CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

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SECTION A. General description of project activity

A.1 Title of the project activity:

Title of the project activity - "Modal shifting in industry for transport of product/feedstocks"
Version - 00
Date of completion of the document – 20/06/2005

A.2. Description of the project activity:

Aracruz Celulose began operations in 1967, when its first eucalyptus plantations were established. The company was formally founded in 1972. The Barra do Riacho Plant, located in the state of Espírito Santo, is the largest pulp mill in the world, fully integrated with the company's tree plantations and a specialized private port (Portocel). The facility contains three production units with a total capacity of 2 million tons a year of pulp.

After over three decades, Aracruz Celulose remains committed to attend to its clients' needs, investing constantly in human resources, quality improvement, technology, and the environment as demonstrated by the management systems certification of its factories in accordance with ISO 9000 and ISO 14000 standards.

The leading global producer of bleached eucalyptus pulp, Aracruz operates the largest and most advanced pulp mill in the world. Located in Barra do Riacho in the Brazilian state of Espírito Santo, just 1.5 km from its private port terminal (Portocel) and 70 km from Vitória, the Aracruz manufacturing complex is composed of three production units (Fiberlines A, B and C) that make optimized joint use of the same infrastructure and logistics for transportation and exports.

Aracruz has developed the methodology for modal shifting in industry for product/feedstocks for its project, which is a two phased project for the maritime (i.e., ocean-going) transportation of wood to the Barra do Riacho Plant. Maritime transportation of wood has not been tried in Brazil. Aracruz has decided to invest and to design a project that uses ocean-going barges to carry logs from Aracruz's Bahia plantations to its private port, Portocel, next to the pulp mill in Espírito Santo, a distance of about 150 miles.

The Luciano Villas Boas Machado Ship-Barge Terminal is part of Aracruz's sea-going wood transportation project, involving investment of US$ 51 million in the terminal — of which US$31 million was for a tugboat and three barges. The first phase of the project started its operation in March 2003 and has been operating as a pilot project. This first phase involved transporting part of the wood by barges and the rest by trucks since the start-up of the project. The second phase of the project would double the wood sea-transportation capacity.

The project activity is about the implementation of a modal shift in industry for the transportation of product/feedstocks, i.e. the wood maritime transportation project. The feasibility study for the implementation of the modal shifting transportation project of wood shows this project as a non-economic investment option, especially when compared to the road transportation alternative of Aracruz (**Table 1**). The financial analysis summarized in **Table 1** displays the annual costs over a 10-year investment horizon. These analyses are based on the actual operating performance of the first phase of the project, which has not been profitable.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Pulpwood transported from Bahia (m3 x 1,000)	2,600	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400
Investments in Maritime transport. project (US$ x 1,000)	24,169*	-	2,060	-	1,030	-	2,060	-	1,030	-
Operational Costs of Maritime transport. (US$ x 1,000)	25,214	29,942	31,702	30,082	31,707	28,914	28,905	29,949	30,335	30,254
Costs of Maritime transport. (US$ x 1,000)	49,383	29,942	33,762	30,082	32,737	28,914	30,965	29,949	31,365	30,254
Operational Costs of Road transportation (US$ x 1,000)	24,567	32,333	32,664	32,788	31,589	32,044	32,085	32,416	32,499	32,127

* Net Present Value of the investments on the project from 2001 to 2005

Table 1 – Financial analysis of wood maritime transportation project.

This project is part of a commitment by Aracruz to the Sustainable Forest Products Industry (SFPI), which is a member-sponsored program of the World Business Council for Sustainable Development (WBCSD). This SFPI study culminated in 1996 with the report Toward a Sustainable Paper Cycle (TSPC). Following its release, a permanent Sustainable Forest Products Industry working group was established to look at the forest industry in a more holistic way.

TSPC estimated that the paper industry across the whole life cycle of paper was making a net contribution to carbon emissions due to high use of fossil fuel in manufacturing and the methane emissions from paper going to landfills. The main directive is that the industry also needs to take advantage of the opportunities afforded by the Clean Development Mechanism to both achieve reduction in carbon releases and contribute to sustainable development.

In this context, and considering Aracruz's environmental policies and its sustainable development principles, Aracruz decided to develop a maritime transportation project to alleviate congestion of Brazil's roads caused by the large quantity of wood it was transporting and to determine if Aracruz could develop a cost-effective alternative.

The project has the capacity to produce **63,799** tons of CO_2 equivalent emissions reduction over a 10-year time frame, considering the emission reductions from decreasing truck trips to bring wood to the plant and consequently reducing the fuel (diesel oil) utilization.

The project also brings numerous and significant environmental, social and economic benefits, contributing to the sustainable development objectives of the Brazilian Government (as shown in section F).

This project is the first in Latin America. If the company is able to achieve CERs from this project, it can become a template for the installation of similar projects in other operations of Aracruz in Brazil as well as for other pulp and paper (or other industrial) companies.

A.3. Project participants:

Please list project participants and Party (ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.		
Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Brazilian Government (host)	Public entity	No
Aracruz Celulose S.A.	Private entity	Yes
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Brazil

A.4.1.2. Region/State/Province etc.:

Espírito Santo and Bahia

A.4.1.3. City/Town/Community etc:

Aracruz and Caravelas

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Project is located between Barra do Riacho in the Brazilian state of Espírito Santo (just 1.5 km from its private port terminal – Portocel – and 70 km from Vitória, the Aracruz manufacturing complex) and Aracruz's plantations in the Brazilian state of Bahia, in the municipality of Caravelas. The new terminal contains a 215-meter-long docking area and has a 5.5-meter draft, permitting the simultaneous loading of two vessels. Loading/unloading capacity is 200 tons/hour. The map shows the details of the project location (**Figure 1**).

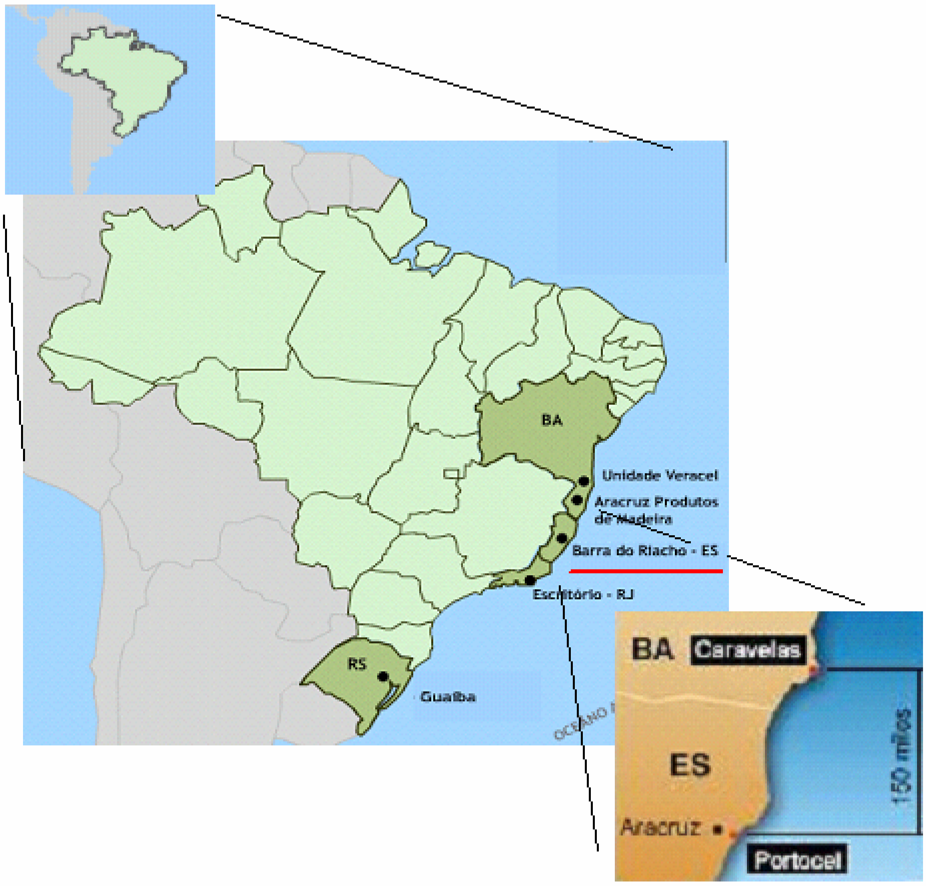


Figure 1 – Map of Brazil, showing location of the transportation project.

