

Business Case of Ecosystem Services Economic Valuation

Assessment of Projects
for Alternative Uses in
Eletropaulo's Safety
Clearances



TeSE

GVCES INITIATIVE



SÃO PAULO SCHOOL OF
BUSINESS ADMINISTRATION

Center for Sustainability
Studies

FGVces and the Business Initiatives (iE)

The **Center for Sustainability Studies (FGVces)** of the Business Administration School at Getulio Vargas Foundation (FGV EAESP) is an open arena for study, learning, innovation, and knowledge production. Formed by a team with multidisciplinary background, engaged and committed, with an authentic desire to transform society, FGVces works based on the development of public and private management strategies, policies and tools to promote sustainability for local, national and international scenarios. It is driven by four major pillars: (i) training activities; (ii) research and knowledge production; (iii) debates and exchange of information; and (iv) mobilization and communication.

Under this context, FGVces' Business Initiatives (iE, its Portuguese acronym) make up a network with the purpose of transforming sustainability challenges into opportunities to create value, contributing to a new development model. This purpose has been achieved through the co-creation of

strategies, tools, and proposals for public and business policies; support for implementation through pilot projects; knowledge systematization and dissemination through publications and events; and articulation with various government and civil society actors.

The Business Initiatives cover five themes, as shown in the table below: **life cycle assessment (LCA)**; **local development**; **value chain management**; **climate change** – mitigation and adaptation; and **ecosystem services**. The Business Initiatives have also advanced in **systemic approach**, jointly working to investigate, produce and apply knowledge to multi and interdisciplinary challenges. Those challenges seek to integrate sustainability into business processes and strategies, bringing more relevance to the theme. Thus, the themes discussed in each one of the five Business Initiatives have been integrated to cocreate solutions for complex and material challenges in different sectors.



Since 2009, the Business for the Climate Platform has had the purpose of contributing to advance business management of greenhouse gas (GHG) emissions, as well as risks and impacts caused by climate change, co-creating guidelines and tools, and recommending public policies.



Since 2012, the Innovation and Sustainability in the Value Chain initiative has been developing methods and tools to incorporate sustainability into business procurement processes and policies, developing protocols to manage the supply chain.



Since 2013, the Local Development and Large Projects initiative has had the purpose of articulating the business sector to reflect, share experiences and build business propositions and guidelines for local development, through dialogue, study and co-creation of methodologies and tools.



Since 2013, the Trends in Ecosystem Services initiative has been developing strategies and tools aimed at business management of impacts, dependencies and externalities related to ecosystem services, adopting the valuation approach.



Since 2015, the Applied Life Cycle initiative has been fostering the use of Life Cycle Assessment (LCA) and integration of the Life Cycle Thinking into business management, helping companies understand and use that approach to measure and manage environmental impacts of their products.



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Assessment of Projects for Alternative Uses
in Eletropaulo's Safety Clearances

An initiative of
Getulio Vargas Foundation
Center for Sustainability Studies (FGVces)
Trends in Ecosystem Services (TeSE)

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Introduction

The Trends in Ecosystem Services (TeSE) business initiative was launched in 2013 by the Center for Sustainability Studies at Getulio Vargas Foundation (FGVces) with the purpose of developing strategies and tools targeted at business management of impacts, dependencies, risks and opportunities related to ecosystem services¹. Since then, the project has elaborated guidelines for the monetary and non-monetary valuation of 10 ecosystem services and guidelines for the reporting of environmental externalities, and has also developed over 50 business cases for the valuation of ecosystem services.

TeSE team supports companies to develop their cases, aiming at testing the applicability of methods, helping enhancing the Guidelines and, mainly, creating pioneer business references to use valuation of ecosystem services, contributing to future application and incorporation of that agenda into business management.

After five years supporting business cases and discussions in meetings with TeSE member companies, the next step is quite clear: explore and communicate the connections of ecosystem service valuation results with financial demonstrations and the business language, seeking to contribute to incorporate natural capital² into business management, reducing risks and leveraging opportunities.

That is the context in which this study emerged and it seeks to **delve deeper into the application of ecosystem service valuation methods** to economic and financial feasibility

studies in the **real business challenge proposed by Eletropaulo** to assess alternative uses for safety clearances under the company's subtransmission lines. This business case is supported by Devese 3.0³ and **describes the experiences of the process; assumptions, calculations and results of the projects assessed; and provides a few reflections and lessons learned**. The goal is to have the case as a source of inspiration, considering different contexts require specific assessments, applications, caution and reflection. The development of this pilot study counted with the efforts of Eletropaulo's Environment department, supported by TeSE team and by a consultant specialized in economic valuation of ecosystem services, in partnership with TEEB Regional-Local Project.

3 The Business Guidelines for the Economic Valuation of Ecosystem Services (Devese, its Portuguese acronym) aims to assist business management in assessing their vulnerabilities and impacts on natural capital, especially externalities. Devese 3.0, updated in 2018, comprises nine ecosystem services (ecosystem services provision; water quantity; water quality; wastewater assimilation; biomass fuel; global climate regulation; recreation and tourism; pollination; and soil erosion) and comes with its corresponding calculation tool. This case sought to test the applicability of Devese 3.0.

1 Direct and indirect contributions of ecosystems to human well-being. In other words, benefits people obtain from nature through ecosystems. (TEEB, 2012)

2 Natural capital is the stock of renewable and non-renewable natural resources that combine to yield a flow of benefits for people. Ecosystems are an example of natural capital 'stock', whereas ecosystem services are an example of 'flow' (Devese 3.0).

MORE ABOUT TESE

In its first cycle of activities, launched in 2013, the Trends in Ecosystem Services (TeSE) business initiative made advancements in building tools to support business management to valuate vulnerabilities and impacts on the natural capital. Thus, the first version of the Corporate Guidelines for the Economic Valuation of Ecosystem Services (Devese) was developed, with the support of The Nature Conservancy (TNC) and Conservation International (CI-Brazil).

Since then, TeSE has been advancing in measurement. In 2014, it supported the development of 10 pilot projects and enhanced Devese, which resulted in its version 2.0 and its corresponding calculation tool. In 2018, based on the experience gathered in over 40 business cases with valuation of ecosystem services, Devese was updated and now features its version 3.0. The new version comprises nine ecosystem services (ecosystem services provision; water quantity; water quality; wastewater assimilation; biomass fuel; global climate regulation;

recreation and tourism; pollination; and soil erosion) and comes with its corresponding calculation tool.

In addition to that, TeSE engaged in the challenge to communicate business externalities and, in 2014, its member companies co-created the Corporate Guidelines for the Reporting of Environmental Externalities (Derea 1.0).

TeSE also explored the universe of non-monetary valuation of cultural ecosystem services (CES), in partnership with the Local Development and Large Projects business initiative, which in 2015 led to the development of the Corporate Guidelines for the Non-Economic Valuation of Cultural Ecosystem Services (Desec). In 2017, for the first time the Desec were applied to a business case.

Since 2014, TeSE has relied on the TEEB R-L Project partnership to proceed with the initiative.

More information on: www.fgv.br/ces/tese



The company and the ecosystem: Eletropaulo's projects of alternative uses for safety clearances

Eletropaulo is the largest power distribution company in Brazil, operating in 24 municipalities in Sao Paulo Metropolitan Region (RMSP), including the capital, and serving about 18 million people. Its mission is to 'provide well-being and socioeconomic development with safe, sustainable and reliable power supply solutions'⁴.

