

Corporate environmental performance and the use of financial institution credit in the low carbon economy context

Desempenho ambiental corporativo e o uso de crédito de instituição financeira no contexto da economia de baixo carbono

Desempeño ambiental corporativo y uso de crédito de instituciones financieras em el contexto de la economía baja em carbono

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Abstract: *As intermediaries of resources between different economic agents, financial institutions play an important role in directing capital to projects and activities that contribute to corporate sustainability. Banks have a high power of induction, that is, they can encourage good practices both in their own internal environment, as a company, and externally, as a financing agent, promoting improvements in the environmental performance of their customers, with a positive impact on society. In this context, the objective of this work is to propose a set of good practices for the use of credit from a financial institution by companies in the city of Maringá, northwest region of the State of Paraná, in the context of the low carbon economy. The research methodology is based on a case study about a relevant financial institution in the economic development of agribusiness, commerce, and industry in the municipality. The research focused on business clients of a financial institution. The main results were the proposition of business strategies for the financial institution, such as the elaboration of a corporate sustainability questionnaire to extract information from customers and the establishment of criteria to rank customers according to socio-environmental responsibility practices.*

Keywords: *Corporate sustainability. Financial system. Local development.*

Resumo: Como intermediadores de recursos entre os diferentes agentes econômicos, as instituições financeiras têm um papel importante no direcionamento de capital para projetos e atividades que contribuam para a sustentabilidade

empresarial. Os bancos têm alto poder de indução, ou seja, apresentam capacidade para estimular boas práticas tanto em seu próprio ambiente interno, como empresa, quanto externo, como agente financiador, promovendo melhorias no desempenho ambiental de seus clientes, com impacto positivo em toda a sociedade. Nesse contexto, o objetivo deste trabalho é propor um conjunto de boas práticas para o uso de crédito de instituição financeira por empresas da cidade de Maringá, região noroeste do Estado do Paraná, no contexto da economia de baixo carbono. A metodologia de pesquisa se apoia em um estudo de caso sobre uma instituição financeira relevante no desenvolvimento econômico do agronegócio, comércio e indústria do município. A pesquisa teve como recorte clientes empresariais de uma instituição financeira. Os principais resultados foram proposição de estratégias negociais para a instituição financeira, como a elaboração de questionário de sustentabilidade empresarial para extração de informações dos clientes e o estabelecimento de critérios para ranquear os clientes conforme práticas de responsabilidade socioambiental.

Palavras-chave: Sustentabilidade corporativa. Sistema financeiro. Desenvolvimento local.

***Resumen:** Como intermediarias de recursos entre diferentes agentes económicos, las instituciones financieras desempeñan un papel importante a la hora de dirigir capital a proyectos y actividades que contribuyen a la sostenibilidad empresarial. Los bancos tienen un alto poder inductivo, es decir, tienen la capacidad de fomentar buenas prácticas tanto en su propio entorno interno, como empresa, como en el externo, como agente financiero, promoviendo mejoras en el desempeño ambiental de sus clientes, con un impacto positivo. sobre la sociedad en su conjunto. En este contexto, el objetivo de este trabajo es proponer un conjunto de buenas prácticas para el uso del crédito de una institución financiera por parte de empresas de la ciudad de Maringá, región noroeste del Estado de Paraná, en el contexto de la economía baja en carbono. La metodología de la investigación se basa en un estudio de caso sobre una institución financiera relevante para el desarrollo económico de la agroindustria, el comercio y la industria en el municipio. La investigación se centró en clientes empresariales de una institución financiera. Los principales resultados fueron la propuesta de estrategias de negocio para la institución financiera, como el desarrollo de un cuestionario de sostenibilidad empresarial para extraer información de los clientes y el establecimiento de criterios para clasificar a los clientes según prácticas de responsabilidad socioambiental.*

***Palabras Clave:** Sostenibilidad corporativa. Sistema financiero. Desarrollo local.*

Introduction

The financial system (FS) is an important instrument for promoting economic development, so that banks are not limited to merely acting as financial intermediaries (Melo et al., 2018). Institutions that make up the FS also contribute during periods of economic expansion (for example, investment in the recovery or expansion of infrastructure, renewal of equipment, opening of new consumer markets, etc.), or in the face of humanitarian crises (for example, addressing urgent needs in security, health, food, etc.) (Suchodolski et al., 2021). The FS connects with today's challenges by using its capacity to mobilize resources for building a new future based on more sustainable and inclusive foundations (Schneider & Macedo, 2020), especially in the economies of emerging countries, by performing the role of intermediary between suppliers and demanders of financial resources (Levine, 2005).