A.4.2. Category(ies) of project activity:

Emission reductions in the transport sector.

A.4.3. Technology to be employed by the project activity:

The maritime transportation of wood is expected to reduce considerably the flow of trucks along the Espírito Santo stretch of the BR-101 highway and the Bahian stretch of the road. The project (**Figures 2 and 3**) is the result of Aracruz's constant search to embrace wood transportation systems that offer better safety conditions as well as lower environmental and social impacts.

The system implemented is known as Integrated Tug and Barge (ITB). This consists of a tugboat that can quickly be coupled to a barge, transforming both units into a single vessel with characteristics that are similar to a conventional craft. The Aracruz ocean-going project is a first-of-its-kind effort in Latin America.

Each barge will have the capacity to transport a quantity of wood that is the equivalent of 100 truckloads of lumber. Pushed by a tugboat at an average speed of 12.5 knots the duration of the trip between the Caravelas terminal and Portocel, which are 275 km apart as the crow flies, will be approximately 12 hours. The annual capacity for shipping logs through the system is currently 1.7 million cubic meters. With the implementation of the second phase the annual capacity for shipping logs through the system will be 3.4 million cubic meters.

The Aracruz Maritime Wood Transportation Project comprises a terminal at the company's private port of Portocel in Barra do Riacho, near the pulp mill in Espírito Santo, the Caravelas terminal in Bahia, three barges and a tugboat. In the second phase of the project a fourth barge and a second tugboat will enter into service.

During the construction of the terminal, 400 jobs were created, of which approximately 80% were filled by local manpower. Aracruz invested more than R$ 3 million in the purchase of materials and services from local suppliers.

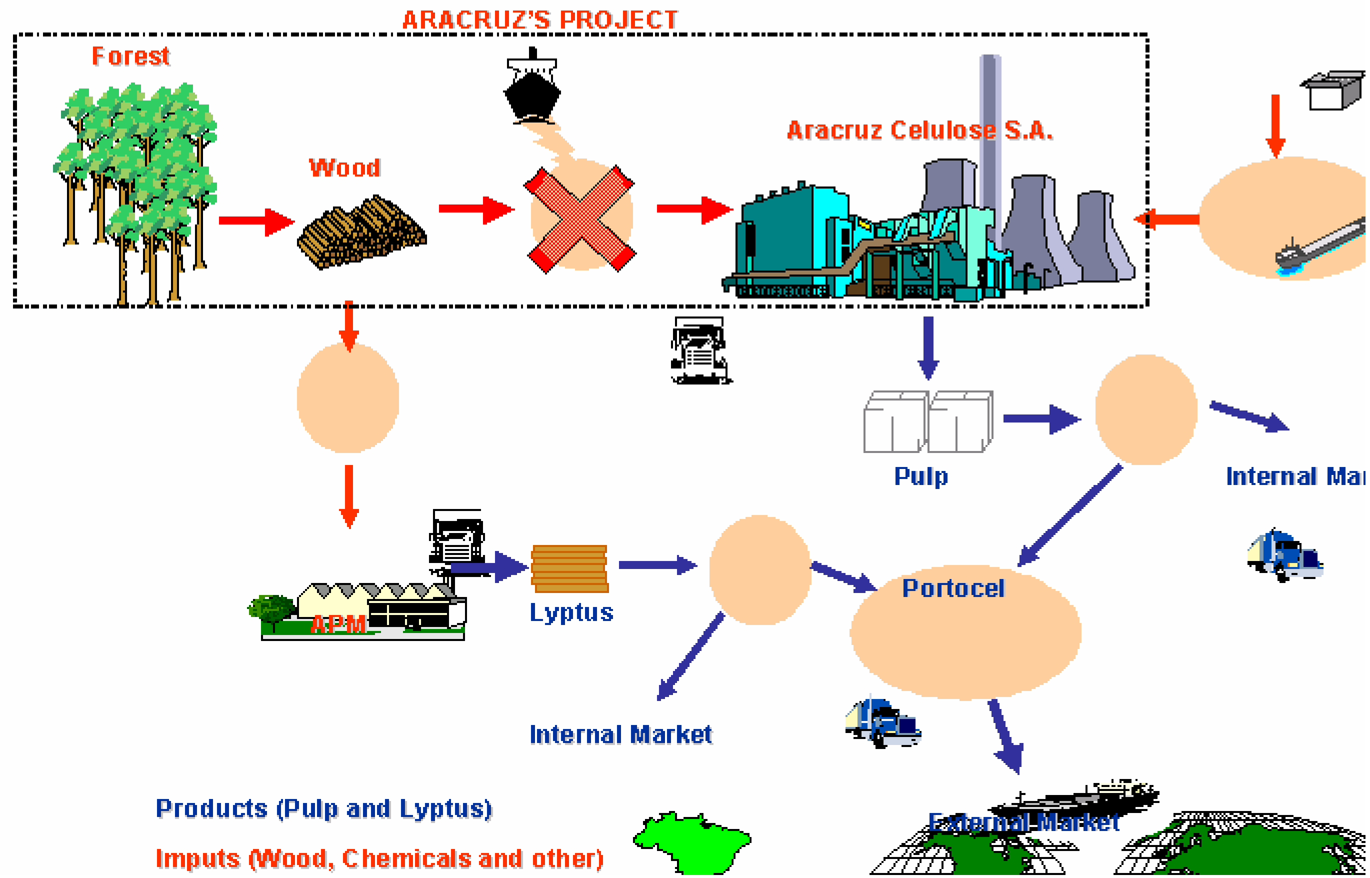


Figure 2 – Aracruz's project in the logistic chain

Figure 3 – Detailed Aracruz's project

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

By using the maritime mode to transport wood from the plantations in the south of Bahia to the Barra do Riacho Plant instead of on-road transportation, Aracruz has chosen a less resource-intensive transportation mode. The main cause of the emission reduction comes from the increase in transportation efficiency. A typical truck load contains about 44 m^3 of wood with fuel consumption of 1.65 km/liter, while Aracruz's barge load contains 4,932 m^3 of wood with fuel consumption of 0.0278 km/liter, thus leading to an effective reduction in greenhouse gas emissions. The total estimated reductions from the project are **63,799** tons of CO_2 (in 10 years). GHG emissions from the project are calculated in section E.

The reductions mentioned above are the results of the project activity that would not have occurred anyway due to several barriers. The proposed system is an advanced alternative to the current practice of transportation. The prevailing pulp and paper industry practice still relies heavily on road transportation as the main mode for wood transportation. In Latin America no companies in the pulp and paper industry use maritime wood transportation. There are four major barriers to the implementation of this process: the maritime wood transportation project has a negative internal rate of return (IRR); lack of infra-structure and regulations for maritime transportation, because on-road transportation is the traditional mode of transportation in Brazil; large investments needed and the weak economic situation of the shipbuilders in Brazil, which increases significantly the risks of the investments.; and lack of familiarity of Aracruz staff with maritime transportation options.

A study carried out by Indufor and STCP Engenharia (*2002 – "Study on Corporate Strategy on Carbon Sinks"*), that helped Aracruz to establish a consistent corporate strategy of greenhouse gas management, identified maritime wood transportation as one of the potential emission reduction projects of Aracruz (the same study highlighted the importance of the CER revenue for the project). According to some studies carried out by School of Business Administration of the Federal University of Rio of Janeiro - COPPEAD/UFRJ (*Fleury, P.F. 2002.'Strategic Transport Management'*), this strong prevalence of road transport is due to the low transportation costs in practice, resulting from various distortions in the Brazilian transport system. The Brazilian road cargo sector is characterized by high fragmentation and excess supply, making entry barriers almost non-existent. These facts lead to predatory competitive practices, resulting in prices below the real long-term social costs. Low road transport prices constitute one of the main explanations for the high market share enjoyed by this mode of transport in Brazil.

Since companies like Aracruz are not familiar with the maritime transportation of wood, this project includes additional risk in terms of financial investment and unfamiliar operation and maintenance practices. For the maritime project, Aracruz sent seven Requests for Proposal to maritime companies, but only one company presented a proposal for undertaking this untried option. This lack of response provides additional indications of the market risks associated with this project.

