



Natural Capital: Pilot Study on Impact Valuation





In this natural capital valuation case, you will find the first pilot study conducted by Fibria with the purpose of monetizing the positive and negative impacts on nature. The study follows the conceptual and instrumental framework provided by the Natural Capital Protocol, introduced in 2016 by the Natural Capital Coalition.

NATURAL CAPITAL AND EXTERNALITIES



NATURAL CAPITAL

Corresponds to the stock of renewable and non-renewable natural resources (plants, animals, air, water, soil, minerals, etc.) that produce a flow of benefits to society (NCP¹, 2016).



ECOSYSTEM SERVICES

Direct and indirect contributions of ecosystems to the well-being of people (TEEB², 2012).

- a. **Provisioning services:** Material or energy outputs from ecosystems (ex: food supply, water supply, etc.)
- b. **Regulating services:** Benefits obtained from the regulation of natural processes by ecosystems (ex: local/regional climate regulation, regulation of soil erosion, pollination, etc.)
- c. **Cultural services:** Non-material benefits obtained from contact with ecosystems (ex: recreation, ecotourism, environmental education, etc.)
- d. **Supporting services:** Services that support almost all other services (ex: ecosystem integrity (biodiversity), nutrient cycling, etc.)



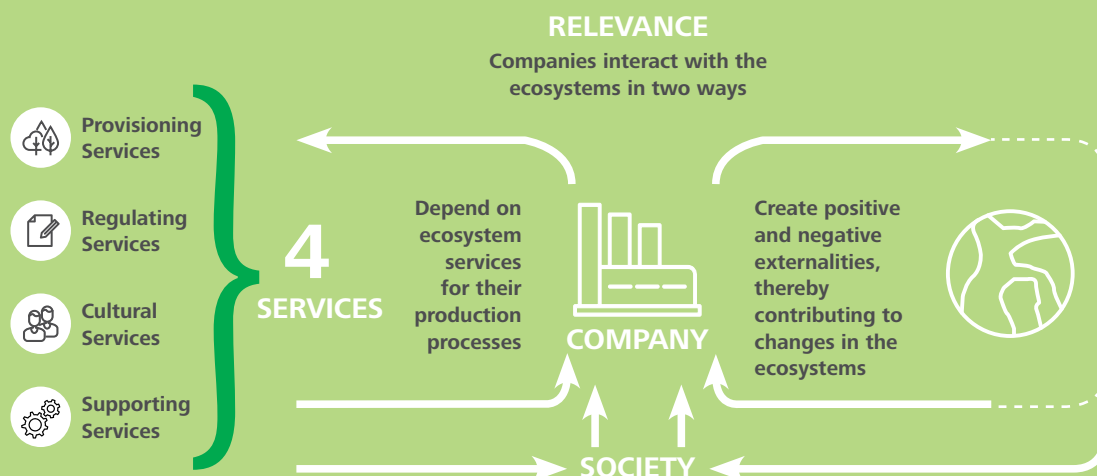
EXTERNALITIES

Impacts (positive or negative) on third parties that were not compensated or penalized

¹ NCC (Natural Capital Coalition). *Natural Capital Protocol*. 2016. (Online) Available at: www.naturalcapitalcoalition.org/protocol

² TEEB. *The Economics of Ecosystems and Biodiversity: Ecological and Economic foundations*. Kumar, P. (Ed). Earthscan, 2012.

ECOSYSTEM SERVICES (ES) AND BUSINESSES



How do we inform and discuss, with stakeholders, the impacts on nature and society, whether positive or negative, caused by the activities of a company?

One way is to use the conceptual and instrumental framework provided by the Natural Capital Protocol (<https://naturalcapitalcoalition.org/protocol/>), presented in 2016 by the Natural Capital Coalition (<https://naturalcapitalcoalition.org>)

The Protocol (NCP) provides companies and businesses with a common basis for measuring and assigning values to these impacts - either qualitative values, or, when allowed, an economic valuation that may, in many cases, be expressed in monetary value.