Financial Institutions (FIs), in turn, have the capacity to encourage best practices, promoting improvements in the social and environmental performance of their clients (Sarai & Kokke, 2021). New patterns of production and consumption — which are based on the more efficient use of natural resources and aim for greater social inclusion and well-being — represent business opportunities for the financial sector (Melo et al., 2018). By prioritizing sustainable development in their activities, FIs generate shared value; that is, in addition to economic value, they also create value for society by addressing its needs and challenges (Lima & Ribeiro, 2021; FEBRABAN, 2022). Alignment with

ESG factors creates opportunities for FIs to develop new products and services, such as financial feasibility consulting for green projects — for example, renewable energy generation projects for clients who have not yet implemented such practices in their business models (Hellvig, 2021; Levine, 2005). Additionally, there are business opportunities in offering insurance policies with differentiated pricing as an incentive for companies that, for instance, monitor their energy usage through specific energy performance indicators (Azmi et al., 2021; Lima & Ribeiro, 2021).

Therefore, the financial system (FS) contributes to promoting more resource-efficient productive activities and to the conservation of biodiversity, forests, water resources, and the climate, as well as to achieving the Sustainable Development Goals (SDGs) outlined in the 2030 Agenda (Schneider & Macedo, 2020).

In this context, the objective of this study is to propose a set of best practices for the use of financial institution credit by companies in the city of Maringá, located in the northwest region of the state of Paraná, within the framework of a low-carbon economy.

As a contribution of this research, it is expected that the recommended best practices will provide tools for the FS to guide the activities of its users (clients), particularly in the corporate sector, toward a low-carbon economic model.

Theoretical Framework of the Research

A low-carbon economy can be defined as an economic model focused on the reduction of greenhouse gas (GHG) emissions, including, among other actions, the implementation of GHG mitigation policies (UK Energy White Paper, 2003). This term first appeared in a 2003 report by the United Kingdom's Department for Transport and the Environment, titled *"Our Energy Future – Creating a Low Carbon Economy."*

Since 2005, within the scope of climate change policies and in pursuit of a low-carbon economy, the debate around plans and proposals for GHG mitigation has intensified (Godoy & Saes, 2015). However, private sector investments in “low carbon” technologies require incentives to make such options attractive (Magalhães, 2013). If a low-carbon technology is more expensive than conventional alternatives or requires higher investment, productive sectors are unlikely to adopt it—even when guided by principles of “sustainability” or “social responsibility” (Schneider & Macedo, 2020). In this context, market mechanisms can be a viable option, as they encourage investment in cleaner technologies, reduce costs, and support a low-carbon economy model that is both economically efficient and environmentally sustainable (Magalhães & Domingues, 2016).

The uncertainty surrounding climate-related financial risks—stemming from political and regulatory changes, technological innovation, transformations in the real economy, and a highly interconnected global financial system—amplifies and propagates risks, with the potential to affect all economic sectors. In this context, the financial system must adapt to this new reality, and financial supervisors can guide market participants toward a managed green transition, ensuring a scenario that minimizes future damage to both the financial system and the broader economy (Crocco & Feil, 2019).

Over the past decades, Brazilian financial institutions (FIs) have adopted a set of practices aimed at incorporating sustainability elements into their operations, making Brazil a distinctive case among developing countries. These institutions have implemented environmental improvement programs and projects related to their operations, promoted environmental education in communities,

and increased the participation of staff specialized in environmental risks and opportunities.

FIs consider sustainability aspects when granting credit and promote training on socio-environmental topics related to business management. They have also developed new environmental credit lines to finance reforestation, the development of agroforestry systems, and investments in renewable energy (Lima & Ribeiro, 2021; Schneider & Macedo, 2020). There are also programs aimed at the decontamination of river basins, environmental compensation, the establishment and maintenance of conservation units, the use of biodiesel, and the promotion of organic production (FEBRABAN, 2022).

As agents of the financial system, financial institutions (FIs) seek to direct the allocation of resources and support the transition toward a high-impact economy—that is, a green, low-carbon, and inclusive economic model, with sound risk management and innovative fundraising solutions. As potential drivers of the economy, these institutions play a key role in expanding businesses that are more aligned with the opportunities of the low-carbon economy. Furthermore, financial institutions are well-positioned to identify sustainable value chains that can foster the green economy, particularly in order to meet Brazil's emissions reduction commitments made at the Paris Conference (Sarai & Kokke, 2021). Some regulations established by the Central Bank of Brazil (BCB) and the National Monetary Council (CMN) for the management of social, climate, and environmental risks by financial institutions include: BCB Resolution 139/2021, BCB Normative Instruction 153/2021, BCB Resolution 140/2021, CMN Resolution 4945/2021, CMN Resolution 4944/2021, and CMN Resolution 4943/2021.