As shown in section A.2, maritime transportation is not an attractive option since it is going to be more costly than the typical practice of on-road transportation. The revenue from GHG emission reductions becomes important to reduce the negative IRR of the maritime project. The baseline adopted for the project is based on the assumption that, in the absence of carbon finance, the company would continue to use on-road wood transportation due to the negative IRR expected on the project. Note that this

expectation of a negative IRR is based on the financial feasibility study and on the actual operating experience during the first phase of the project.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emission reductions shall be in indicated using the following tabular format.	
Years	**Annual estimation of emission reductions in tonnes of CO_2e**
Year 2005	7,649
Year 2006	6,272
Year 2007	4,707
Year 2008	5,567
Year 2009	4,681
Year 2010	6,986
Year 2011	9,877
Year 2012	6,233
Year 2013	7,131
Year 2014	4,697
Total estimated reductions (tonnes of CO_2e)	**63,799**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	6,379.9

A.4.5. Public funding of the project activity:

There is no Annex I public funding involved in the Aracruz project activity. The investments made were financed by a local bank, the Brazilian Development Bank (BNDES – Banco Nacional de Desenvolvimento Econômico e Social).

The Brazilian Development Bank (BNDES) is a federal public company that is associated with the Ministry of Development, Industry and Foreign Trade, which has as an objective the long term financing of endeavours that contribute towards the development of the country.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

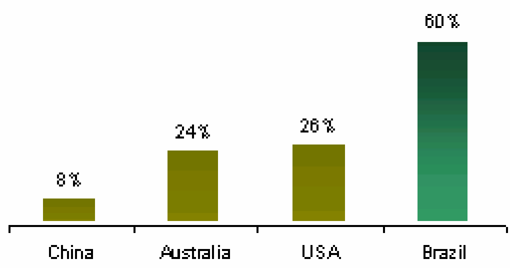
There is no approved baseline methodology for use of alternative transportation modes (as of June 2005). Thus, a new methodology is proposed here: "Baseline methodology for modal shifting in industry for product/feedstocks".

This new methodology is presented in more detail below and in CDM_NMB Aracruz document.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

Aracruz's Barra do Riacho Plant, where the project will occur, is a pulp and paper processing plant that uses on-road transportation to bring wood to the plant. This reliance on on-road wood transportation in the pulp and paper process is treated as the baseline. Nevertheless, as part of its commitment to the "Sustainable Forest Products Industry (SFPI)"[1], which was formed to help the pulp and paper industry address the challenges of sustainable development (including climate change issues), Aracruz decided to invest in a higher cost alternative involving maritime transportation of the wood to the Barra do Riacho Plant.

For more than three decades, Aracruz has been transporting wood by trucks. In Brazil, the basic logistic scheme relies heavily on road transportation (**Figure 4**). According to some studies carried out by the Logistics Studies Centre of Coppead Institute / UFRJ[2], the main reasons for that are the lack of regulations and lack of infra-structure to make other transportation alternatives feasible. In the case of maritime transportation, other barriers are the large investments needed and the weak economic situation of the shipbuilders in Brazil, which increase significantly the risks of the investments.



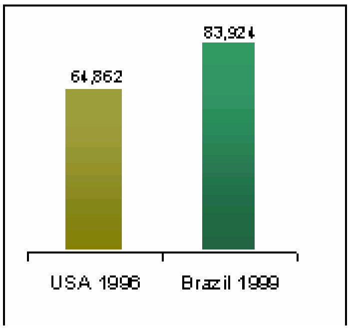
Source: *GEIPOT, Monthly Bulletin of Statistics, Transport Statistics for Europe, World Development Indicators (World Bank)*

Figure 4 – Share of Road Transportation in the Transportation Matrix – Comparison between Brazil and other countries with large territories

[1] A member-sponsored program of the World Business Council for Sustainable Development (WBCSD).

[2] CNT/CEL Coppead/UFRJ (2002). 'Transporte de Carga no Brasil – Ameaças e Oportunidades para o Desenvolvimento do País'.

Despite the fact that road transportation is the most used logistic system in Brazil, there are many impacts associated with road transportation, especially related to safety, air quality and energy consumption (**Figure 5**).



Source: Balanço Energético Nacional - 2000/MME; Transportation Statistics Annual Report 2000 – BTS; Department of Energy, Energy Information Administration, Monthly Energy Review, July 2000.

Figure 5 – Relative Energy Efficiency of Transport in Brazil
(BTU spent per US$ of the Gross Domestic Product)

With a view to identifying better alternatives for transportation, Aracruz developed a maritime transportation project that will substitute for the road transportation. The traditional Brazilian logistic system is usually road based. The use of ocean-going barges to carry logs to the pulp mill is a pioneering project in Brazil and Latin America that Aracruz believes makes sense from both a safety and an environmental viewpoint. The operational experience during the first phase of the project has shown Aracruz that actual performance of the new mode was worse than expected, mostly due to several natural factors affecting the operations (e.g., wind, tides, waves are behaving differently than expected, etc.).

In the case of this project Aracruz will reduce emissions globally because the maritime transportation mode is more fuel efficient than road transport. The key arguments determining project additionality include the lack of similar projects in Brazil (and Latin America) and the higher costs associated with the project activity. In the project, each barge can transport up to 5,000 tons of wood, which is the equivalent to the hauling capacity of 100 trucks. The emission reductions are the result of the project activity that would not have occurred anyway due to several barriers. The proposed system is an advanced alternative to the current practice of transportation. The prevailing pulp and paper industry practice still relies heavily on road transportation as the main mode for wood transportation. In Latin America no companies in the pulp and paper industry use maritime wood transportation. The revenue from carbon credits will also reduce Aracruz's exposure to variation in diesel oil prices (although the IRR of the project will continue to be negative).

The project includes studies in partnership with non-governmental organizations. One was a survey to monitor humpback and franca whales in the region in an effort to determine the best route for the barges to take; monitoring of coral reefs, shrimp and other marine organisms in the area in order to proceed with desilting operations of the terminal's access channel; and recovery of mangrove swamps in the neighboring coastal region.

The feasibility study for the wood maritime transportation project assumes that it will be a non cost-effective option, when compared to the regular transportation in the pulp and paper industry. Rail

transportation was also evaluated but according to the primary analysis it is environmentally not viable. **Table 1** (on Section A.2) shows the financial analysis of the project, considering the modal shifting in industry for product/feedstocks, specifically for the substitution of road transportation for maritime transportation and investments directly linked to the project to make it technically feasible. **Table 2** shows the net present value (NPV[3]) of the existing transportation case (baseline) and alternative transportation case (project) with and without the possible revenue of carbon credits.

	NPV * (US$ x 1,000)
NPV of existing transportation mode (road transportation)	171,486
NPV of alternative transportation without revenue of carbon credits - including investments (maritime transportation)	187,963
NPV of alternative transportation with revenue of carbon credits, considering US$10.00 the price of the ton of CO_2e (including investments)	187,602

* considering BNDES discount rate of 12.57%

Table 2 – Financial analysis of alternative transportation mode project (i.e., wood maritime transportation project).

From **Tables 1** and **2** it is evident that the most cost-effective alternative for the proponent is to continue to meet its internal transportation demands with the existing transportation mode (i.e., trucks). All the other options were more expensive than the existing system: on-road wood transportation. In summary, the baseline emissions are calculated from:

- Emissions from fossil fuel burned in the existing transportation mode to transport product/feedstock (i.e., wood transportation by trucks from plantation to the plant).

Emissions in the baseline derive from:

- Consumption of fossil fuel for the existing transportation mode to transport product/feedstock (i.e., wood transportation by trucks from plantation to the plant).

This value is an estimation of the total CO_2 emissions from the baseline operations. This emissions value is then divided by the quantity of product/feedstock transported during the year to create a metric defining the quantity of CO_2 emissions produced per ton of product/feedstock transported. This adjustment is done for each year to ensure that any emission reduction credits are based on the efficiency and environmental improvements at the plant, not on year-to-year fluctuations in the amount of business (as measured by the quantity of product/feedstock transported). This calculation was done for the year 2002 (the year before implementation of the first phase of the project).

For CH_4 and N_2O emissions due to fuel consumption, the calculation formula considers the quantity of fuel consumed by existing transportation mode; the Net Calorific Value of fuel; the methane emission factor of fuel; the GWP of methane; nitrous oxide emission factor of fuel and; the GWP of nitrous oxide.

Emissions from the project derive from three sources:

[3] NPV calculations were made from 2005 to 2014 considering the following information: road transportation – distances, fuel consumptions, quantity of fuel and unitary costs of the fuel used; maritime transportation – distances, fuels consumptions, quantity of fuels, unitary costs of the fuels used, port building expenses, dredging expenses, environmental licensing process expenses, ship company services and other investments.