This way, it is possible to integrate non-financial externalities into the economic calculation, facilitating the incorporation of social and environmental factors into everyday choices made by companies. It is important to note that there are impacts and externalities that may be identified and relevant to particular social groups, but that cannot be monetized

- for example, those related to cultural, spiritual, and ethical values.

To a certain extent, the role played by the Protocol for other environmental externalities is similar to the role played by the Greenhouse Gas Protocol (GHG Protocol) for carbon – in the case of NCP, applied to the corresponding impacts on natural capital and ecosystem services (direct and indirect contributions of ecosystems to the well-being of people). However, the Protocol goes beyond by providing instructions on how to value externalities - when valuation is possible and socially accepted - and try to integrate them into decision-making.

ECONOMIC VALUATION OF THE EXTERNALITIES

In this context, in 2017, Fibria began an economic valuation of externalities using these tools, jointly conducted with the specialized consulting firm, Pangea Capital. Following the NCP framework, the company carried out seven of the nine steps described in the Protocol:

1. Get started
2. Define the objective
3. Scope of the assessment
4. Determine the impacts and/or dependencies
5. Measure impact
6. Measure changes in the state of natural capital
7. Value impacts and/or dependencies

DIAGNOSTIC

The first phase of the study took steps 2 to 4 into account. We worked to diagnose and measure the externalities arising from Fibria's operations in Brazil. With this, we sought to understand, qualitatively, the actual and potential externalities, positive and negative.

During this phase, the baseline year adopted was Fibria's foundation in 2009. Initially, the scope of the diagnostic was limited to direct externalities - that is, it did not cover the company's value chain (suppliers or customers). For forest logistics - the transport of wood from forests to industry - it was decided that the phase would be considered a direct activity of Fibria and included in the scope of the analysis, due to its close interrelation with forestry operations. Any past impacts of industrial operations or port logistics, therefore, were excluded from the analysis.

QUANTIFICATION AND VALUATION

In a second phase, which included steps 5 to 7, we recorded, through indicators based on physical measures and monetarily evaluated the externalities that occurred in 2016 were selected during the first phase.

Photo: Marcio Schimming



Portocel. Aracruz (Espírito Santo state)

SELECTION OF EXTERNALITIES

The diagnostic phase, which was essentially carried out with secondary data from specialized literature supplemented by company's own information, identified relevant externalities for 20 (87%) of the 23 ecosystem services considered (according to the TEEB benchmark³).

Forestry operations impact all of these 20 ecosystem services, while industrial and logistics operations impact 4 (17%) and 7 (30%) of them, respectively.

Based on these results, and after internal consultations conducted by Fibria, a set of externalities considered priorities for economic valuation was selected (*see table below*).

RESULTS

Relevant externalities were identified for 20* of the 23 ecosystem services considered in the analysis



SUPPLY SERVICES (Ecosystem Products)

- Raw materials
- Biofuels
- **Food**
- **Fresh water**
- Genetic resources
- Biochemical, medicinal, and pharmaceutical resources



REGULATORY SERVICES (Obtained from the control of natural processes)

- Natural disasters
- **Air quality**
- **Local, regional, and/or global climate**
- **Water dynamics**
- **Soil erosion**
- **Water purification**
- **Human illness**
- **Soil quality**
- **Biological pest control**
- **Pollination**



CULTURAL SERVICES (Non-material)

- **Recreation and ecotourism**
- **Ethical, spiritual, and cultural values**
- **Educational and inspirational values**



SUPPORT SERVICES (Support almost all the other services)

- **Ecosystem integrity**
- **Nutrient cycling**
- **Primary production**
- **Water cycle**

* The 20 relevant externalities are identified in bold.

Subsequently, the company put together a multidisciplinary group to study the results of the first mapping phase and define the priority externalities to be further studied and valued. The group included representatives from the Commercial, Comptroller, and Investor Relations areas, as well as from the Environment and Sustainability areas, which provided a vision on each aspect from the perspectives of customers, investors, and other stakeholders such as neighboring communities, Nonprofit Organizations (NGOs) and civil society organizations.

