* ceramic – Year of 2006

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Apr	794,074	158,815	485.7
May	811,833	162,367	496.5
Jun	1,006,773	201,355	615.8
Jul	950,730	190,146	581.5
Aug	941,008	188,202	575.6
Sep	824,051	164,810	504.0
Oct	844,701	168,940	516.6
Nov	643,530	128,706	393.6
Dec	766,923	153,385	469.1
Total	**7,583,623**	**1,516,725**	**4,638**

Table 6. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *São Sebastião* ceramic – Year of 2007

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Jan	759,388	151,878	464.5
Feb	642,353	128,471	392.9
Mar	766,457	153,291	468.8
Apr	789,770	157,954	483.0

May	849,600	169,920	519.6
Jun	812,836	162,567	497.2
Jul	697,333	139,467	426.5
Aug	920,662	184,132	563.1
Sep	732,547	146,509	448.1
Oct	836,816	167,363	511.8
Nov	800,967	160,193	489.9
Dec	652,921	130,584	399.3
Total	**9,261,650**	**1,852,330**	**5,665**

Table 7. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *São Sebastião* ceramic – Year of 2008

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Jan	656,332	131,266	401.4
Feb	534,346	106,869	326.8
Mar	612,965	122,593	374.9
Apr	651,308	130,262	398.4
May	965,980	193,196	590.8
Jun	875,267	175,053	535.3
Jul	855,472	171,094	523.2
Aug	797,193	159,439	487.6
Sep	879,822	175,964	538.1
Total	**6,828,685**	**1,365,737**	**4,177**

Vulcão Ceramic

Table 8. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Vulcão* ceramic – Year of 2006

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Apr	1,300,000	164,203	502.2
May	1,100,000	138,941	424.9
Jun	1,254,000	158,393	484.4
Jul	1,253,682	158,353	484.3
Aug	1,230,000	155,361	475.1
Sep	1,215,253	153,499	469.4
Oct	1,333,000	168,371	514.9
Nov	1,350,000	170,519	521.5
Dec	1,226,817	154,959	473.9
Total	**11,262,752**	**1,422,598**	**4,351**

Table 9. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Vulcão* ceramic – Year of 2007

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
Jan	1,248,000	157,635	482.1
Feb	1,235,000	155,993	477.1

Mar	1,357,000	171,403	524.2
Apr	1,278,000	161,424	493.7
May	1,211,696	153,049	468.1
Jun	1,236,226	156,148	477.5
Jul	1,358,000	171,529	524.6
Aug	1,450,220	183,177	560.2
Sep	1,487,000	187,823	574.4
Oct	1,554,000	196,286	600.3
Nov	1,556,000	196,538	601.0
Dec	1,547,000	195,402	597.6
Total	**16,518,142**	**2,086,407**	**6,381**

Table 10. Quantity of oil that would be utilized in the absence of the project and emission reductions due to the project activity in *Vulcão* ceramic – Year of 2008

	Monthly Production	**Qoil (liters)**	**ERy (tCO2e)**
jan	1,462,000	184,665	564.7
feb	1,557,000	196,665	601.4
mar	1,384,000	174,813	534.6
apr	1,458,480	184,221	563.4
may	1,516,756	191,581	585.9
jun	1,502,832	189,823	580.5
jul	1,767,420	223,243	682.7
aug	1,644,205	207,680	635.1
sep	1,572,785	198,658	607.5
Total	**13,865,479**	**1,751,349**	**5,356**

Total Emission Reductions

Table 11. Total Emission Reductions for the grouped project activity

	2006	**2007**	**2008**	**Total**
	ERy (tCO2e)	**ERy (tCO2e)**	**ERy (tCO2e)**	**ERy (tCO2e)**
Jan		982	1,494	2,476
Feb		1,090	1,495	2,585
Mar		1,472	1,490	2,961
Apr	1,467	1,492	1,560	4,519
May	1,366	1,497	1,795	4,659
Jun	1,533	1,510	1,685	4,728
Jul	1,547	1,488	1,840	4,876
Aug	1,518	1,671	1,750	4,938
Sep	1,399	1,539	1,771	4,709
Oct	1,469	1,640		3,109
Nov	1,317	1,603		2,919
Dec	1,170	1,398		2,568
Total	**12,787**	**17,380**	**14,879**	**45,046**

Based on methodology AMS-I.C.: Thermal energy for the user with or without electricity – Version 13 from March 14th 2008 and on monitored data as well considering the high contribution to sustainability, the project participants request the carbon credits due to **45,046 tCO_2e.**

The contribution to sustainability will be monitored applying the Social Carbon methodology, which is based in six main pointers: Technology; Natural; Financer; Human; Social and Carbon Resources.

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

The responsible for projects monitoring are *Mr. Marcelo de Oliveira do Vale* from *Argibem* ceramic, *Mrs. Maria Delmina Oliveira Gonçalves* from *São Sebastião* ceramic; and *Mr. Cláudio Pelegrini* from *Vulcão* ceramic.

The monitoring report was completed in May 15th, 2009 by *Marcelo Hector Sabbagh Haddad* and *Rafael Ribeiro Borgheresi* from *Carbono Social Serviços Ambientais LTDA.*