1. Consumption of fossil fuel to transport product/feedstock to the plant (i.e., wood from plantations to port 1 close to plantations; and from port 2 close to the plant to the plant)

2. Consumption of fossil fuel to load and unload product/feedstock from alternative transportation mode (i.e., load and unload wood from barges).

3. Consumption of fossil fuels to transport product/feedstock (i.e., wood transportation by barges from port 1 close to plantations to port 2 close to the plant).

These three values are then added together to estimate total CO_2 emissions from the project operations. This emissions value is then divided by the quantity of product/feedstock transported during the year to create a metric defining the quantity of CO_2 emissions produced per ton of product/feedstock transported. This calculation provides an acceptable metric to factor out year-to-year fluctuations in the business cycle.

Actual emission reductions from the project take this project value of CO_2 emissions/ton of product/feedstock transported (in this case, wood transported), subtract it from the baseline value of CO_2 emissions/ton of product/feedstock transported (again, wood transported), which provides a net reduction in CO_2 emissions per ton of product/feedstock transported (i.e., wood transported). This net reduction value is then multiplied by the amount of product/feedstock transported (i.e., wood transported) in the project year to determine the total reduction in CO_2 emissions that has occurred from the project for each year of the crediting period.

For CH_4 and N_2O emissions due to fuel consumption, the calculation formula considers the quantity of each fuel consumed by alternative transportation mode; the Net Calorific Value of each fuel; the methane emission factor of each fuel; the GWP of methane; nitrous oxide emission factor of each fuel and; the GWP of nitrous oxide.

According to the calculations, the average emissions due to CH_4 and N_2O will add less than 0.2% to the total baseline and project emissions. These emissions are also expected to be lower in the project activity. So compared to the total emissions in the baseline and in the project, they are not significant and they won't be included in the quantified project benefits.

The key arguments determining project additionality include the lack of similar projects in Brazil (and Latin America) and the higher costs associated with the project activity. That is, Aracruz had been transporting wood from Bahian plantations to the Barra do Riacho plant using trucks consuming diesel oil. The company decided to evaluate a variety of alternatives to the existing transportation modal system, including keeping on-road wood transportation. Despite the fact that the project is more costly than simply keeping on-road transportation, Aracruz would like to keep investing in the maritime wood transportation system. Aracruz has decided that the higher financial investment will be warranted due to the environmental and social benefits of the maritime wood transportation system, including the additional income that can be earned from the associated carbon credits to offset some of the financial losses of the project (see also Section F). The project activity meets the applicability conditions presented in the NMB.

B.2. Description of how the methodology is applied in the context of the project activity:

The calculation of the baseline and project emissions must be estimated from the fuel consumption of the existing transportation mode (i.e., trucks) compared to fuel consumption of the alternative transportation mode (i.e., barges) to transport product/feedstock to the plant (in the case of the project, wood transportation from the Bahia eucalyptus plantations to the plant; and some trucks will be used to transport wood from plantations to port 1 and from port 2 to the plant and some equipment will be used during loading and unloading wood from barges).

All the formulas are presented in the Annexes.

Baseline emissions derive from one source:

- Fuel-based CO_2 Generation – the combustion of fossil fuels used by the existing transportation mode to transport product/feedstock to the plant (i.e., wood transportation by trucks from plantations to the plant), producing CO_2 as an energy-related emission source

There are also small amounts of CH_4 and N_2O emissions that occur from combustion in both the project and baseline activities. For CH_4 and N_2O emissions due to fuel consumption, the calculation formula consider the quantity of fuel consumed by existing transportation mode; the Net Calorific Value of fuel; the methane emission factor of fuel; the GWP of methane; nitrous oxide emission factor of fuel and; the GWP of nitrous oxide.

Project emissions derive from the same source described above and use a similar formula to calculate the emissions:

- Fuel-based CO_2 Generation – the combustion of fossil fuel used for the alternative transportation mode to transport product/feedstock (i.e., wood transportation by trucks from plantations to port 1 and from port 2 to the plant), producing CO_2 as an energy-related emission source

- Fuel-based CO_2 Generation – the combustion of fossil fuel used for loading and unloading from the alternative transportation mode (i.e., barges), producing CO_2 as an energy-related emission source

- Fuel-based CO_2 Generation – the combustion of fossil fuels used on the alternative transportation mode to transport product/feedstock (i.e., wood transportation by barges from port 1 to port 2), producing CO_2 as an energy-related emission source

There are also small amounts of CH_4 and N_2O emissions that occur from combustion in both the project and baseline activities. For CH_4 and N_2O emissions due to fuel consumption, the calculation formula considers the quantity of each fuel consumed by the alternative transportation mode; the Net Calorific Value of each fuel; the methane emission factor of each fuel; the GWP of methane; nitrous oxide emission factor of each fuel and; the GWP of nitrous oxide.

It should be noted that the emission reduction credits from the project are based on the lower resource requirements for the fuel combustion needed for transporting each year's quantity of product/feedstock to the plant, adjusted for the quantity of product/feedstock transported with these resource requirements. This adjustment is done to ensure that any emission reduction credits are based on the efficiency and environmental improvements of the new transportation system, not on year-to-year fluctuations in the

amount of business (as measured by the quantity of product/feedstock transported). This methodology is explained in more detail in Section E.

Key elements used to determine the baseline for the project activity:

Information related to CO_2, CH_4 and N_2O emission factors of each fuel used by each transportation mode was taken from "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories".

Heating Values and Specific Weight of each fuel were taken from the 2003 Brazilian Energetic Balance (Brazilian Ministry of Mines and Energy) and provided by the project participant based on each fuel quality characteristics at the plant.

Fuels Carbon Factors were taken from "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual", Volume 3, OECD/IEA.

Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary:

Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording Frequency	Comments
Product/Feedstock transported	Ton	M (on-site device)	Monthly	For instance, wood transportation
Fuel consumption of alternative transportation mode	M^3	M (on-site device)	Monthly	For instance, diesel oil consumption of trucks and equipments
Fuel consumption of alternative transportation mode	M^3	M (on-site device)	Monthly	For instance, Marine fuel consumption of barges
Fuel consumption of alternative transportation mode	M^3	M (on-site device)	Monthly	For instance, Maritime diesel oil consumption of barges

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The determination of project scenario additionality is done using the CDM tool for the demonstration and assessment of additionality, which uses the following steps, as described in **Figure 6** (additionality flowchart). As described further below, this project meets all steps of the additionality evaluation:

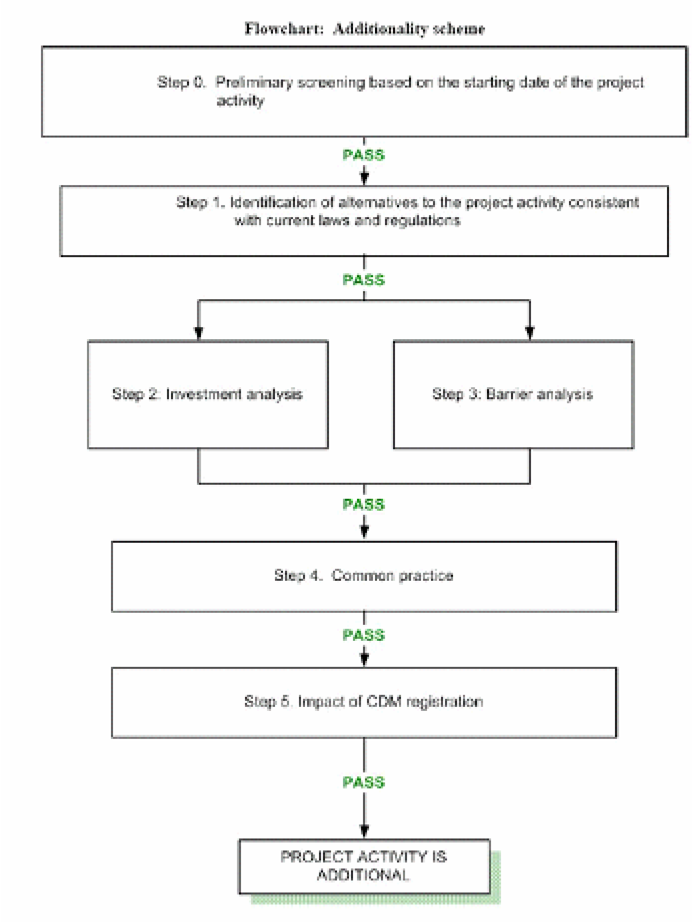


Figure 6: Additionality flowchart

Step 0: Preliminary screening based on the starting date of the project activity

As stated in section C. 2.2.1, the crediting period is expected to start only once the project activity is registered by the Executive Board. In any case, as it will be demonstrated in steps 1 to 5, the CDM incentive has been considered since the beginning of development of the project, since it is an important part of the financial evaluation of the project.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a) Define alternatives to the project activity

Alternative 1: The proposed project activity: Implementation of the wood maritime transportation project, to bring wood from plantations to the plant.