³ TEEB. *The Economics of Ecosystems and Biodiversity: Ecological and Economic foundations*. Kumar, P. (Ed). Earthscan, 2012.

From the initial list of 20 items, and taking into account the multiplicity of points of view involved, two externalities were chosen to be analyzed in the first valuation exercise:

1) Food supply (positive externality):

ecosystems provide conditions for cultivating food for human consumption (ex: agriculture, livestock, fishing, beekeeping, and aquaculture).

2) Climate regulation (positive and negative externalities): emission or sequestration of greenhouse gases and the influence of vegetation on regional and local temperature, rainfall, etc.

It should be noted that the work carried out captures only a portion of the

company's externalities, by selecting two among the 20 ecosystem services identified as relevant. Therefore, it cannot be seen as a profile of the company's total externalities; it was an initial and well-defined step, to be improved and expanded in terms of the scope, methodology, and valuation criteria adopted.

It should also be taken into account that the estimation of the indicators and the economic value for the services considered represent Fibria's first valuation exercise, adopting assumptions and directions based on the methodologies available. A degree of uncertainty is inherent to the method and process - the estimates found, therefore, should not be seen as precise values, but rather as an indication of magnitude.

Photo: Marcio Schimming



Alexandra Oliveira Barbosa, Laboratory Analysis I technician, in Três Lagoas (Mato Grosso do Sul state).

METHODOLOGICAL GUIDELINES

Concept of externality: *The positive or negative consequence of an action that affects someone other than the agent undertaking that action and for which the agent is neither compensated nor penalized.* (WBCSD et al. 2011)¹.

Sources: from the diagnostic to the economic valuation of externalities, the work was based on data and information raised by Fibria as well as secondary data: Company documents and specialized literature. In other words, a comprehensive and specific primary data survey was not carried out for the analyses of economic value conducted in the study.

Valuation logic: The economic valuation developed in the study refers to estimates of the monetary value of the portion of measurable economic impacts suffered by third parties and resulting from impacts of Fibria's activities on the environment. Immeasurable social or economic consequences of environmental impacts arising from company activities were not considered.

¹ WBCSD, ERM, IUCN, PWC. Guide to Corporate Ecosystem Valuation: a framework for improving corporate decision-making. 2011. Available at: <http://www.wbcds.org/templates/TemplateWBCSD5/layout.asp?type=p&MenuId=MTc3OQ&doOpen=1&ClickMenu=LeftMenu>. "Consequence" means: changes in the quantity or quality of natural capital, and, more specifically, of the resulting ecosystem services. In other words, externalities are impacts on third parties who have not been compensated or penalized ["third parties" shall mean any player or social segment other than the company itself (firstly) or its direct consumers (secondly)]. In this context, mitigation actions for previous negative impacts are not considered externalities.

VALUATION PROCEDURES

General procedures adopted for economic valuation:

1. For each of the externalities, a performance indicator (IP) was initially quantified, based on physical units that can represent, directly or indirectly (proxy), environmental changes resulting from company activities (also called key performance index or KPI). Examples of IPs: tons of CO₂ released into or removed from the atmosphere, cubic meters of water consumed, etc.
2. Subsequently, economic values representative of losses or gains perceived by the directly affected community (VE) were estimated or obtained from specialized literature, for each IP.
3. The values of externalities were then obtained by multiplying IPs by their respective VE.

4. A sensitivity analysis of the results obtained regarding the parameters used in IP and VE was developed. Its goal was to assess the impacts that variations in relevant parameters for the IP or VE adopted would have on the estimated final economic value. These analyses focused on the parameters whose estimates showed greater uncertainty.

The following table summarizes the results of the economic valuation of externalities of Fibria's domestic operations in 2016, broken down by ecosystem services. The table shows the monetary values found for the two externalities chosen.

In the next part of this section, the concepts, valuation methodology, and results found for each of the two externalities presented in the summary table will be described in greater detail.

SUMMARY TABLE.