As an integral part of its business, Eletropaulo has 1,165 miles (1,876 km) of high-voltage subtransmission lines that supply power to the company distribution units. According to the legislation and to technical regulations, under the subtransmission lines there must be safety clearances with total length of about 465 miles (750 km). Safety clearance consists of an area required to perform building, operation, maintenance and inspection services in the power subtransmission line, and it can only be used by service personnel, in order to avoid accidents involving the electrical grid, as well as to ensure asset integrity and protect the environment.

Considering its operation area, Eletropaulo is responsible for many pieces of land located within the safety clearance, mostly in urban, highly populated areas, with high levels of environmental degradation. Those areas, due to pressure from external factors, face continuous and illegal settlements, and are used for garbage deposits or other activities, which may incur costs for the company, since it is subject to being fined, paying to remove illegal settlements, and continuously paying for cleaning in order to regularize the areas. Recovering and maintaining those areas are an environmental and social challenge, and also represent high

costs to manage, maintain and adjust the safety clearances according to the requirements of the subtransmission line operating licenses.

The company believes that using safety clearances in a sustainable and safe manner would dramatically reduce costs and those areas could actually offer social and environmental benefits. In this context, Eletropaulo has been researching and assessing innovative solutions. The company has some experience with the **Urban Orchard (Pomar Urbano) Project**, in partnership with the State of Sao Paulo administration, and with the **Revitalization of Safety Clearances (Revitalização de Faixas) Project**, developed as a pilot project in some places. It is currently assessing two new projects for alternative uses in safety clearances: **Green Lines (Linhas Verdes) Project** and **Community Vegetable Gardens (Hortas Comunitárias) Project** (please refer to Box 1).

While the current expenses with area maintenance and costs to implement and keep those projects have been assessed, are well known and properly quantified, the economic benefits provided by ecosystem services had not been assessed by the company.

Considering the economic and financial feasibility of a project depends on taking into account all costs involved and benefits offered by it, it is critical that the assessment of economic and financial feasibility of new projects for alternative uses in safety clearances includes values concerning ecosystem services. They can be fundamental for the feasibility of a project and to determine ways to enhance it, leveraging environmental benefits and reducing several costs.

⁴ Eletropaulo's website: <https://www.eletropaulo.com.br/Paginas/aes-eletropaulo.aspx>

Box 1 – A little bit about Eletropaulo’s projects for alternative uses in safety clearances



The **Urban Orchard (Pomar Urbano)** project, from Sao Paulo State Secretary for Environment, has been revitalizing the banks of the Pinheiros River, in Sao Paulo, since 1999. Eletropaulo is a partner in the project, responsible for an area of about 1.5 ha.

More information: <https://www.ambiente.sp.gov.br/pomarurbano/inicio/>

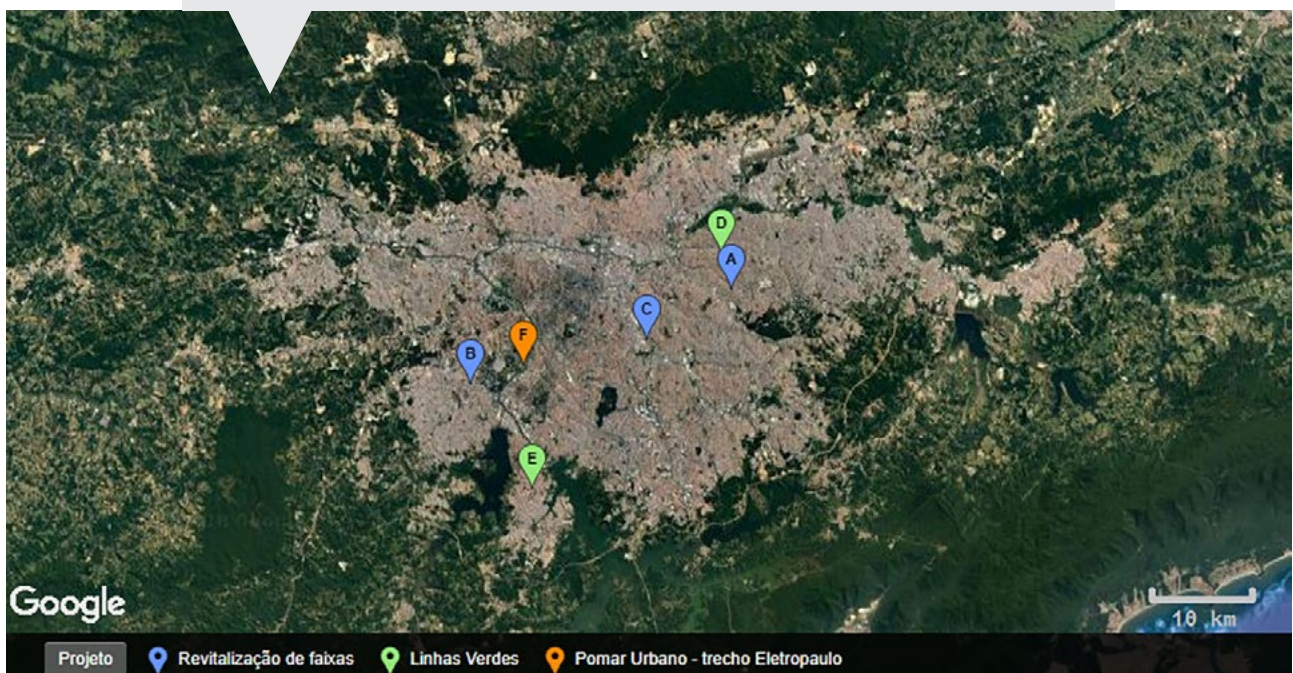


The **Green Lines (Linhas Verdes)** project consists of revegetation of safety clearances under Eletropaulo’s responsibility, by (mandatory or voluntary) planting of small and medium-sized trees, to be performed by Eletropaulo itself and other companies willing to participate in the project. Eletropaulo plans to allocate about 1,356,000 ft² (126,000 m²) of safety clearances under its subtransmission lines to the project.



The **Revitalization of the Safety Clearances (Revitalização das Faixas)** project consists of reurbanizing the safety clearances, transforming them into parks or squares where the population can freely visit for recreation and leisure. Three areas have already been revitalized.

The **Community Vegetable Gardens (Hortas Comunitárias)** project, which is in the planning stage, will allocate safety clearances for underprivileged populations to produce food in the municipality of Sao Paulo. The project aims at offering training on horticulture, and creates opportunities of work and income generation for people considered in social vulnerability.



Step by step guide for identification and economic and financial valuation of ecosystem services

Eletropaulo's goal with the development of this study is to **assess the economic and financial feasibility of projects for alternative uses in safety clearances, including valuation of ecosystem services, in order to support actions to reduce management costs and maximize social and environmental benefits**. The company understands those are important steps for their effective implementation in a systemic way.