Alternative 2: Continuation of the current situation: On-road transportation to bring wood to the plant.

During the alternative analysis, the rail mode was also evaluated, but it was not feasible due to adverse environmental reasons.

Sub-step 1b) Enforcement of applicable laws and regulations:

All the proposed alternatives comply with the applicable laws and regulations. There are no legal or regulatory requirements mandating the proposed project activity or the current mode of transport by truck.

Step 2: Investment analysis

In the absence of the CDM project activity (Alternative 1), Aracruz would be transporting wood from the plantations to the plant using only trucks: Alternative 2.

This option would have been the most cost-effective option, as discussed above in section A.2 and as shown in **Table 3** below.

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**NPV [4] (US$ x 1,000)**
Pulpwood transported from Bahia (m3 x 1,000)	2,600	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	
Investments on maritime transport. project (US$ x 1,000)	24,169*	-	2,060	-	1,030	-	2,060	-	1,030	-	
Operational costs of maritime transport. (US$ x 1,000)	25,214	29,942	31,702	30,082	31,707	28,914	28,905	29,949	30,335	30,254	
Costs of maritime transport. (US$ x 1,000)	49,383	29,942	33,762	30,082	32,737	28,914	30,965	29,949	31,365	30,254	**187,963**
Operational costs of road transportation (US$ x 1,000)	24,567	32,333	32,664	32,788	31,589	32,044	32,085	32,416	32,499	32,127	**171,486**

* Net Present Value of the investments on the project from 2001 to 2005

Table 3 – Financial analysis of wood maritime transportation project and NPV.

The use of the maritime transportation mode showed this project as a non cost-effective option, when compared to the regular wood transportation mode in the pulp and paper industry (**Table 1**).

Therefore, the proposed CDM project activity is less economically and financially attractive than the other alternative (which is the continuation of the current situation).

Aracruz has lower cost options available at the plant but is willing to invest in maritime wood transportation project for the social and environmental benefits, which are consistent with its voluntary

[4] NPV calculations were made considering the following information: *road transportation* – distances, fuel consumptions, quantity of fuel and unitary costs; *maritime transportation* – distances, fuels consumptions, quantity of fuels and unitary costs, port building expenses, dredging expenses, environmental licensing process expenses, ship company services and other investments.

commitments with the Sustainable Forest Products Industry (SFPI) initiative, a member-sponsored program of the World Business Council for Sustainable Development (WBCSD)[5].

Step 3: Barrier analysis

In addition to its non cost-effectiveness, the proposed CDM project activity faces a certain number of other barriers:

Sub-step 3a): Identify barriers that would prevent the implementation of type of the proposed project activity

- Technological and institutional barriers:
    - As discussed already this technical hurdles related to lack of maritime transportation infrastructure;
    - Regulations (and the lack thereof) for maritime transportation (because on-road transportation is the traditional mode of transportation often favoured in Brazil);
    - Large capital investments needed for the project, which can be difficult to obtain in Brazil due to uncertain economic conditions and past economic problems; and
    - Weak economic situation of the shipbuilders in Brazil (which increase significantly risks of the investments since local shipbuilders may not be readily available to support the project)

These barriers cause an additional increase in transportation costs.

- Barriers due to prevailing practices
    - The prevailing industry practice still relies heavily on the on-road transportation mode. Moreover, not only in Brazil but also in Latin America, no company in the pulp and paper industry uses maritime transportation for wood. The proposed CDM project activity is therefore the first of its kind.

Since pulp and paper companies in Latin America are not familiar with the maritime transportation of wood, the project includes additional risk in terms of financial investment and unfamiliar operation and maintenance practices.

Sub-step 3b): Of course, the barriers listed in sub-step 3a) do not prevent the implementation of alternative 2, because this alternative is the continuation of the current situation, which is perfectly working.

Step 4: Common Practice analysis

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[5] Currently, sixteen pulp and paper companies, including Aracruz, sponsor the program. After a wide-ranging program of research and consultation on various aspects of the paper cycle, a report entitled, "Towards a Sustainable Paper Cycle" (TSPC) was published in 1996 and disseminated widely through workshops and other means. A number of recommendations, including in the climate change area, were made in this publication for the pulp and paper industry, and for the stakeholders – governments, international agencies, consumers, and non-governmental organizations – which affect the enabling environment for change. Following its release, a permanent Sustainable Forest Products Industry working group was established to look at the forest industry in a more holistic way.

As stated in Step 3 regarding barriers due to prevailing practices, there are no similar activities commonly carried out in the region, since no pulp and paper company uses barges to transport wood in Latin America.

Step 5: Impact of CDM registration

The revenue from carbon credits could help to minimize the exposure of Aracruz to fuel price variations. Also, since the investments made by Aracruz were much more expensive than the baseline option, the financial benefits of the carbon credits could provide an additional incentive to Aracruz to maintain or even enlarge the maritime project.

	NPV * (US$ x 1,000)
NPV of road transportation	171,486
NPV of maritime transportation without revenue of carbon credits (including investments)	187,963
NPV of maritime transportation with revenue of carbon credits, considering US$10.00 the price of the ton of CO_2e (including investments)	187,602

* considering BNDES discount rate of 12.57%

Table 4 – Financial analysis of wood maritime transportation project (NPV with and without carbon credits).

From **Tables 3** and **4** it is evident that the most cost-effective alternative for Aracruz is to continue to meet its internal transportation demands with trucks.

A study carried out by Indufor and STCP Engenharia (2002) that helped Aracruz to establish a consistent corporate strategy of greenhouse gas management ('Study on Corporate Strategy on Carbon Sinks') identified maritime wood transportation as one of the potential emission reduction projects for Aracruz (the same study highlighted the importance of the CER revenue for the project).

Conclusion: the proposed CDM project activity is undoubtedly additional, since it passes all the steps of the tool for the demonstration and assessment of additionality. The project is not the most financially attractive (step 2) and it faces other barriers (technical and prevailing practices, step 3). The registration of the project as a CDM project and any associated CER revenue will definitely help overcome these barriers and will have a decisive impact on the realization of the project.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The project is about the implementation of a new transportation mode to move the product/feedstock to the plant. Aracruz's project activity is about the implementation of a maritime wood transportation project, i.e., through the utilization of maritime barges a Pulp and Paper Company is willing to transport wood from plantations to its industrial plant. The project boundary is defined as the roadway from the plantations to the plant, including the transportation from the plantation to port 1 (close to the plantation); from port 1 (close to the plantation) to port 2 (close to the plant); and from port 2 (close to the plant) to the plant (as showed in **Figure 3**).

Prior to the beginning of the project, and in the absence of the project, Aracruz would keep using trucks as the main transportation mode to bring wood from the plantations to the plant. As soon as the project

starts, Aracruz will use barges instead of trucks, increasing the environmental efficiency of Aracruz operations.

Thus, the baseline is determined by the emissions from combustion of fuel using the existing transportation mode of product/feedstock to the plant. Fuel combustion from transportation also occurs in the project activity, but at a higher efficiency level, thereby bringing a clear reduction of fuel-based CO_2 generation. There are also small amounts of CH_4 and N_2O emissions that occur from combustion in both the project and baseline activities. These emissions are believed to be small in both instances (less than 0.2% of the total emission), with project emissions lower than baseline emissions. By defining the project boundary as proposed here, the only concern is with the impact of the project on emissions due to the improved transportation efficiency.

This definition of the project boundary makes sense for several reasons, including: the project emissions depend entirely on fuel consumption in the alternative transportation mode (i.e.., barges, trucks and equipments used to load and unload wood from barges), while emissions avoided (baseline emissions) can be determined from the fuel consumption to transport product/feedstock to the plant using only the existing transportation mode (i.e., trucks).