Estimates of the monetary values of the externalities of Fibria's domestic operations in 2016, broken down by ecosystem service (values of externalities are rounded).

ECOSYSTEM SERVICES	OPERATING UNITS			
	Aracruz	Jacareí	Três Lagoas	Total
Food supply	BRL 829,000	BRL 7,871,000	BRL 1,192,000	BRL 9,892,000
Global climate regulation	BRL 696,256,000	BRL 523,858,000	BRL 1,547,615,000	BRL 2,767,729,000
Total	BRL 697,085,000	BRL 531,729,000	BRL 1,548,807,000	BRL 2,777,621,000

Photo: Marcio Schimming

From left to right, Rodolfo Araujo Loos, Ecophysiology researcher; Carlos Eduardo Scardua, lead technician in field research; and, Almir Rogério da Silva, technician in field research, in Aracruz (Espírito Santo state)





APPROACH TO THE TWO EXTERNALITIES

1. EXTERNALITIES IN FOOD SUPPLY

To supply an industrial production chain, the planted forest may contribute to displacing small subsistence crops, affecting food supply in that region. This conversion in land use may therefore negatively impact local food safety. This externality is due to the simple fact that the land is not being used to produce food, regardless of who promoted the conversion or when the original conversion was made - for example, regardless of whether the land was already being used as pasture before being reforested with eucalyptus trees. In the data available, there is an estimate of the previous use and, based on this data, the valuation of the food that is produced today was considered.

On the other hand, at two of its forestry operations, Fibria has in place two initiatives that encourage the simultaneous production of food in the same areas used for cultivating wood: the Colmeias (Hives) program, to promote beekeeping, and the Integrated Wood and Food Production project (PIMA), aimed toward local farming communities (*read more in the **Colmeias/PIMA Project** box*).

COLMEIAS PROGRAM

- Supports small producers of honey in the vicinity of Fibria's eucalyptus planted forests.
- The trees in these forests bloom for 5 years before they are harvested, supplying the bees with an abundance of nectar and pollen. The same happens with the native forests maintained or recovered by the company.
- Today, Colmeias accounts for 65% and 35% of honey production in the states of Espírito Santo and São Paulo, respectively.

PIMA PROJECT

- Part of Fibria's Rural Land Development Program (PDRT), PIMA makes it possible for local communities to cultivate short-cycle food - today, cassava and corn - between the eucalyptus seedlings of planted forests.
- Crops may be kept for a year and a half, after planting the forest.
- Although the scale of the project is small compared to Fibria's forest area, its impact on the beneficiary communities is certainly relevant.

Tiago Barros dos Santos, handling the boxes of Uruçu native bees in the Tupiniquim and Guarani indigenous villages, in Aracruz (Espírito Santo state)

We consider the externalities generated by these initiatives to be positive, in terms of the ecosystem service of food supply. Therefore, we take into account that food production is not part of Fibria's business, and the company does not directly benefit from it.

However, by making honey and food crops available in the same production area occupied by our forest crops - for the benefit of the local communities, who received the economic gains of these initiatives - we have identified a new positive externality whose value may be monetarily calculated. The following is the breakdown and results of these calculations:

SCOPE

- Externalities related to Fibria's forestry operations.
- Colmeias Program: at the units in Jacareí (São Paulo state), Três Lagoas (Minas Gerais state), and Aracruz (Espírito Santos and Bahia states).
- PIMA: at the Aracruz unit (more specifically, in the state of Bahia).