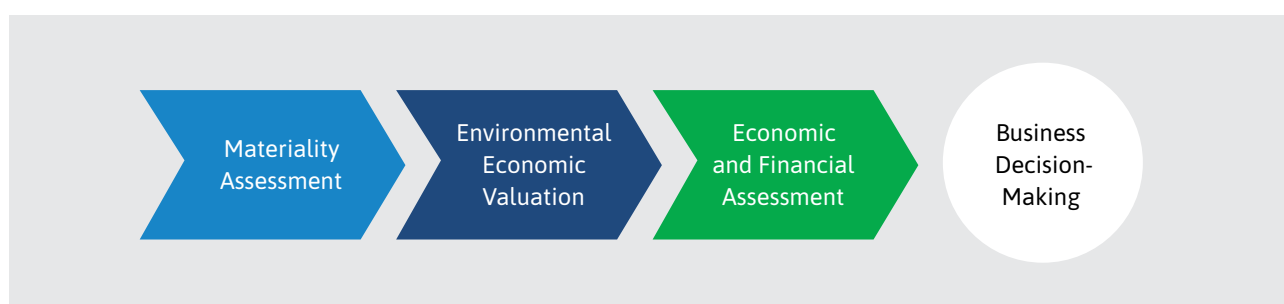
Eletropaulo's team was led by the Environment department, guided by their Health, Safety and Environment (HSE) Office, supported by other departments, as well as by TeSE team and an external consultant.

The assessments were conducted **per project**, namely: **Urban Orchard (Pomar Urbano) Project, Green Lines (Linhas Verdes) Project, Revitalization of Safety Clearances (Revi-**

talização de Faixas) Project, and Community Vegetable Gardens (Hortas Comunitárias) Project (Box 1). The **prospective approach** was applied, assessing potential project return in a **10-year time horizon** – concession time remaining for Eletropaulo to distribute power in Sao Paulo. Each project assessed is conducted in a different **geographic area in Sao Paulo Metropolitan Region (RMSP)**, under different regimes of land use and ownership. The value chain **stage** assessed was own operations, considering Eletropaulo is responsible for and has decision-making power over the allocation of safety clearances. Therefore, the company was also considered responsible for the externalities in this study.

Figure 1 shows the business decision-making process consisting of materiality assessment, ecosystem service valuation and economic and financial assessment of the projects.

Figure 1 – Process of incorporating the environmental economic valuation into business decision-making



Materiality Assessment

In the first stage of the study, Eletropaulo conducted a materiality assessment⁵ to determine the ecosystem services that should be included in each project assessed. That stage counted with the participation of four members of the company's Environment department and one member of the Sustainability department. For each project, a preliminary selection of ecosystem services deemed relevant was made, which was then discussed with the team supporting the project in the company, to finally determine the ecosystem services considered material. The materiality assessments were conducted separately for aspects of dependencies⁶, internal impacts⁷ and externalities⁸.

Table 1 summarizes the analysis results. Blank cells indicate ecosystem services from Devese that were not pre-selected. In Table 1, the highest level of materiality for the aspects assessed (dependency, internal impact, externalities) is registered. Green cells indicate ecosystem services selected. Materiality assessment per project is detailed in Annex 1.

Due to lack of data available, in the Green Lines (Linhas Verdes) project, it was not possible to assess Soil Erosion Regulation and Flow Regulation ecosystem services; and, in the Revitalization of Safety Clearances (Revitalização de Faixas) project, the Soil Erosion Regulation ecosystem service could not be assessed.

Table 1 – Summary of Project Materiality Assessment

| | URBAN ORCHARD (POMAR URBANO) | GREEN LINES (LINHAS VERDES) | REVITALIZATION OF SAFETY CLEARANCES (REVITALIZAÇÃO DE FAIXAS) | COMMUNITY VEGETABLE GARDENS (HORTAS COMUNITÁRIAS) |
|---------------------------------------|---------------------------------|--------------------------------|--|--|
| General Provision | | Low | | High |
| Water Provision | | | | |
| Biomass Fuel Provision | | | | |
| Water Quality Regulation | | | | |
| Regulation of Wastewater Assimilation | | | | |
| Global Climate Regulation | | Medium | | Low |
| Soil Erosion Regulation | Medium | Medium | High | |
| Pollination Regulation | Low | Low | Low | |
| Recreation and Tourism | High | | High | |
| Flow Regulation | Low | Medium | | |

Source: Authors, 2018

5 Materiality assessment is an assessment designed to identify ecosystem services that, after having their values considered for the assessment objective and scope, can potentially change decision-making (Devese 3.0).

6 Need of something to achieve a certain goal. The more important something is to reach that goal, the higher the dependency level (Devese 3.0).

7 It refers to the impact caused on the company, its unit or sector used as target of the economic valuation assessment (Devese 3.0).

8 Consequence of an action that affects someone other than the agent responsible for that action, and for which the person in charge is not compensated (in case of positive externality) or penalized (in case of negative externality) (Devese 3.0).

Economic Valuation of Ecosystem Services

The next stage sought to estimate the environmental economic value⁹ according to Devese 3.0 guidelines. Each project had meetings to discuss and define the data collection process, that involved other departments in the company, such as Sustainability and Safety Clearance Management, as well as the State Secretary for Environment, through the Urban Orchard (Pomar Urbano) project managers. It was challenging to find data available in order to calculate some ecosystem services. Whenever possible, the company collected data from its operational areas, or used secondary external data.

⁹ Importance or economic value of the natural capital for the well-being of the society as a whole or specifically for business (Devese 3.0).

Economic and Financial Feasibility Assessments

The projects were then assessed on their financial and economic feasibility, considering the values of costs and benefits related to material ecosystem services, and project ordinary costs and revenues (e.g. upfront investment, maintenance). Three economic and financial assessment techniques were used for the projects and corporate policies, as presented in Devese 3.0:

- **ROI** (Return on Investment) is a financial indicator, shown as a percentage, that measures the relationship between the amount gained (or lost) with the project (i.e. gain obtained with the investment, minus the cost of investment) compared to the total investment required to implement and keep the project.
- **Discounted Payback Period** represents how long it will take to break even from the investment, the moment after which the project provides financial benefit. Different from the payback period, the discounted payback period considers the value of money along time.
- **Cost-Benefit Analysis (CBA)** is a tool in which all financial flows, including estimates related to ecosystem services, are classified as costs (C) or benefits (B) and updated to their present value. The result of the analysis can be expressed in two different ways: i) net project result (benefits – costs), i.e. profit or loss; or ii) relative benefit (benefits / costs), that is, the relationship between the amount obtained and the amount invested.

The analysis covered a period of 10 years and all values projected for a future time were adjusted according to the accrued inflation rate, except for values estimated for the Global Climate Regulation ecosystem service, whose valuation scope, for being global, is not very sensitive to the inflation rate in Brazil. For global climate regulation values, the fixed rate of 3% p.a. was adopted to fix projections for the future¹⁰.

Future values were discounted at their present value in three different approaches for discount rates:

¹⁰ Nordhaus (2017)

1. **Capital Cost Rate (CCR)** for values related to ecosystem services and ordinary values;
2. **Reduced Social Discount Rate (RSDR)** for values related to ecosystem services and ordinary values;
3. **CCR** for ordinary values, and **RSDR** for values related to ecosystem services.

The CCR (nominal rate of the Weighted Average Capital Cost – WACC type) used by Eletropaulo in its regular financial analyses and also in this study was 9.97% p.a., and the RSDR used was 3.00% p.a.¹¹.

Projects were deemed feasible from the **financial** perspective when their **ROI, B/C and B-C were positive**; and were considered feasible from the **economic** perspective when their **ROI outweighed the capital opportunity cost criteria** adopted: SELIC interest rate of 87.71% for the 10-year period, and the cost of equity (K_e) with a return of 158.67% for the 10-year period.