The associated Monitoring and Verification Plan provides the information needed to determine both project and baseline emissions on a conservative basis because the indirect emissions of the project implementation will be reduced but were not included in the claimed project reductions.

Project and baseline emissions, direct and indirect, estimated and not estimated		
Sources	Project	Baseline
Direct, Estimated	▪ CO_2 emissions from fossil fuel consumption to transport products/feedstocks (i.e., wood from plantation to port 1; and from port 2 to the plant by trucks). ▪ CO_2 emission from fossil fuels consumption for products/feedstocks transportation by alternative transportation mode (i.e., barges). ▪ CO_2 emission from fossil fuel consumption related to loading and unloading on alternative transportation mode (i.e. wood from barges). ▪ Minor quantities of CH_4 and N_2O from fossil fuel combustion.	▪ CO_2 emissions from fossil fuel consumption in products/feedstocks transportation by existing transportation mode (i.e., trucks). ▪ Minor quantities of CH_4 and N_2O from fossil fuel combustion.
Direct, Not Estimated	None	None
Indirect, Estimated	None	None
Indirect, Not Estimated	▪ CO_2 emission reductions from decrease of truck trips to bring fuel to the plantations and plant.	▪ CO_2 emissions from truck trips to bring fuel to the plantations and plant.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

- Date of completing the final draft of this baseline section: 20/06/2005

- Name of person/entity determining the baseline:
  Aracruz (detailed contacts in Annex I)
  Mr. Ricardo Rodrigues Mastroti, Aracruz Celulose S.A.
  Mr. Mario Cerqueira, Aracruz Celulose S.A.

  Mr. Craig Ebert, ICF Consulting
  Ms. Christianne Maroun, ICF Consultoria do Brasil
  Mr. Augusto Mello, ICF Consultoria do Brasil

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

15/07/2005

C.1.2. Expected operational lifetime of the project activity:

30 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/12/2005 (estimated; will begin once project is registered with CDM)

C.2.2.2. Length:

10years

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

There is no approved monitoring methodology for the proposed project.

Thus, a new methodology is proposed here: "Monitoring methodology for modal shifting in industry for product/feedstocks".

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology was developed based on the circumstances of wood transportation at the Aracruz Barra do Riacho Plant.

The following basic data will be monitored in order to estimate the emission reductions of the project: fuel specifications and fuel consumption per unit of product/feedstock transported to the plant. The specific data requirements are outlined in greater detail in Section D.2.2. All data will be archived for two years following the end of the crediting period.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Product/Feedstock transported		Ton	M	Annually	100%	Electronic (2y following the end of the crediting period)	For instance, wood transportation
2	Fuel consumption of alternative transportation mode		m^3	M	Monthly	100%	Electronic (2y following the end of the crediting period)	For instance, diesel oil consumption of trucks and equipments
3	Fuel consumption of alternative transportation mode		m^3	M	Monthly	100%	Electronic (2y following the end of the crediting period)	For instance, Marine fuel consumption of barges
4	Fuel consumption of alternative transportation mode		m^3	M	Monthly	100%	Electronic (2y following the end of the crediting period)	For instance, Maritime diesel oil consumption of barges

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Emissions from the project derive from three sources:

1. Consumption of fossil fuel to transport product/feedstock to the plant (i.e., wood transportation by trucks from plantations to port 1; and from port 2 to the plant)

2. Consumption of fossil fuel to load and unload product/feedstock from the alternative transportation mode (i.e., load and unload wood from barges).

3. Consumption of fossil fuels to transport product/feedstock (i.e., wood transportation by barges from port 1 to port 2).

Emissions from these sources were determined by the following formulae (all calculations based on net heating value):

For energy consumption to transport product/feedstock to the plant (i.e., from plantations to port 1; and from port 2 to the plant):

(Quantity of fuel consumed by the transport mode, i.e., trucks)*(Net Calorific Value of fuel)* (Specific Weight of fuel) * (Carbon emission factor for fuel)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For energy consumption to load and unload from the alternative transportation mode (i.e., wood from barges):

(Quantity of fuel to load and unload from the alternative transport mode, i.e., barges)*(Net Calorific Value of fuel)* (Specific Weight of fuel)*(Carbon emission factor for fuel)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For energy consumption to transport the product/feedstock by alternative transportation mode (i.e., wood transportation by barges from port 1 to port 2):

(Quantity of each fuel for product/feedstock transportation) * (Net Calorific Value of each fuel) * (Specific Weight of each fuel) * (Carbon emission factor for each fuel) *44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For CH_4 and N_2O emissions due to fuel consumption, the following formulae will be used:

(Quantity of each fuel consumed by alternative transportation mode, i.e., trucks and barges) * (Net Calorific Value of each fuel) * (Methane emission factor of each fuel) * (GWP CH_4) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

(Quantity of each fuel consumed by alternative transportation mode, i.e., trucks and barges) * (Net Calorific Value of each fuel) * (Nitrous oxide emission factor of each fuel) * (GWP N_2O) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Product/Feedstock transported	Integrated Management System	Ton	M	Annually	100%	Electronic (2y following the end of the crediting period)	For instance, wood transported to the plant
2	Fuel consumption of existing transportation mode	Integrated Management System	m^3	M	Monthly	100%	Electronic (2y following the end of the crediting period)	For instance, diesel oil for trucks

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Emissions in the baseline derive from:

- Consumption of fuel for product/feedstock transportation (in this case, wood transportation from the plantation to the plant)

Emissions from this source were determined by the following formulae (all calculations based on net heating value):

For energy consumption to transport products/feedstock by the existing transportation mode to the plant (i.e., wood transportation by trucks from the plantations to the plant):

(Quantity of fuel consumed by existing transportation mode, i.e. trucks) * (Net Calorific Value of fuel) * (Specific Weight of fuel) * (Carbon emission factor for fuel)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For CH_4 and N_2O emissions due to fuel consumption, the following formulae will be used:

(Quantity of fuel consumed by exiting transportation mode, i.e., trucks) * (Net Calorific Value of fuel) * (Methane emission factor of fuel) * (GWP CH_4) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

(Quantity of fuel consumed by existing transportation mode, i.e., trucks) * (Net Calorific Value of fuel) * (Nitrous oxide emission factor of fuel) * (GWP N_2O) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

Not Applicable.

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not Applicable.

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Not Applicable.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

This project is not expected to create leakage problems, largely because the data collected to monitor the project benefits and the baseline activity are straightforward to collect. The data include information on the quantity of product/feedstock transported, the amount of fuel used for the existing transportation mode, and the amount of fuels used for the alternative transportation mode. The emission reductions that occur from this project activity are directly related to the transparent monitoring and reporting of these variables. That is, GHG emissions within the project boundaries derive from CO_2 from fuel combustion activities. However, according to the calculations, the CH_4 and N_2O emissions due to fuel consumption are not significant when compared to the total emissions in the baseline and in the project. There are emission reductions resulting from the fuel savings since fuel supply trucks no longer need to deliver oil to the plant, as they were required to do in the baseline; and there are emission reductions due to CH_4 and N_2O emissions in the project compared to the baseline. These additional emission reductions, however, have not been included as the project's quantified benefits to reinforce the conservative and transparent manner under which the emission reduction calculations were done.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Not applicable.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The net emission reductions from the project can be calculated by:

Project Life-time Emission Reductions = Σ_{yr} (Annual Emissions Reductions) = Σ_{yr} [($Em_{baseline}$ - $Em_{proj\ yr}$)]

where:

$Em_{baseline}$ = baseline emissions

$Em_{proj\ yr}$ = project emissions per year

Yr = project years

Baseline emissions derive from one source (equations were described in section D.2.1.4):

- Fuel-based CO_2 Generation – the combustion of fossil fuels used for the existing transportation mode to transport product/feedstock to the plant (i.e., wood transportation by trucks from the plantation to the plant), producing CO_2 as an energy-related emission source

Project emissions derive from the same source described above and use a similar formula to calculate the emissions (equations were described in section D.2.1.4):

- Fuel-based CO_2 Generation – the combustion of fossil fuel used for the alternative transportation mode to transport product/feedstock (i.e., wood transportation by trucks from thr plantations to port 1 and from port 2 to the plant), producing CO_2 as an energy-related emission source

- Fuel-based CO_2 Generation – the combustion of fossil fuel used to load and unload from the alternative transportation mode (i.e., barges), producing CO_2 as an energy-related emission source

- Fuel-based CO_2 Generation – the combustion of fossil fuels used for the alternative transportation mode to transport product/feedstock (i.e., wood transportation by barges from port 1 to port 2), producing CO_2 as an energy-related emission source

It should be noted that the emission reduction credits from the project are based on the lower resource requirements for fuel combustion needed for transporting each year's quantity of feedstock (i.e., wood) to the plant, adjusted for the quantity of output transported (i.e., wood) with these resource requirements.