METHODS

- **Quantification of externalities:** the performance indicator (IP-PA) for the food supply is Kilograms of food produced per hectare or hectare year (kg/year or kg/ha year). Production of honey, propolis, and bee wax by the Colmeia Project - IP-PA_c (kg/year) - and the agricultural production of PIMA, IP-PA_p (kg/ha year) were considered.
- **Valuation of externalities:** estimates of economic value (VE) were based on the financial profit of food production: revenue from sales less costs of production¹. In the case of PIMA, profit from production was also adjusted by the variation in maintenance costs of eucalyptus plantations in the areas where the program is developed - PIMA, C_{MP} (C_{MP} = maintenance cost without PIMA - maintenance cost with PIMA)².

$$\text{Value of the externality} = \text{IP-PA}_c \times \text{VE}_c + \text{PA} \times \text{IP-PA}_p \times (\text{VE}_p - \text{C}_{\text{MP}})$$

where: PA = area (ha) committed to PIMA

¹ The valuation method at the market price is recognized in literature; a similar strategy was adopted by the World Bank in valuing honey production in a region in Turkey. In Brazil, other companies (Monsanto and Natura) have also used it.

² Managing agricultural production may reduce or eliminate pests that could affect planted eucalyptus seedlings in the area, and since such management is carried out by the beneficiaries of PIMA and not by the company, it would free Fibria from these costs. In practice, this represents payment of the beneficiaries of PIMA for Fibria, and since the concept of externality excludes compensation for the benefit generated, this value was deducted from the value of the externality. (Fibria/Pangea and Fibria's Environmental Externalities Economic Valuation Report, 2017)





RELEVANCE

When converting land use from local food production to a monoculture of industrial interest, a frequent occurrence for traditional communities and low income small farming populations, it is common for social stress situations to arise. This may occur even if the company responsible for the new monoculture was not directly responsible for the conversion, which may have happened in the past.

This is a recurring social conflict issue. We consider that the two initiatives taken into account here, PIMA and *Colmeias*, are very relevant to this topic because of the positive social impact of mitigating these conflicts - rather than the magnitude of the amounts involved.



RESULTS

The total externality related to food supply, considering the *Colmeias* and PIMA programs, was approximately BRL 9.892 million for the year 2016 (a result obtained by multiplying the quantities produced by the profits obtained in the two initiatives, in compliance with the criteria described above).

The results of the economic valuation described - by Fibria production unit and by location - are presented in the tables under this topic.

COLMEIAS TABLE

Result of the economic valuation of the positive externality generated by the *Colmeias* Program in 2016 (values of externalities are rounded).

LOCATION	IP-PA _c			VE _c			EXTERNALITY (BRL)
	honey (kg/year)	propolis (kg/year)	wax (kg/year)	honey (BRL/kg)	propolis (BRL/kg)	wax (BRL/kg)	
Aracruz Unit							
Conceição da Barra - Espírito Santo state	222.000	0	0	BRL 3.00	-	-	BRL 666,000
Posto da Mata - Espírito Santo state	4.500	0	350	BRL 3.00	-	BRL 43.00	BRL 29,000
Total Aracruz							BRL 695,000
Jacareí Unit							
Capão Bonito - São Paulo state	1.123.894	0	0	BRL 6.90	-	-	BRL 7,755,000
Vale do Paraíba - São Paulo state	30.427	50	700	BRL 3.29	-	BRL 22.72	BRL 116,000
Total Jacareí							BRL 7,871,000
Três Lagoas Unit							
Três Lagoas - Mato Grosso do Sul state	216.810	0	0	BRL 5.50	-	--	BRL 1,192,000
Total Três Lagoas							BRL 1,192,000
GRAND TOTAL							BRL 9,758,000

PIMA TABLE

Result of the economic valuation of the positive externality generated by the Integrated Wood and Food Production (PIMA) project in 2016 (values of externalities are rounded).

LOCATION	Area (ha)	IP-PA _p (kg/ha)	VE _p (BRL/kg)	CM _p (BRL/kg)	EXTERNALITY (BRL)
Aracruz Unit					
Cachoeira do Riacho - Bahia State	11,13	8,000	0,480	-BRL 0,013	BRL 44,000
Gimihuna - Bahia State	5,75	7,000	0,480	BRL 0,033	BRL 18,000
Cachoeira do Riacho - Bahia State	15,74	8,000	0,480	BRL 0,135	BRL 43,000
Cachoeira do Riacho - Bahia State	8,79	6,000	0,480	-BRL 0,063	BRL 29,000
Total					R\$ 134,000