At that stage, the Environment team relied on technical support of collaborators from the Strategic Planning, Financial and Regulatory Planning/Asset Management departments, who contributed to determine the parameters adopted in those analyses (future inflation rate, capital cost rate, time horizon) and to assess the results obtained.

Assessing the first version of the results was critical to revise some data and make adjustments to then obtain the final results on the projects economic and financial feasibility.

Interpreting the Results for Decision-Making

Then, the results – materiality, economic environmental valuation, and economic and financial feasibility – were assessed by Eletropaulo's Environment team aiming at enhancing those analyses and better planning the use of the safety clearances.

Finally, the team determined the next steps, such as adjustments to project planning in order to include opportunities related to ecosystem services.

11 HM Treasury (2018)

Urban Orchard (Pomar Urbano) Project

Eletropaulo has a partnership with Sao Paulo State Secretary for Environment in the implementation of the Urban Orchard project, which revitalized the landscape design of the banks of Pinheiros River, in Sao Paulo municipality, crossed by the subtransmission lines. The company is responsible for an area of about 1.5 ha in the project. The Urban Orchard project started in 1999 and is a reference for revitalization plans in areas under subtransmission lines.

The Urban Orchard project has had been receiving regular visitors, who benefit from the park with leisure and recreation activities and using the bike lanes for leisure and transportation to work. According to the Urban Orchard project management, most of the 26,000 visitors per year estimated at the left bank, where the area under Eletropaulo's responsibility is located, use the bike lanes to go to work.

Environmental Economic Valuation: Recreation and Tourism

Environmental Economic Valuation

The recreation and tourism ecosystem service refers to the role of ecosystems as places where people can find opportunities for rest, relaxation and recreation (Devese 3.0). The perception of the value of the social and cultural benefit brought by areas featuring the Urban Orchard project characteristics, however, tends to be very subjective. To get an estimate, it is recommended to interview visitors, in order to get from them a direct value statement, or at least an indication of the opportunity cost. Up to the moment, it was not possible to gather enough samples to run a more consistent analysis on the value visitors assign to the project.

Thus, the valuation of that externality was based on two assumptions:

Description: Benefits of revitalizing the banks of the Pinheiros River crossed by Eletropaulo's transmission lines, both to society and to the company.

Geographic Area: Morumbi segment, on the left bank of the Pinheiros River

Approach and time horizon: prospective for a ten-year period

Ecosystem Services Assessed: Recreation and Tourism

1. Those who visit the Urban Orchard area as commuters to go to work or go back home would have to cross the region even though there were no garden or bike lanes, and would, therefore, incur travel expenses.
2. If those who visit the Urban Orchard area to enjoy leisure or recreation wanted to have similar benefits in case the Orchard did not exist, they would have to move to another area with similar characteristics.

In both cases, travel expenses adopted was the value of two ordinary public transportation tickets in 2018 in the city of Sao Paulo, or BRL 8.00. That value was multiplied by the number of visitors and then prorated by the Urban Orchard proportional area under Eletropaulo's responsibility (0.93 mile / 1.5 km) compared to the Urban Orchard total area on the left margin (10.3 miles / 16.6 km), according to

the formula below. The positive externality result for recreation and tourism was approximately BRL 19 thousand per year.

$$\text{BRL } 8.00 \times 26,000 \text{ visitors/year} \times (1.5 \text{ km} / 16.6 \text{ km}) \\ = \text{BRL } 18,795.18$$

Economic and Financial Assessment

Economic
and Financial
Assessment

COSTS AND BENEFITS CONSIDERED IN THE ASSESSMENT

As Eletropaulo has been a partner of Urban Orchard project for many years, and the analyses refer to the next 10-year period, no upfront investment was considered.

COSTS

- C1. Maintenance costs – Landscape scenario: Gardening costs and similar costs for the maintenance of the landscape design in the Urban Orchard area under Eletropaulo's responsibility.
- C2. Maintenance costs – Institutional signs: Regular replacement of institutional signs announcing the partnership between Eletropaulo and the Urban Orchard Project.

All those costs represent expenses for the company (cash outflow).

BENEFITS

- B1. Positive externality concerning the recreation and tourism ecosystem service, as calculated in the previous step.
- B2. Institutional marketing – Support offered to the Urban Orchard project enables partner companies to show institutional marketing that will directly benefit their public image. This type of advertising has significant economic value, particularly after restrictions imposed by the municipal legislation limiting that kind of marketing material. In this case, the value of the benefit was estimated as equivalent to the value of advertising in similar media, such as bus stop advertisements.
- B3. Avoided costs - maintenance: Regular mowing to control weeds.

No benefits represent cash inflow to the business. B1 benefits the society. B2 and B3 benefit the business.

RESULTS OF THE ASSESSMENTS

Table 2 – Results of the Economic and Financial Feasibility Assessments for the Urban Orchard (Pomar Urbano) Project

| | WITH ENVIRONMENTAL VALUATION | | WITHOUT ENVIRONMENTAL VALUATION | |
|----------------------------------|------------------------------|------------------|---------------------------------|------------------|
| | CCR | RSDR | CCR and RSDR | CCR |
| ROI | 92.14% | 92.29% | 97.73% | 78.65% |
| Discounted Payback Period | > 1 year | > 1 year | > 1 year | > 1 year |
| CBA: B - C | BRL 955 thousand | BRL 1.35 million | BRL 1.01 million | BRL 815 thousand |
| CBA: B / C | BRL 1.941 | BRL 1.941 | BRL 1.997 | BRL 0.558 |

The Project is financially feasible according to all indicators assessed, and the major benefit comes from institutional marketing. For the Discounted Payback Period, the assessment is not very useful, since there was no upfront investment to recover.

From the economic perspective, when you consider the opportunity cost of the capital invested, the project ROI indicates feasibility when compared to the return offered by the basic interest rate adopted in the economic scenario, known as SELIC (87.71% in a 10-year period); but it indicates a deficit when it comes to the capital cost rate (CCR) (158.67% in a 10-year period). Without the value associated with the ecosystem service, the project economic performance would be below SELIC interest rate.

Based on the results obtained in CCR and RSDR schemes, for the project to be economically feasible according to the criterion required by CCR, it would be necessary, for instance, to reduce maintenance costs in 24%. Other combinations in cost reduction or in a greater number of benefits can also make the project economically attractive.

It is worth pointing out that other positive impacts that would increase the project ROI were not taken into account due to lack of available data. It is the case, for instance, of a likely impact on the appreciation of real estate properties located in the region thanks to the attraction to the landscape provided by the Urban Orchard project.

Under the business perspective, it is a beneficial project, since the value of the benefits received by the company outweighs the value of the costs it pays.

CONTRIBUTIONS TO THE PROJECT FUTURE

The Urban Orchard Project offers a significant contribution to the city of Sao Paulo, so Eletropaulo will keep investing in it. In addition to the ecosystem service mapped in this study, the company plans to map and value the well-being generated by the project to the people who drive along the Marginal Pinheiros river bank daily and benefit from its landscape design. In the past, the area used to be extremely degraded, whereas now it is visually attractive and the population can use it.

