SUZANO
PAPEL E CELULOSE

Water Resources and the Mucuri River Basin – a study of the ecosystem services of water provision, water quality regulation and global climate regulation

EXECUTIVE SUMMARY

Suzano Pulp and Paper is the second largest global producer of eucalyptus pulp and is among the five largest producers of market pulp. In addition to its relationship with natural capital, in its forestry activities, the company also presents interfaces with natural capital in its industrial operations. For the present study, *Suzano* chose to evaluate this relationship in its industrial unit in *Bahia*. This is because, located in the *Mucuri* River Basin, the company supplies its water resources and develops environmental recovery actions of forest areas in the basin.

In relation to ecosystem services for water provision and water quality regulation, *Suzano* chose to evaluate, from an economic perspective, its dependencies and impacts. For the water provision service, a prospective exercise of water unavailability equivalent to 25% of the plant's demand was carried out, and the economic valuation was calculated by the Replacement Cost Method (RCM), considering the substitution of own collection for provision by the water utility. In this scenario, the company would be impacted by an unavailability of about 14 million liters/year, an amount of R$ 288 million.

For the ecosystem service of water quality regulation, the parameters related to turbidity were evaluated using the RCM valuation, considering the modelling of a Water Treatment Plant (WTP) implementation. The company's dependence was calculated at 182 UNT and the impact at 19 UNT, valued at R$ 1.2 million/year and R$ 717 thousand/year, respectively.

These results allowed the company to reflect on the business unit's exposure to potential operational and financial risks, considering scenarios of changes in water availability patterns.

Complementarily, the company also opted to evaluate the potential positive externality to be generated by its forest restoration project in relation to the ecosystem service of global climate regulation. The *Mucuri* River Springs Project, started in 2017, aims to recover degraded areas of river sources. An average of one hectare per spring was considered, in areas of Dense *Ombrophilous Submontane* Forest, in the Atlantic Forest biome, degraded by pasture activity. Considering the recovery of 500 river sources over 5 years, it is estimated that approximately 540 thousand tCO_2e will be removed, which were valued at R$ 67.8 million, when using the Social Cost of Carbon, which considers the estimated costs of the probable impacts of the addition of one ton of carbon to the atmosphere.

The results of this study were used by the company in a context of results measurement and communication with stakeholders, providing information that can support the dialogue regarding the monitoring and performance of the forest restoration project.

Report on dependencies, impacts and externalities

Responsible for completing: Valeria Parisotto Victor

Project drivers

Goals: Communicate internally or externally.

Description: Assess the risks associated with the availability of water resources, as well as quantify and report the potential positive externalities of the Mucuri River Springs Project.

Project scope

Object of the project analysis: Project.

Description: Industrial Unity in *Bahia*.

Geographic Area: *Mucuri* River Basin.

Step(s) of the value chain included: Own operations.

Type of approach: Retroactive and prospective.

Time Horizon: For provision and regulation of water quality: one year (2016); for global climate regulation: five years.

Ecosystem Services: Water provision; water quality regulation; and global climate regulation.

Water provision

Role of ecosystems in the hydrological cycle and their contribution in terms of water quantity, defined as total production of freshwater.

Method(s) Used: Replacement Cost Method (RCM).

Results

Dependency: R$ 1,15 billion

Impact: R$ 288,5 milion

Externality: Not calculated

Data used	Type of data
Dependency on the quantity of water: 56.026.806,00 m^3.	Primary/own
Hydrological balance of the water used by the business: the externality aspect was not calculated.	Primary/own
Watershed from where water is collected, name and classification of the water body: *Mucuri* River Basin (MG-BA), class 2 - own funding according to grant.	Secondary (ANA)
Watershed used for water replacement, name and classification of the water body: *Mucuri* River Basin, class 2 - water purchase of *Embasa*.	Secondary (ANA)

Further information

Results from physical metrics:

Dependency on the quantity of water: 31.23 m^3/t.

Quantity of demanded water, but unavailable: 14.006.701,50 m^3.

Purchase cost: R$ 20.60/m^3

Assumptions adopted in the valuation estimates:

Dependency on the quantity of water: 31,23 m^3/t.

Quantity of pulp and paper produced in 2016 by the plant: 1.794.027,55 t.

Capture of 56.026.806,00 m^3 for the entire plant.

Quantity of unavailable water: 14.006.701,50 m^3

To calculate the impact of 25% of the demanded water if it is not available and is replaced by purchase of Embasa at 20,60 R$ / m^3 (consumption band > 50m^3, industrial category).

Others: The logistics costs for water imports were not accounted for.

Regulation of water quality

The role played by ecosystems in water quality control, considering physical, chemical and biological parameters.

Method(s) Used: Replacement Cost Method (RCM).