2. EXTERNALITY IN THE REGULATION OF GLOBAL CLIMATE

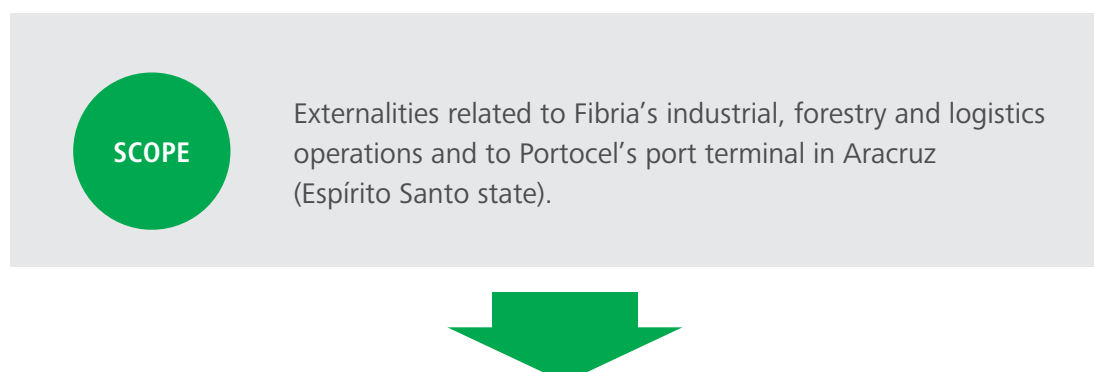
Fibria's operations generate greenhouse gas (GHG) emissions, largely related to energy consumption: directly by machinery and vehicles burning fossil fuels or by burning biomass in boilers or indirectly through the purchase of electricity.

The emissions generated imply negative externalities in terms of global climate regulation. On the other hand, the company maintains a forest base of considerable size, capable of significantly removing CO₂ from the atmosphere, characterizing a positive externality regarding global climate regulation.

The balance of these two types of emissions, measured and estimated according to internationally accepted and adopted standards, is the company's most relevant externality regarding the climate. The positive sign of the balance of estimates made for the 2016 emissions reflects the fact that the forests restored, conserved, or planted by Fibria represent an important consumer of CO₂, the main greenhouse gas.

By conserving native forests, Fibria will be preventing emissions while the baseline of local social and economic development indicates a trend towards deforestation. Similarly, by restoring degraded native forests or managing its planted forests in order to maintain a continuous generation of biomass, it will be removing CO₂ from the atmosphere. Every year, Fibria harvests only a portion of the trees it plants, resulting in the maintenance of a permanent, substantial stock of these forests.

The economic valuation of Fibria's positive and negative externalities regarding the regulation of climate change is shown below:





METHODS

- **Quantification of externalities:** The performance indicator of externalities in global climate regulation (IP- RCG) is *Tons of CO₂ equivalent* (tCO₂e).

Emissions and removals of the main greenhouse gases (GHG) were quantified: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The amounts found were then converted to tCO₂e. For negative externalities, the IP- RCG includes emissions of CO₂, CH₄, and N₂O; for positive externalities, it considers only the removal of CO₂.

- **Valuation of externalities:** In order to determine the economic value of externalities (VE), an estimate of the Social Cost of Carbon (CSC)¹ of USD 78.00 tCO₂e was adopted. This amount, obtained for the year 2012, is based on a meta-analysis² of studies on the social cost of carbon (PWC, 2015)³. The estimates considered in this analysis refer to impacts on the global economy. None of them deals specifically with the Brazilian economy.

This is adjusted for US inflation from 2012 to 2016⁴ including, plus 3% per annum - as growth rate of the SCC, in order to update the value of the economic damages due to additional GHG emissions (NORDHAUS⁵, 2017; STERN⁶, 2007) - the value reached USD 96.30 tCO₂e. Finally, it was converted into Brazilian Reais (BRL 211.26 tCO₂e), based on the conversion factor of the purchasing power parity (PPP) - private consumption⁷.