Green Lines (Linhas Verdes) Project

The project basically consists of revegetation in the safety clearances through compensatory or voluntary planting of small-sized trees¹². Eletropaulo plans to allocate to the project about 1,356,000 ft² (126,000 m²) of safety clearances under its subtransmission lines. The project is expected to contribute to build ecological corridors, connecting adjacent green areas, as well as to remove carbon from the atmosphere, contributing to global climate regulation. In August 2018, Eletropaulo planted the first 21 trees. Then, in December 2018, it started planting 2,404 tree seedlings, in partnership with Ecovias¹³.

Environmental Economic Valuation: Global Climate Regulation

Environmental
Economic
Valuation

Global Climate Regulation ecosystem service refers to the role played by ecosystems in carbon and nitrogen biogeochemical cycles, thus influencing emissions of important greenhouse gases, such as CO₂, CH₄, and N₂O, which affect the global climate (Devese 3.0).

Typical reforestation in the Atlantic Forest with total planting accrues about 20tC/ha during the first 10 years of development, which accounts for 25% of the biomass accumulated until it reaches its full development.¹⁴ In the first years, biomass accrual is somewhat linear, which implies about 2tC/ha per year, or 7.33 tCO₂/ha per year. The area considered for the analysis of this project is 1 ha, based on the stage of the project that has already been determined.

Description: Revegetation of safety clearances by planting small-sized trees.

Geographic Area: Different locations in Sao Paulo Metropolitan Region

Approach and Time Horizon: Prospective for a 10-year period

Ecosystem Services Assessed: Global Climate Regulation

Considering the social cost of carbon US\$ 87.30/tCO₂e¹⁵ and the exchange rate BRL 3.19/US\$¹⁶, the economic value corresponding to that assimilation of atmospheric CO₂ in biomass will be approximately BRL 2.04 thousand/ha per year, according to the formula below.

$$7.33 \text{ tCO}_2/\text{ha per year} \times 1 \text{ ha} \times \text{US\$ } 87.30/\text{tCO}_2\text{e} \times \text{BRL } 3.19/\text{US\$} = \text{BRL } 2,041.31/\text{ha per year}$$

¹⁵ Nordhaus (2017)

¹⁶ World Bank Official Exchange Rate, 2017: <https://data.worldbank.org/indicator/PA.NUS.FCRF>

¹² Small-sized trees prevent interference with the subtransmission lines.

¹³ Concessionaire of the Anchieta-Imigrantes System.

¹⁴ Martins (2004)

Economic and Financial Assessment

Economic
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COSTS AND BENEFITS CONSIDERED IN THE ASSESSMENT

COSTS

- C1. Upfront investment: Costs incurred in project deployment, such as site preparation and planting of trees.
- C2. Maintenance costs: Maintenance of tree planting.

BENEFITS

- B1. Positive externality concerning the global climate regulation ecosystem service: Tree planting works as atmospheric CO₂ sink, contributing to mitigate global climate change.
- B2. Avoided costs – Area maintenance: Regular mowing. The restored vegetation is expected to replace the need for mowing to control weed.
- B3. Avoided costs – Illegal settlements: Settlements removal. Revegetated areas are expected to avoid illegal settlements and occupation.
- B4. Avoided costs – Fines: Improper maintenance of the easement area. Revegetation is expected to meet the requirements for easement areas of that nature.

Those costs represent expenses for the company or partners.

No benefits represent cash inflow to the business. B1 benefits the society. B2, B3 and B4 benefit the business.

RESULTS OF THE ASSESSMENTS

Table 3 – Results of the Economic and Financial Feasibility Assessments for the Green Lines (Linhas Verdes) Project

| | WITH ENVIRONMENTAL VALUATION | | | WITHOUT ENVIRONMENTAL VALUATION |
|----------------------------------|------------------------------|------------------|-----------------|---------------------------------|
| | CCR | RSDR | CCR and RSDR | CCR |
| ROI | 9.00% | 39.86% | 9.60% | 7.53% |
| Discounted Payback Period | 5 years | 5 years | 5 years | 5 years |
| CBA: B - C | BRL 89 thousand | BRL 427 thousand | BRL 95 thousand | BRL 74 thousand |
| CBA: B / C | BRL 1.090 | BRL 1.399 | BRL 1.096 | BRL 1.075 |

The project is financially feasible according to all indicators selected, although it is not economically feasible, since ROI is lower than 158.67% for CCR, and 87.71% for SELIC interest rate in the same 10-year-period. The invested capital payback period of up to five years is reasonable.

Those results derive from high upfront costs involved in the project, not much impacted when updating at present value, and also from the fact that the benefits are concentrated around the fifth year and are, therefore, more penalized in the financial update process. Moreover, whereas costs end after three years, benefits extend beyond the 10-year period considered in the assessment, but that additional part of the benefits is not captured by financial indicators in the time horizon covered in the study.

Based on the results obtained in the scheme that combines CCR and RSDR, for the project to be economically feasible based on the opportunity cost required by SELIC interest rate, it would be necessary, for instance, to reduce deployment costs in 23.5% and maintenance costs in 50% per year. For CCR used as a criterion for opportunity cost, it would be necessary to reduce deployment costs in 52.5% and maintenance costs in 60% per year. Other combinations in cost reduction or in a greater number of benefits can also make the project be more economically attractive.

The potential impact of choosing the discount rate in the result assessments can be seen in the differences between the results obtained using CCR and RSDR schemes, noting the CCR rate is three times greater than the RSDR rate.

It was not possible to estimate other potential benefits, such as likely appraisal of neighboring real estate properties thanks to the removal of degradation factors, like as accumulation of debris and weeds.

It is worth pointing out that, even though the project has not met the economic feasibility criteria, it allows for a more beneficial scenario to manage the area compared to

the current situation. In addition to that, if the project itself has low economic performance, the financial return to the company can be relevant in case all costs involved in planting and maintenance are absorbed by partners, in a scenario of environmental compensation, for instance. In that case, the net balance for the company corresponds to the amount of avoided costs, which is about BRL 1 million in a 10-year period (updated according to the CCR scheme); making the project very beneficial to Eletropaulo.

CONTRIBUTIONS TO THE PROJECT FUTURE ANALYSES

This project brings clear financial benefits to the company, and environmental benefits to the community. It is appropriate for areas that are not highly populated or for safety clearances located near parks, because it can act as an ecological corridor, connecting different areas in the city.

Part of the project can be developed with investments from third parties, having other companies use the safety clearances for voluntary or compensatory planting, which will make the project more attractive.

Revitalization of Safety Clearances (Revitalização de Faixas) Project

The project basically consists of revitalization of safety clearances, transforming them into parks or squares, with free access to the population for recreation and leisure. The project redevelops the area by planting small-sized vegetation (ornamental - landscaping) and installing urban furniture. Thus, an area that used to be degraded is now requalified as an asset of social interest. There are two areas whose revitalization was completed, one located in the East and another one in the South of Sao Paulo. The area considered in this study is in a neighborhood called Jardim Santa Maria, located between the streets named Cananga, Figueira da India, Capotiragua and Hamamelis, in the East of Sao Paulo municipality.

Environmental Economic Valuation: Recreation and Tourism

Environmental Economic Valuation

The recreation and tourism ecosystem service refers to the role of ecosystems as places where people can find opportunities for rest, relaxation and recreation (Devese 3.0).

For the environmental economic valuation, at first, it was considered to use as reference the area of about 75,340 ft² (7,000 m²) recently revitalized by the company and open to the population in the East side of the city of Sao Paulo. However, it was not possible to apply the travel cost method, since visitors work or live near enough so as not to incur travel expenses.