Actual emission reductions from the project take this project value of CO_2 emissions/ton of product/feedstock transported, subtract it from the baseline value of CO_2 emissions/ton of product/feedstock transported, which provides a net reduction in CO_2 emissions per ton of product/feedstock transported. This net

reduction value is then multiplied by the amount of product/feedstock transported in the project year to determine the total reduction in CO_2 emissions that has occurred from the project.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	Low	There will be QA/QC procedures for these data based on project participant's management system, mainly because these data will be used for calculation of emissions reductions.
2	Low	There will be QA/QC procedures for these data based on project participant's management system, mainly because these data will be used for calculation of emissions reductions.
3	Low	There will be QA/QC procedures for these data based on project participant's management system, mainly because these data will be used for calculation of emissions reductions.
4	Low	There will be QA/QC procedures for these data based on project participant's management system, mainly because these data will be used for calculation of emissions reductions.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The project proponent has its quality and environmental management systems certified, according to Quality and Environmental Management System guidelines. The Integrated Management System assures that all necessary records are kept and procedures established for all data, including procedures for monitoring, measuring and calibrating equipment used to conduct these activities.

D.5 Name of person/entity determining the monitoring methodology:

Aracruz Celulose (Contacts of the Project Participant are included on Annex I)
Ricardo Mastroti - Rua Lauro Muller, 116 / 40th floor - Rio de Janeiro, RJ – Brazil; Telephone: 55 21 3820-8148; E-mail: rrm@aracruz.com.br

ICF Consulting

Craig Ebert, 9300 Lee Highway, Fairfax, VA, 22201, USA. Telephone: 1.703.934.3505; E-mail: craigebert@icfconsulting.com
Christianne Maroun / Augusto Mello - Avenida das Américas, 700 – Bl. 6 – Sl. 250 Cittá América – Barra da Tijuca – Rio de Janeiro, RJ – Brazil; Telephone: 55 21 2132-7324; E-mail: cmaroun@icfconsulting.com ; amello@icfconsulting.com

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

Emissions from the project derive from three sources:

1. Consumption of fossil fuel to transport product/feedstock to the plant (i.e., consumption of diesel oil to transport wood from the plantations to port 1; and from port 2 to the plant by trucks)

2. Consumption of fossil fuel to load and unload product/feedstock from the alternative transportation mode (i.e., consumption of diesel oil to load and unload wood from barges).

3. Consumption of fossil fuels to transport product/feedstock (i.e., consumption of marine fuel and maritime diesel oil to transport wood from port 1 to port 2 by barges).

Emissions from these sources were determined by the following formulae (all calculations based on net heating value):

For energy consumption to transport the product/feedstock (i.e., wood):

(Quantity of fuel consumed by alternative transportation mode, i.e., diesel oil for trucks)*(Net Calorific Value of fuel, i.e. diesel oil)* (Specific Weight of fuel, i.e., diesel oil) * (Carbon emission factor for fuel, i.e., diesel oil)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For energy consumption to load and unload from alternative transportation mode (i.e., barges):

(Quantity of fuel to load and unload from the alternative transportation mode, i.e., diesel oil for loading and unloading from barges)*(Net Calorific Value of fuel, diesel oil)* (Specific Weight of fuel, i.e., diesel oil)*(Carbon emission factor for fuel, i.e., diesel oil)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For energy consumption to transport the product/feedstock by the alternative transportation mode (i.e., wood transportation by barges from the port 1 to port 2):

(Quantity of each fuel consumed by alternative transportation mode, i.e., marine fuel and maritime diesel oil for barges) * (Net Calorific Value of each fuel, i.e., marine fuel and maritime diesel oil) * (Specific Weight of each fuel, i.e., marine fuel and maritime diesel oil) * (Carbon emission factor for each fuel, i.e., marine fuel and maritime diesel oil) *44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

For CH_4 and N_2O emissions due to fuels consumption (i.e., diesel oil, marine fuel and maritime diesel oil), the following formulae will be used:

(Quantity of each fuel consumed by the alternative transportation mode, i.e., trucks and barges) * (Net Calorific Value of each fuel) * (Methane emission factor of each fuel) * (GWP CH_4) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

(Quantity of each fuel consumed by the alternative transportation mode, i.e., trucks and barges) * (Net Calorific Value of each fuel) * (Nitrous oxide emission factor of each fuel) * (GWP N_2O) * 4.1868, divided by 10^6, to determine tons of carbon dioxide in metric tons.

Table 6 presents all the information related to each fuel used in the project case.

	Diesel Oil* (trucks and equips)		Oil MF180 (barges)		Maritime Diesel (barges)	
LHV	kJ/kg	42,287	kJ/kg	40,654	kJ/kg	42,521
Density	kg/m^3	840	kg/m^3	988	kg/m^3	850
Carbon Emission Factor (CEF)	tC/TJ	20.2	tC/TJ	21.1	tC/TJ	20.2
Carbon content	tC/m^3	0.718	tC/m^3	0.848	tC/m^3	0.730
CH_4 Emission Factor	CH_4 kg/TJ	0.7	CH_4 kg/TJ	1.4	CH_4 kg/TJ	0.7
N_2O Emission Factor	N_2O kg/TJ	0.4	N_2O kg/TJ	0.3	N_2O kg/TJ	0.4

Sources: "IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual – Energy" and the "2003 Brazilian Energetic Balance" (Brazilian Ministry of Mines and Energy)

Table 6 – Information related to each fuel used in Project case.

E.2. Estimated leakage:

This project is not expected to create leakage problems, largely because the data collected to monitor the project benefits and the baseline activity are straightforward to collect from the project proponent's Integrated Data System. The data include information on the quantity of product/feedstock transported, the amount of fuel used for the existing transportation mode, and the amount of each fuel used for the alternative transportation mode. The emission reductions that occur from this project activity are directly related to the transparent monitoring and reporting of these variables. That is, GHG emissions within the project boundaries derive from CO_2 from fuel combustion activities. As noted, there are also small amounts of CH_4 and N_2O emissions that occur from combustion in both the project and baseline activities. However, according to the calculations, the CH_4 and N_2O emissions due to the fuel consumption are not significant when compared to the total emissions in the baseline and in the project. There are emission reductions resulting from the fuel savings since fuel supply trucks no longer need to deliver oil to the plant, as they were required to do in the baseline; and there are emission reductions due to CH_4 and N_2O emissions in the project compared to the baseline. These additional emission reductions, however, have not been included as the project's quantified benefits to reinforce the conservative and transparent manner by which the emission reduction calculations were done.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Because there are no significant leakage values that would adversely affect claimed emission reductions, the project activity emissions are expressed in E.1.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Emissions in the baseline derive from:

- Consumption of fossil fuel for product/feedstock transportation (in this case, consumption of diesel oil to transport wood by trucks from the plantation to the plant)

Emissions from this source were determined by the following formulae (all calculations based on net heating value):

For energy consumption to transport product/feedstock to the plant (i.e., transportation of wood by trucks from the plantations to the plant):

> (Quantity of fuel consumed by the existing transportation mode, i.e., diesel oil for trucks) * (Net Calorific Value of fuel, i.e., diesel oil) * (Specific Weight of fuel, i.e., diesel oil) * (Carbon emission factor for fuel, i.e., diesel oil)*44/12, divided by 1000, to determine tons of carbon dioxide in metric tons.

This value represents the estimation of total CO_2 emissions from the baseline operations. This emissions value is then divided by the quantity of product/feedstock transported during the year to create a metric defining the quantity of CO_2 emissions produced per ton of product/feedstock transported. This calculation was done for the year 2002 (the year before implementation of the first phase of the project). This calculation provides an acceptable metric to factor out year-to-year fluctuations in the business cycle.

Table 7 presents all the information related to the fuel used in the baseline case.