Insofar as this CSC estimate is not based on the Brazilian regions potentially impacted by the externalities generated by Fibria, it is considered a transfer of benefits. The CSC is based on the economic logic of economic damages caused by climate change from GHG emissions. For GHG removal from the atmosphere, they are considered damages avoided. The CSC has been used in other corporate studies of economic valuation of environmental externalities⁸.

METHODS

Some of the criteria adopted for estimating the Social Cost of Carbon are the object of controversy among economists and scholars. One of these debates addresses the distribution, to present and future generations, of the social, economic and environmental damage caused by climate change - a result that may vary according to the methodological choices made when estimating the CSC.

It is a decision that involves ethical as well as economic issues. The quality of life is at stake not only for present generations, but for future generations - and future generations are unable to influence the current decisions of public and private policies that will affect their quality of life. For valuation of this externality, in Fibria's case, we opted for choices that value the maximum fairness between the rights of present and future generations.

¹ The CSC refers to the economic value of future damages to society as a result of climate change resulting from GHG emissions (STERN, 2007). In general terms, it considers economic loss related to the availability of water resources, loss of land due to the rising sea level, loss of land for food production, public health, and extreme events (droughts, floods, heat waves, etc.) (IAWG, 2016, PWC, 2015).

² A meta-analysis is an analysis that uses results from previous studies as a database and applies specific and systematic methodological procedures to them in order to answer a question or obtain a specific result. The CSC estimate used in this study was based on a sample of the 10 most recent studies until 2012, which present 34 CSC estimates (PWC, 2015).

³ PWC. Valuing corporate environmental impacts. 2015. Available at: www.pwc.co.uk/naturalcapital.

⁴ Source: World Bank <https://data.worldbank.org>

⁵ NORDHAUS, W. D. Revisiting the social cost of carbon. Proceedings of the National Academy of Sciences, v. 114, n. 7, p. 1518–1523, 2017.

⁶ STERN, N. The Economics of Climate Change: The Stern Review. Cambridge University Press, 2007.

⁷ Source: World Bank <https://data.worldbank.org>

⁸ AkzoNobel (WBCSD, 2011), Kering (KERING, 2013, 2016), Natura (NATURA, 2015), Natura and Monsanto (INTERNATIONAL CONSERVATION BRAZIL, 2014), AMMAGI, Beraca, Bunge, and Walmart, Copel, Veracel and Centroflora Group (TeSE cycle 2015 site21), LafargeHolcim (LAFARGEHOLCIM, 2014, 2015, 2016), and others.

(notes from the document *Fibria/Pangea and Fibria's Environmental Externalities Economic Valuation Report*, 2017)





RELEVANCE

Climate change caused by the accumulation of greenhouse gases (GHG) in the atmosphere is one of the main topics of global environmental policy. In the Paris Agreement, signed in 2015, countries around the world agreed on targets and commitments for adapting and mitigating impacts on the climate. Brazil has committed to reducing GHG emissions and restoring forests.

Fibria, as a forest-based industrial company, contributes both to the emission of greenhouse gases in its operations and to the removal of these gases from the atmosphere through the sequestration of carbon carried out by its planted forests. The knowledge and evolution of the balance between these two impacts - one negative and one positive - are of fundamental importance to the company's social and environmental management.



RESULTS

The overall positive externality regarding global climate regulation in 2016 reached about BRL 2.768 billion. This value is reached by multiplying the result of GHG quantification (IP-RCG, removed - released), by the CSC (VE) value:

$$\text{Value of Externality} = (\text{IP-RCG}_{\text{REMOVAL}} - \text{IP-RCG}_{\text{EMISSION}}) \times \text{VE}$$

Fibria's forestry operations, which result in the production of biomass in the company's commercial and native forests, generate positive externalities for climate regulation, in a volume that predominates over the negative externalities generated by other company operations, particularly logistics and industrial.

The complete results of the economic valuation are presented in the following table.

CLIMATE TABLE

Result of the economic valuation of externalities regarding climate change in 2016.