Comparing the price per square foot before and after the leisure area under the safety clearance was launched could be another possibility for valuation; however, this method was not used because it was not possible to determine and control other variables that might have influenced the real estate prices in the region. Moreover, the

Description: Revitalization of safety clearances, transforming them into parks or squares, with free access to the population for recreation and leisure.

Geographic Area: Jardim Santa Maria, Sao Paulo

Approach and Time Horizon: Prospective for a ten-year period

Ecosystem Services Assessed: Recreation and Tourism

area has been launched to the community recently, and its benefits have not been fully incorporated into the property prices yet.

Thus, it was assumed the economic benefit of revitalizing that area can be more clearly expressed in terms of the appraisal of real estate prices in the surroundings, which tends to be valued using revealed preference methods, such as hedonic pricing¹⁷. According to cases review in the United States, a 20% premium over the prices of properties next to parks is a proper preliminary estimate, and this premium quickly falls as distance increases, going down to 10% when 295 ft (90 m) away, and 5% when 650 ft (200 m) away.¹⁸

For the study, a conservative estimate was adopted, considering only the value for properties adjacent to the revitalized area. As it was not possible to collect a sample of

¹⁷ Brander and Koetze (2011); Gómez-Baggethun and Barton (2013); Bertram and Rehdanz (2015); Tempesta (2015)

¹⁸ Crompton (2015)

those property prices, it was used the average value per square meter in the neighborhood where the revitalized area is located, in January 2018, right before the area was open to the community (BRL 3,900.00/m²)¹⁹. This value was multiplied by the approximate total area of neighbor properties (101,180 ft² / 9,400 m²)²⁰. In order to avoid overestimation, the value of the footage of the neighbor properties was rounded down. Finally, that value was multiplied by 20%, according to appraisal estimates of properties adjacent to the revitalized area, found in specialized literature.

The final value estimated for economic gain for owners of properties located next to the revitalized area, a positive externality of revitalization projects in urban areas concerning the recreation and tourism ecosystem service, was approximately BRL 7.3 million, according to the formula below. It was also assumed that real estate properties take up to one year to be appraised after the revitalized area is open to the community.

$$\text{BRL } 3,900 / \text{m}^2 \times 9,400 \text{ m}^2 \times 20\% \\ = \text{BRL } 7,332,000.00$$

It is worth noting that the value obtained corresponds only to part of the economic value generated by the revitalized area. Other benefits, such as health, leisure and well-being, could not be assessed, since there was no data available.

Economic and Financial Assessment

Economic
and Financial
Assessment

COSTS AND BENEFITS CONSIDERED IN THE ASSESSMENT

COSTS

- C1. Upfront investment: Costs incurred in project deployment, such as illegal settlement removal and waste disposal.
- C2. Maintenance costs: Maintenance of the landscape design adopted (e.g. gardening)

All those costs represent expenses for the company (cash outflow).

BENEFITS

- B1. Positive externality concerning the recreation and tourism ecosystem service: Appraisal of neighboring real estate properties thanks to the landscape revitalization and use of the area for leisure and recreation activities, as calculated in the previous step.
- B2. Avoided costs – Area maintenance: Regular mowing. The area revitalization will replace the need to mow for weed control with landscape design maintenance.
- B3. Avoided costs – Illegal settlements: Settlements removal. Revitalized areas open for the community are expected to prevent illegal settlements and occupation.
- B4. Avoided costs – Fines: Improper maintenance of the easement area. Revitalization is expected to meet the requirements for easement areas of that nature.

No benefits represent cash inflow to the business. B1 benefits the society. B2, B3 and B4 benefit the business.

¹⁹ As found on: <https://www.agenteimovel.com.br/mercado-imobiliario/a-venda/jardim-santa-maria,sao-paulo,sp/>

²⁰ Estimated by high-resolution satellite imagery, using Google Earth

RESULTS OF THE ASSESSMENTS

Table 4 – Results of the Economic and Financial Feasibility Assessments for the Revitalization of Safety Clearances (Revitalização de Faixas) Project

| | WITH ENVIRONMENTAL VALUATION | | | WITHOUT ENVIRONMENTAL VALUATION |
|----------------------------------|------------------------------|------------------|------------------|---------------------------------|
| | CCR | RSDR | CCR and RSDR | CCR |
| ROI | 241.15% | 275.31% | 259.86% | -35.41% |
| Discounted Payback Period | > 1 year | > 1 year | > 1 year | > 10 years |
| CBA: B - C | BRL 6.05 million | BRL 7.09 million | BRL 6.52 million | -BRL 889 thousand |
| CBA: B / C | BRL 3.411 | BRL 3.753 | BRL 3.599 | BRL 0.646 |

If the environmental externality is not taken into account, the project will not be feasible from the economic or financial perspective. Now, taking the externality into account, the project proves to be financially and economically feasible, since its ROI outweighs the criteria for the opportunity cost of capital (return of 158.67% in case of CCR, and 87.71% in case of the SELIC interest rate for the same 10-year period).

The positive result is due almost entirely to the positive externality of adjacent property appraisal (benefit B1), which offers benefits within the first year and is not very penalized by the financial update at present value. The project would still be economically feasible if the appraisal of the area neighboring properties were only 13.5% (instead of 20%) based on the results obtained in CCR and RSDR schemes; or even if the cost per square meter in the region were 34% lower than the value assumed, according to the CCR scheme.

Other benefits associated with the area revitalization, such as the use for leisure and recreation activities, and the impacts of those activities on the community health, were not valued due to lack of data and, therefore, the value of the benefit concerning ecosystem services has been potentially underestimated.

In spite of good economic performance, the expenses related to the project exceed the revenue for the company, because Eletropaulo is responsible for paying all the expenses, but it does not benefit from the environmental externality. On the other hand, the Brazilian legislation for the energy sector allows Eletropaulo to recover at

least part of its upfront investment in projects like this by readjusting energy tariffs, making the project financially feasible to the company.

CONTRIBUTIONS TO THE PROJECT FUTURE ANALYSES

All the upfront investment of the project assessed will be received by the company incorporated into the energy tariffs in the coming years, since the project has been fully grouped, and is now part of the company Regulatory Remuneration Base (BRR). Thus, the project offers only benefits (economic, social and environmental benefits) in the long term. Its implementation in Rua Cananga, the street assessed in this study, is being monitored. A preliminary analysis suggests the area maintenance costs have been overestimated and may need to be revised in the future.

The project could be implemented in a more systemic way, if a mid-term plan was elaborated to manage those safety clearances.

Community Vegetable Gardens (Hortas Comunitárias) Project

It consists of using safety clearances to produce food to feed underprivileged communities in Sao Paulo municipality. The project aims at offering training on horticulture, and create opportunities of work and income generation for people considered in social vulnerability. However, access to the area is limited to farmers. Eletropaulo has run a diagnosis on the project potential, and it should be implemented in partnership with an NGO.

Description: Use safety clearances to produce food to feed underprivileged communities.

Geographic Area: Not determined yet

Approach and Time Horizon: Prospective for a ten-year period

Ecosystem Services Assessed: Food provision

Environmental Economic Valuation: Food Provisioning

Environmental Economic Valuation

Food provisioning ecosystem service refers to the role ecosystems play in producing and offering food (TEEB, 2012). The project, to be implemented and managed by a partner, is based on a study conducted on an intercropping system to grow banana, cassava and beans in community vegetable gardens, and shows estimates for production costs, quantities produced over time, and market prices for those agricultural commodities.