	Diesel Oil* (trucks)	
LHV	kJ/kg	42,287
Density	kg/m^3	840
Carbon content	tC/m^3	0.718
Carbon Emission Factor (CEF)	tC/TJ	20.2
CH_4 Emission Factor	CH_4 kg/TJ	0.7
N_2O Emission Factor	N_2O kg/TJ	0.4

Sources: "IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual – Energy" and the "2003 Brazilian Energetic Balance" (Brazilian Ministry of Mines and Energy)

Table 8 – Information related to the fuel used in the baseline case.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

Actual emission reductions from the project take the project value of CO_2 emissions/ton of product/feedstock transported (defined in E.1), subtract it from the baseline value of CO_2 emissions/ton of product/feedstock transported (defined in E.4), which provides a net reduction in CO_2 emissions per ton of product/feedstock transported for each year of the crediting period. This net reduction value is then multiplied by the amount of product/feedstock transported in the project year to determine the total reduction in CO_2 emissions that has occurred from the project.

For CH_4 and N_2O emissions, according to the calculations, the average emissions due to CH_4 and N_2O will account for less than 0.2% of the total baseline emissions. So compared to the total emissions in the baseline and in the project, the implementation of the project will result in additional emission reductions; however, for the total emission calculation they will be considered as not significant. Therefore, these additional emission reductions have not been included in the project's quantified benefits to reinforce the conservative and transparent manner by which the emission reduction calculations were done.

E.6. Table providing values obtained when applying formulae above:

The entire methodology for calculating emissions in the baseline and the project activity, including subsequent emission reductions, is presented in the spreadsheet 'AracruzMaritime.xls'.

The *ex post* calculation of baseline emission rates may only be used if proper justification is provided. Notwithstanding, the baseline emission rates shall also be calculated *ex ante* and reported in the CDM-PDD. The result of the application of the formulae above shall be indicated using the following tabular format.

Year	**Estimation of project activity emission reductions (tonnes of CO_2 e)**	**Estimation of baseline emission reductions (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO_2 e)**	**Estimation of emission reductions (tonnes of CO_2 e)**
Year 2005	44,210	51,859	-	7,649
Year 2006	61,543	67,815	-	6,272
Year 2007	63,108	67,815	-	4,707
Year 2008	62,248	67,815	-	5,567
Year 2009	63,134	67,815	-	4,681
Year 2010	60,829	67,815	-	6,986
Year 2011	57,938	67,815	-	9,877
Year 2012	61,582	67,815	-	6,233
Year 2013	60,684	67,815	-	7,131
Year 2014	63,118	67,815	-	4,697
Total (tonnes of CO_2e)	**598,396**	**662,195**	**-**	**63,799**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

In the case of maritime wood transportation, the environmental impacts are expected to be positive compared to the baseline activity. This is due to five major factors:

(1) Improvement in air quality, especially for the local communities along the existing truck route;

(2) Decrease in use of fossil fuels, since maritime transportation is much more efficient than on-road transportation;

(3) Development of local infra-structure due to the project (for example: building a 3.7-km service road and the dredging of a 3.8-km access channel in the Caravelas River, also benefiting a local fishing community by allowing access for larger vessels; construction of a lighthouse);

(4) The project brought valuable financial resources to the region (Aracruz invested more than R$ 3 million in the purchase of materials and services from local suppliers); and;

(5) During the construction and operation of the terminal, 400 jobs were created, of which approximately 80% were filled by local manpower.

There are transboundary impacts that were discussed in Section D.4; on balance the environmental impacts of the project will be positive.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The Brazilian Environmental Agency (IBAMA) and the Environmental Agency of Bahia (CRA), responsible for environmental enforcement in the region where the project will take place, have already analyzed and evaluated the Environmental Impact Study (EIA). The number of the Environmental Licensing is LO 2.732/03.

The conclusion of the EIA study was that no significant negative impacts would be observed due to the project start up or operations and its conclusions have been amply debated in public meetings in Caravelas with members of the general public, local fishermen, and representatives of a wide range of non-governmental organizations (NGOs) and local government agencies.

Nevertheless, some preventive programs were established in order to mitigate the potential impacts related to the project, such as some studies in partnership with non-governmental organizations. One example was a survey to monitor humpback and franca whales in the region in an effort to determine the best route for the barges to take; monitoring of coral reefs, shrimp and other marine organisms in the area in order to proceed with desilting operations of the terminal’s access channel; and recovery of mangrove swamps in the neighboring coastal region. Together with government training entities such as Senai and Setas, Aracruz offered nearly 60 courses to train local workers in the skills necessary for barge operation. These include courses in stonemasonry, carpentry, soldering and welding, general mechanics, ship mechanics, information technology and similar subjects. More than 1,600 individuals have benefited from the training classes.

SECTION G. Stakeholders’ comments

During the Licensing process stakeholders were consulted extensively. There were many public meetings with members of the general public, local fishermen, and representatives of a wide range of non-governmental organizations (NGOs) and local government agencies in attendance.

G.1. Brief description how comments by local stakeholders have been invited and compiled:

Local stakeholders visited the Portocel and Barra do Riacho Plant. They have been to the plant and to the port and were able to discuss the advantages and disadvantages of the new process being installed.

The visits were organized by Aracruz and included a brief explanation of the process.

Besides this visit invitations for comments were sent to stakeholders, according to Resolution #1 dated on 02/1202003 , from Brazilian Inter-ministerial Commission of Climate Change (Comissão Inter-ministerial de Mudança Global do Clima- CIMGC) decreed on 07/07/1999.

G.2. Summary of the comments received:

Comments will be summarized on the final PDD version.

G.3. Report on how due account was taken of any comments received:

Comments received did not require any significant modification of the project. In a second phase, the project will be modified to include any relevant observations from stakeholders and the validator, although at this time no substantive comments requiring significant changes to the project are expected.

Model of the invitation of comments given to the stakeholders listed in the item G.1.

ARACRUZ

SUA OPINIÃO É MUITO IMPORTANTE PARA NÓS. SEUS COMENTÁRIOS SERÃO ENCAMINHADOS PARA A ENTIDADE RESPONSÁVEL PELO PROJETO.

RESPONDA ÀS PERGUNTAS ABAIXO E FAÇA SEUS COMENTÁRIOS

1. Você acredita que o Projeto da Aracruz de Transporte Marítimo de Madeira para Redução de Gases de Efeito Estufa contribuiu para o desenvolvimento sustentável do Brasil?

____
____
____

2. Na sua opinião, o projeto contribuiu para a transferência de tecnologia para o Brasil?

____
____
____

3. Houve melhoria na situação sócio-ambiental da região, com a implantação do projeto?

____
____
____

4. Que outras críticas e/ou comentários você tem a fazer?

____
____
____
____

Por favor, envie este folheto para o endereço abaixo. Obrigado.

NOME: ____________________________________
ENTIDADE: ____________________________________
TEL.: ____________________________________

ARACRUZ

Rua Lauro Muller, 116 – 40º andar
Cep 22299-900 Rio de Janeiro – RJ

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no Annex I public funding involved in the Aracruz project activity. (Please refer to section A.4.5)

Annex 3

BASELINE INFORMATION

Key elements used to determine the baseline for the project activity:

All the information related to fuel consumption (i.e., diesel oil, maritime diesel oil and marine fuel) was provided by the project proponent.

Heating Values and Specific Weight of each fuel were taken from the "2003 Brazilian Energetic Balance" (Brazilian Ministry of Mines and Energy) and provided by project proponent based on fuel quality characteristics at the plant.

Carbon Emission Factors, Methane Emission Factors and Nitrous Oxide Emission Factors of each fuel were taken from "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual," Volume 3, OECD/IEA.

	Diesel Oil* (trucks and equips)		Oil MF180 (barges)		Maritime Diesel (barges)	
LHV	kJ/kg	42,287	kJ/kg	40,654	kJ/kg	42,521
Density	kg/m^3	840	kg/m^3	988	kg/m^3	850
Carbon content	tC/m^3	0.718	tC/m^3	0.848	tC/m^3	0.730
Carbon Emission Factor	tC/TJ	20.2	tC/TJ	21.1	tC/TJ	20.2
CH_4 Emission Factor	CH_4 kg/TJ	0.7	CH_4 kg/TJ	1.4	CH_4 kg/TJ	0.7
N_2O Emission Factor	N_2O kg/TJ	0.4	N_2O kg/TJ	0.3	N_2O kg/TJ	0.4

Sources: "IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual – Energy" and the "2003 Brazilian Energetic Balance" (Brazilian Ministry of Mines and Energy)

For other subjects, please refer to Section B.

Annex 4

MONITORING PLAN

Please refer to Section D.

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