LOCATION	EMISSIONS				REMOVALS			VE (BRL/tCO ₂ e)	EXTERNALITY (BRL)
	CO ₂ (tCO ₂ e)	CH ₄ (tCO ₂ e)	N ₂ O (tCO ₂ e)	IP-RCG _{EMISSION} (tCO ₂ e)	Eucalyptus (tCO ₂ e)	Native (tCO ₂ e)	IP-RCG _{REMOVAL} (tCO ₂ e)		
Aracruz Unit									
Forests	146,997	266	13,635	160,898	7,574,303	314,508	7,888,811	BRL 211	BRL 1,632,636,000
Industry	4,307,312	93,534	28,172	4,429,018	-	-	-	BRL 211	-BRL 935,696,000
Portocel Port - Espírito Santo state	3,081	79	79	3,238	-	-	-	BRL 211	-BRL 684,000
Total Aracruz								BRL 696,256,000	
Jacareí Unit									
Forests	59,227	87	4,532	63,845	4,088,410	415,698	4,504,108	BRL 211	BRL 938,071,000
Industry	1,930,619	16,805	12,377	1,959,801	-	-	-	BRL 211	-BRL 414,037,000
Capão Bonito Nursery - São Paulo state	834	2	0	836	-	-	-	BRL 211	-BRL 177,000
Total Jacareí								BRL 523,858,000	
Três Lagoas Unit									
Forests	50,854	72	11,561	62,487	9,593,762	320,763	9,914,525	BRL 211	BRL 2,081,389,000
Industry	2,490,257	20,449	15,858	2,526,564	-	-	--	BRL 211	-BRL 533,774,000
Total Jacareí								BRL 1,547,615,000	
GRAND TOTAL								BRL 2,767,729,000	

FOR THE FUTURE

The results of the valuation work will be updated and presented, throughout 2018, to academic partners and social and environmental forums for debate and analysis. The most enriching way to handle environmental economic valuation - and make it even more useful to public or corporate policy - is to make it an ongoing process in which values are monitored and re-estimated over time.

There are several ways to enhance the initial study. One is to produce more primary data that may replace some of the secondary data used. Another is to improve the tools used to calculate the estimates.

In addition, we will expand the objects of the study, including new externalities, such as water and ecosystem integrity, and the industry's dependence on water. The study of dependencies is focused on the impact of changes in ecosystem services upon Fibria, variations caused by other economic agents or by the company itself. The study of externalities assesses the impact of the changes in ecosystem services caused by the company on third parties - there is a inversion of signs between the two concepts.

It is also necessary to periodically revise the estimates so that they may continue to serve as a performance indicator in the quest to increase positive externalities and reduce the company's negative externalities.

In one way or another, through this initiative and its ramifications, Fibria intends to discuss important environmental and economic sustainability concepts, and seeks to integrate non-financial information into decision-making. In this way, the company wishes to contribute to a more transparent debate on these aspects, and at the same time, use valuable tools for the strategic management of its businesses



*Forest mosaic in Capão
Bonito (São Paulo state)*

Photo: Marcio Schimming

CONTACT

For questions and suggestions, please contact us via email
comunicacaofibria@fibria.com.br

COVER PHOTOS

- Mayara Martins Aparecido, at the Technology Center in Jacareí (São Paulo state) – *Photo: Marcio Schimming*
- Clarice Da Silva Santos, assistant at the Nursery, in Três Lagoas (Mato Grosso do Sul state) – *Photo: Marcio Schimming*
- Pulp in Portocel, Aracruz (Espírito Santo state) – *Photo: Marcio Schimming*
- Valmir Florentino Paulo, participant of the PDRT in Nova Viçosa (Bahia state) – *Photo: Araquém Alcântara*
- Jefferson Moraes da Cruz, planting seedlings, in Capão Bonito (São Paulo state) – *Photo: Marcio Schimming*

BACK COVER PHOTO

- Vitor Morais Galvão Bueno Trigueirinho, environmental analyst at Fibria – *Photo: Araquém Alcântara*





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