Valuation adopts the market price method: quantity produced multiplied by the sales price, subtracting the agricultural production costs. According to a report on urban farming published in 2017, commissioned by Eletropaulo, the annual cycles of intercropping yield the following average productivity: bananas produce 1,590 lb. (720 kg)/year, cassava produces 4,410 lb. (2,000 kg)/year, and beans produce 1,500 lb. (660 kg)/year. Average sales price assumed was BRL 3.50/kg for bananas, BRL 4.00/kg for cassava, and BRL 8.00/kg for beans. Finally, the agricultural production

cost was estimated as BRL 1,560.00 per year. The annual present value of that externality was estimated as: BRL 16,160.00 for an area equivalent to 10,763 ft² (1,000 m²), which results in a 7,534 ft² (700 m²) production area, used as reference for the economic and financial assessment.

$$(720 \text{ kg bananas/year} \times \text{BRL } 3.50) + (2,000 \text{ kg cassava/year} \times \text{BRL } 4.00) + (600 \text{ kg beans /year} \times \text{BRL } 12.00) - \text{BRL } 1,560.00 \text{ /year} = \text{BRL } 16,160.00$$

Economic and Financial Assessment

Economic and Financial Assessment

COSTS AND BENEFITS CONSIDERED IN THE ASSESSMENT

COSTS

C1. Upfront investment: Costs to prepare the area for agricultural production.

BENEFITS

- B1. Positive externality concerning the food provisioning ecosystem service: The food produced benefits the community involved in the project.
- B2. Avoided costs – Area maintenance: Regular mowing. Using the area for agricultural production will eliminate the need to mow to control weed.
- B3. Avoided costs – Illegal settlements: Settlements removal. Areas used by the community to produce food are expected to prevent illegal settlements and occupation.
- B4. Avoided costs – Fines: Improper maintenance of the easement area. Agricultural management is expected to meet the requirements for easement areas of that nature.

This cost represents expenses for the company. Partners will be responsible for agricultural production costs, which have already been discounted when estimating the value of externality related to food production.

None of the benefits represent cash inflow to the business. B1 benefits the society. B2, B3 and B4 benefit the business.

RESULTS OF THE ASSESSMENTS

Table 5 – Results of the Economic and Financial Feasibility Assessments for the Community Vegetable Gardens (Hortas Comunitárias) Project

| | WITH ENVIRONMENTAL VALUATION | | WITHOUT ENVIRONMENTAL VALUATION | |
|----------------------------------|------------------------------|------------------|---------------------------------|------------------|
| | CCR | RSDR | CCR and RSDR | CCR |
| ROI | 509.80% | 729.53% | 530.08% | 460.88% |
| Discounted Payback Period | 5 years | 5 years | 5 years | 5 years |
| CBA: B - C | BRL 1.25 million | BRL 1.83 million | BRL 1.30 million | BRL 1.13 million |
| CBA: B / C | BRL 6.10 | BRL 8.30 | BRL 6.30 | BRL 5.61 |

This project shows to be more financially and economically feasible than the other projects assessed, largely outweighing the criteria for the opportunity cost of capital invested (return of 158.67% in case of CCR, and 87.71% in case of the SELIC interest rate for the same 10-year period).

This result is essentially due to two factors: the high value of avoided costs that would be required to remove illegal settlements from those areas, and the low cost of upfront investment and maintenance of the area, since the costs of agricultural management have already been subtracted from the value of the positive externality.

Based on the results obtained in CCR and RSDR schemes, even if the avoided costs that would be required to remove illegal settlements dropped to half, or if the upfront investment doubled, the project would still be economically feasible. Based on the capital opportunity cost given by CCR, upfront investment would have to double and avoided costs with settlements would have to drop over 20% for the project to be considered economically unfeasible.

The potential impact of choosing the discount rate in the results can also be seen in the differences between the results obtained using CCR and RSDR schemes, noting the CCR rate is more than three times greater than the RSDR rate.

CONTRIBUTIONS TO THE PROJECT FUTURE ANALYSES

In addition to the model proposed in the study, the company already has many areas with vegetable gardens, made available in a leasing regime, in which the party interested in the area is granted the right to use it and has the obligation to take care of it, observing applicable technical limitations. It is suggested to map the areas to check whether the current vegetable gardens are in good condition and/or could be better explored.

Help in the Decision Making

Business Decision-Making

The assessments made in this study contributed to Eletropaulo's team to determine actions to be implemented.

- Enhance assessment of the projects, revising their assumptions and valuating ecosystem services that could not be valued in this study, such as the visual impact created by the Urban Orchard (Pomar Urbano) Project and the risk of mudslide in other areas where the revitalization project was developed. Also, the Community Vegetable Gardens (Hortas Comunitárias) Project could be developed in the form of agroforestry, whereas the Revitalization of Safety Clearances (Revitalização de Faixas) Project could combine planting of arboreal species along with the area landscape design, including the climate regulation service.
- Restructure internal and external communication of those projects, elaborating business cases to show the importance of incorporating social or environmental benefits into the project feasibility assessments, whether they represent an advantage to the business or to the society. As for the Green Lines (Linhas Verdes) Project, it will be possible to value the global climate regulation ecosystem service as one more aspect to be presented to potential partners.
- Map all the extension of the current transmission line in order to identify challenges, pressures and vocations in each area. Thus, it will be possible to propose a master plan for the long term, suggesting to each area one of the solutions presented in this study (except for the Urban Orchard (Pomar Urbano) project, because its institutional arrangement is hard to replicate). It is also possible to assess the feasibility of implementing hybrid versions of the projects, maximizing their gains.
- Consider implementing the Green Lines (Linhas Verdes), Revitalization of Safety Clearances (Revitalização de Faixas), and Community Vegetable Gardens (Hortas Comunitárias) projects by default in the safety clearances under the subtransmission lines, rather than the standard procedure of stabilizing the safety clearances by growing grass. In addition to preserving the safety clearance integrity and avoiding costs with future maintenance and potential fines or removal of illegal settlements, the projects also benefit the neighboring population and integrate the electrical grid into the urban landscape.
- Map the ecosystem services affected by the company (externalities) or that impact its operations, considering the perspective of the power product life cycle. The analysis will support the development of procedures, projects or actions to mitigate the impacts.

Reflections and Lessons Learned

As the projects were assessed based on areas of different sizes, care should be taken when comparing them. Moreover, as the projects have different purposes, it should be determined whether the project is fit to a given area.

The study showed that a challenge to conduct economic and financial assessments taking into account ecosystem services is the lack of data available to make assumptions and calculations. For the projects analyzed here, because of data limitation, which prevented the estimation of some environmental benefits, the total value of environmental benefits and the economic and financial performance of those projects are considered underestimated.

In this study, it was adopted the interpretation that avoided costs are not a compensation for generated environmental externalities, because the recipients of those externalities are not directly responsible for cost abatement (avoided costs), which are a consequence of the operation of the company itself or its partners.

The economic feasibility criteria adopted in this study – namely, the returns expected from CCR and SELIC interest rates in a 10-year period – may not be fair if interpreted as goals to be met, because the areas allocated to those projects may be subject to a number of use restrictions that limit the generation of economic value, and other benefits may have not been monetized.