Results

Dependency: R$ 1,2 milion per year

Impact: R$ 717,6 thousand per year

Externality: Not calculated

Data used	Type of data
Watershed catchment, name and class: *Mucuri* River Basin, Class 2.	Secondary (ANA)
Quality parameter in water considered: Turbidity.	Primary/own

Further information

Results from physical metrics:

- Volume of water collected in 2016: 1.794.027,55 m^3.
- Ideal turbidity for the industrial process: > 1 NTU.
- Average quality captured: turbidity of 20 NTU.
- Minimum quality captured: turbidity of 183 NTU.
- Treatment cost from 20 NTU to 1 NTU: 0,40 R$/$m^3$.
- Treatment cost from 183 NTU to 1 NTU: 0,71 R$/$m^3$.
- 78% increase in treatment cost per volume.

Assumptions adopted in the valuation estimates:

- Turbidity captured by the company: 20 NTU
- Corresponds to the average turbidity of daily monitoring from January 2015 to October 2017.
- Maximum turbidity, considering minimum quality: 183 NTU
- Corresponds to the highest turbidity measured in the period from January 2015 to October 2017, in daily monitoring. In this way, was adopted this value of turbidity, considering minimum ecosystem regulation.
- Treatment cost of collected water: 0,40 R$/$m^3$
- Average monthly cost of raw water treatment in 2016.
- Cost of treatment, considering average turbidity of 183 NTU: 0,71 R$/$m^3$
- To estimate the cost of treatment from 183 NTU to 1 NTU, were considered the data evaluated by CONSTANTINO and YAMAMURA (2009) for the WTP of the city of Maringa. An exponential regression (R^2 = 0,91) was performed to estimate the costs for a turbidity of 183 NTU. The costs for 20 NTUs were also calculated on this curve in order to define the proportionality between the result calculated by the curve and the internal value of the company.

Others: The most critical parameters for the process are pH, conductivity, alkalinity, color and turbidity. The turbidity was chosen because it cover several critical properties and its behavior in the historical series.

Coagulant used in the treatment of collected water: PAC

Reference article to estimate increase in treatment cost:

CONSTANTINO, A. F. and YAMAMURA, V.D. Redução do gasto operacional em estação de tratamento de água utilizando o PAC. Maringa: Engineering Graduate Symposium - State University of Maringa, 2009.

Explanatory Notes: It is important to emphasize that the method used to estimate the cost increase due to turbidity raise is a simplification and, therefore, has significant non-quantified errors.

The mentioned article considers only the coagulant, lime and water costs for equipment cleaning, so that other related costs - such as disposal and treatment of silt - are not covered. The parameters for a WTA of public supply are also different (<5 NTU). In addition, there are other parameters that interfere in the treatment and its cost, so it is necessary to conduct laboratory tests for the correct determination of the amount of chemical agents that should be used, considering the quality of the raw water as a whole and not based on parameters in isolation.

Thus, the increase of almost 78% in the treatment cost can be either a super or an undersizing. Since the relationship between cost and improvement in parameters is not linear, this increase was considered suitable for this study and should cover the other embedded costs that were not directly accounted.

Global climate regulation

The role played by ecosystems in carbon and nitrogen biogeochemical cycles, thus influencing emissions of important greenhouse gases, such as CO_2, CH_4 and N_2O.

Method(s) used: Replacement Cost Method (RCM).

Results

Externality: R$ 67,8 million

Data used	Type of data
Actual removals resulting from environmental recovery, in tCO_2e: 108.267,13.	Primary calculated

Further information

Exchange rate used to convert the Social Cost of Carbon (SCC), in Brazilian Reais: R$ 3,30.

Assumptions adopted in the valuation estimates: The carbon removal potential of the *Mucuri* River Springs Project was calculated at the end of its implementation. That is, a projection was made, considering the recovery of the degraded areas of 500 river sources per year, during the five years of the project. Considering an average of one hectare per spring, at the end of the project, 2,500 hectares of third-party areas will be restored. They are areas of Dense *Ombrophilous Submontane* Forest (Atlantic Forest), degraded by pasture activity.

The quality of the project implementation is considered good, according to the TeSE tool. This is due to the monitoring of qualified professionals; from the removal of the degrading factor; ants control; periodic maintenance and fertilization of the base and cover; differentiation in the field of the location of pioneer species and diversity; besides the consideration of proximity to fragments of natural vegetation with seed bank.

Others: The Social Cost of Carbon considered was US$ 38.

Analysis of the results

The results of the study contributed to a reflection on the exposure of the business unit to potential operational and financial risks, considering scenarios of changes in water availability patterns. It also allowed to identify positive externalities related to projects of recovery of water springs and the climate variable.

Management of ecosystem services

Use of ecosystem service valuation results: Reporting.

Description: The results of the valuation were used by the company in a context of measurement of results and communication with stakeholders, when quantifying positive externalities of forest restoration actions, beyond those usually monitored. The results of the ecosystem services related to water provision and quality have now integrated/complemented existing studies related to the operational risks of the industrial unit.