Other benefits generated by those projects, such as the development of social capital²¹ for the Community Vegetable Gardens (Hortas Comunitárias) Project, were not included in the analyses because they have not been monetized, which reinforces that the total benefits provided by the projects were underestimated. In the future, the valuation

of social capital can benefit from approaches that have been developed for natural capital.

Overall, incorporating the benefits provided by ecosystem services into the project economic and financial feasibility assessments allows for **more thorough assessments**. In all cases analyzed, incorporating those benefits **significantly increased the project performance**, and, for the Revitalization of Safety Clearances (Revitalização de Faixas) project, it was decisive for its economic and financial feasibility. Adding the ecosystem service approach also enabled to i) assess how a business action generates economic, social and environmental value; ii) support a more thoughtful **planning** of safety clearances under the transmission lines; and iii) find justification to show partners, funders and other departments in the company to advocate project implementation.

It was clear that the project analysis must **consider future flows** (in the mid term) of costs and benefits, so as to broadly take into account future environmental impacts, both positive and negative.

It is worth noting that financial analyses support **business decision-making**, but cannot incorporate all relevant information in the context of the project. Thus, the business decision-making process can and should adopt other criteria, including qualitative criteria.

²¹ Relationships, shared values and institutions created by the society (WBCSD, 2017)



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Annex: Materiality Matrices

Urban Orchard (Pomar Urbano) Project

| | RECREATION AND TOURISM | SOIL EROSION REGULATION | FLOW REGULATION | POLLINATION REGULATION |
|--------------------------------------|---|--|--|---|
| EXTERNALITIES | | | | |
| Materiality | High Materiality | Medium Materiality | Low Materiality | Low Materiality |
| Situation | Positive Externality | Positive Externality | Positive Externality | Positive Externality |
| Description | Improves the landscape visual aspect, making it more attractive for pedestrians and bicyclists. | Vegetation in the area prevents washout, contributing to a better visual quality of the river (less muddy on rainy days) and the Urban Orchard project landscape. | A larger permeable area decreases surface runoff, reducing flood intensity. Also, vegetation next to the river contributes to maintain the 'normal' flow of the river. | Pollination ensures maintenance of / perennial local vegetation. The attraction of fauna (insectivorous pollinators) provides for pollination in areas other than the one assigned to the project. Maintenance of / perennial local vegetation supports gains identified in recreation / tourism, contributing to the social license to operate. |
| Type | Reputational | Reputational | Reputational | Reputational |
| DEPENDENCY / INTERNAL IMPACTS | | | | |
| Materiality | Not Applicable | Low Materiality | Not Applicable | Not Applicable |
| Situation | | Positive Impact | | |
| Description | | Avoiding erosion ensures preservation of the distribution infrastructure. However, the problem of soil erosion could be solved in a cheaper way than adopting the Urban Orchard project. There is financial reduction due to the avoided costs of mowing the grass in the safety clearances. | | |
| Type | | Operational, financial | | |

Green Lines (Linhas Verdes) Project

| | WATER PROVISION | FLOW REGULATION | SOIL EROSION REGULATION | CLIMATE REGULATION | POLLINATION REGULATION |
|--------------------------------------|---|---|--|--|--|
| EXTERNALITIES | | | | | |
| Materiality | Low Materiality | Medium Materiality | Not Applicable | Medium Materiality | Low Materiality |
| Situation | Positive Externality | Positive Externality | | Positive Externality | Positive Externality |
| Description | Planting trees significantly improves the permeability of the soil in the area, allowing to refill the water table. | A larger permeable area decreases surface runoff, reducing flood intensity. | As there is no population living in the area, erosion regulation is not an externality to anyone. | In the local context, planting trees in the region positively influences the local microclimate, contributing to the population well-being. In the global context, the Project fosters carbon sequestration, minimizing the intensity of climate change effects. | Pollination ensures maintenance of / perennial local vegetation. The attraction of fauna (insectivorous pollinators) provides for pollination in areas other than the one assigned to the project. Maintenance of / perennial local vegetation supports gains identified, contributing to the social license to operate. |
| Type | Reputational | Reputational | | Reputational | Reputational |
| DEPENDENCY / INTERNAL IMPACTS | | | | | |
| Materiality | Not Applicable | Not Applicable | Medium Materiality | Low Materiality | Not Applicable |
| Situation | | | Positive Impact | Positive Impact | |
| Description | | | Avoiding erosion ensures preservation of the distribution infrastructure. However, the problem of soil erosion could be solved in a cheaper way than adopting the Green Lines project. There is financial reduction due to the avoided costs of mowing the grass in the safety clearances. | Carbon sequestration reduces the intensity of climate change, which has a negative impact on the business operations. | |
| Type | | | Operational, financial | Operational, financial | |

Revitalization of Safety Clearances (Revitalização de Faixas) Project

| | RECREATION AND TOURISM | SOIL EROSION REGULATION | POLLINATION REGULATION |
|--------------------------------------|--|--|--|
| EXTERNALITIES | | | |
| Materiality | High Materiality | High Materiality | Low Materiality |
| Situation | Positive Externality | Positive Externality | Positive Externality |
| Description | When the company revitalizes the area, it has a positive impact on the neighboring population (improvement in the landscape, safety, well-being and health) and consequently improves the business image, contributing to the social license to operate. | Erosion can cause soil movements, impacting the safety of the neighboring population. Avoiding erosion ensures the population safety and preservation of the distribution infrastructure, ensuring power supply (a critical service). | Pollination ensures maintenance of / perennial local vegetation. The attraction of fauna (insectivorous pollinators) provides for pollination in areas other than the one assigned to the project. Maintenance of / perennial local vegetation supports gains identified, contributing to the social license to operate. |
| Type | Reputational | Reputational, safety | Reputational |
| DEPENDENCY / INTERNAL IMPACTS | | | |
| Materiality | Not Applicable | Medium Materiality | Not Applicable |
| Situation | | Positive Impact | |
| Description | | Avoiding erosion ensures preservation of the distribution infrastructure. However, the problem of soil erosion could be solved in a cheaper way than adopting the Revitalization of Safety Clearances project. Should an accident occur, the company could be legally suited for not having properly managed the area (risk reduction, opportunity). | |
| Type | | Operational, legal/regulatory, financial | |

Community Vegetable Gardens (Hortas Comunitárias) Project

| | GENERAL PROVISION | CLIMATE REGULATION |
|--------------------------------------|--|--|
| EXTERNALITIES | | |
| Materiality | High Materiality | Low Materiality |
| Situation | Positive Externality | Positive Externality |
| Description | Vegetable gardens can provide food and other species used for cooking. | In the local context, planting trees in the region positively influences the local microclimate, contributing to the population well-being. In the global context, the Project fosters carbon sequestration, minimizing the intensity of climate change effects. |
| Type | Financial | Reputational |
| DEPENDENCY / INTERNAL IMPACTS | | |
| Materiality | Not Applicable | Low Materiality |
| Situation | | Positive Impact |
| Description | | Carbon sequestration reduces the intensity of climate change, which has a negative impact on the business operations. |
| Type | | Operational, financial |

An initiative of:



SÃO PAULO SCHOOL OF
BUSINESS ADMINISTRATION
*Center for Sustainability
Studies*

Avenida 9 de Julho, 2029 - 11º andar
São Paulo/SP - Brasil

www.fgv.br/ces



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