In this scenario, the main challenges include promoting national economic growth on sustainable foundations that incorporate production chains with lower social and environmental risks and higher returns, generating business opportunities in areas such as reforestation, urban infrastructure, mobility, decentralized energy generation, energy efficiency, and sustainable supply chains in agricultural and livestock activities (Semieniuk et al., 2021; Suchodolski et al., 2021; Banco do Brasil, 2023).

Methodological Elements of the Research

This is an applied and exploratory study, using both primary and secondary data to assess the environmental performance of a sample of 27 case study companies that are clients of a large Brazilian financial institution located in the municipality of Maringá—a city that plays a significant role in the economic development of agribusiness, commerce, and industry in the northwest region of the state of Paraná. The research focused on companies classified by the financial institution as Corporate (annual revenue above R\$ 800 million), Upper Middle (annual revenue between R\$ 200 million and R\$ 800 million), and Middle (annual revenue between R\$ 30 million and R\$ 200 million), based on their gross annual revenue (GAR), as these segments account for the vast majority of the loans granted by the institution.

The study involved two stages of data collection regarding the companies, namely: (i) consultation of the financial institution's internal records (with its consent) to extract registration and contractual information; and (ii) interviews with managers of the analyzed companies. A total of 27 client companies participated in the research (61.4% of the companies classified as Corporate, Upper Middle, and Middle), representing the institution's largest loan recipients in the municipality

of Maringá.

The data from the financial institution's internal records about the companies included: length of operation; client tenure; classification by annual revenue; approved credit limit; risk rating; description of the National Classification of Economic Activities (CNAE); sector of activity; contribution margin; annual revenue; number of creditor financial institutions; total indebtedness in the national financial system; total indebtedness with the financial institution; percentage of credit taken from the financial institution; use of agribusiness credit lines; use of foreign trade credit lines; use of working capital credit lines; use of receivables advance credit lines (operations carried out by acquirers or sub-acquirers, characterized by the settlement of receivables within a period shorter than the maximum allowed by the payment arrangement); number of employees; exporting company; and importing company.

To survey the environmental sustainability practices carried out by the companies in the sample, the 2022 Corporate Sustainability Index (ISE) questionnaire from the Brazilian stock exchange (B3) was used. The purpose of this index is to indicate the performance of assets of companies with recognized commitment to sustainability, supporting investors in decision-making and encouraging companies to adopt better sustainability practices that contribute to the long-term viability of their businesses. In addition to being a strong benchmark for socio-environmental investments in Brazil, the ISE B3 stands out for its historical performance, consistently outperforming other indices presented by B3 (ISE B3, 2023).

The 2022 ISE questionnaire covers five dimensions: (i) human capital; (ii) social capital, corporate governance, and senior management; (iii) business models and innovation; and (iv) environment (ISE B3, 2023). To achieve the research objective, a questionnaire was developed with 12 of the most relevant questions from the "environment" dimension of the 2022 ISE, and the questionnaire used in the research was validated by two managers from the financial institution.

The correlation between quantitative variables (internal data from the financial institution) was also assessed, beginning with the Shapiro-Wilk test to verify whether the sample data distribution followed normality—that is, a p-value greater than 0.05. The multivariate Shapiro-Wilk normality test indicated a deviation from normality (non-normal) with significance below 0.05 ($p < 0.05$). However, since correlations are calculated pairwise, this test is not the most appropriate; rather, the Shapiro-Wilk test for bivariate normality should be used. Therefore, the test was performed to verify if there is pairwise normality among the variables.

According to Rumsey (2016), the value of the correlation coefficient ranges between +1 and -1, and its interpretation should consider the condition that most closely matches one of the following alternatives:

- Exactly -1 = Perfect negative linear relationship
- < -0.70 = Strong negative linear relationship
- < -0.50 = Moderate negative linear relationship
- < -0.30 = Weak negative linear relationship
- 0 = No linear relationship
- $+0.30$ = Weak positive linear relationship
- $+0.50$ = Moderate positive linear relationship
- $+0.70$ = Strong positive linear relationship
- Exactly +1 = Perfect positive linear relationship

Presentation and Discussion of Results

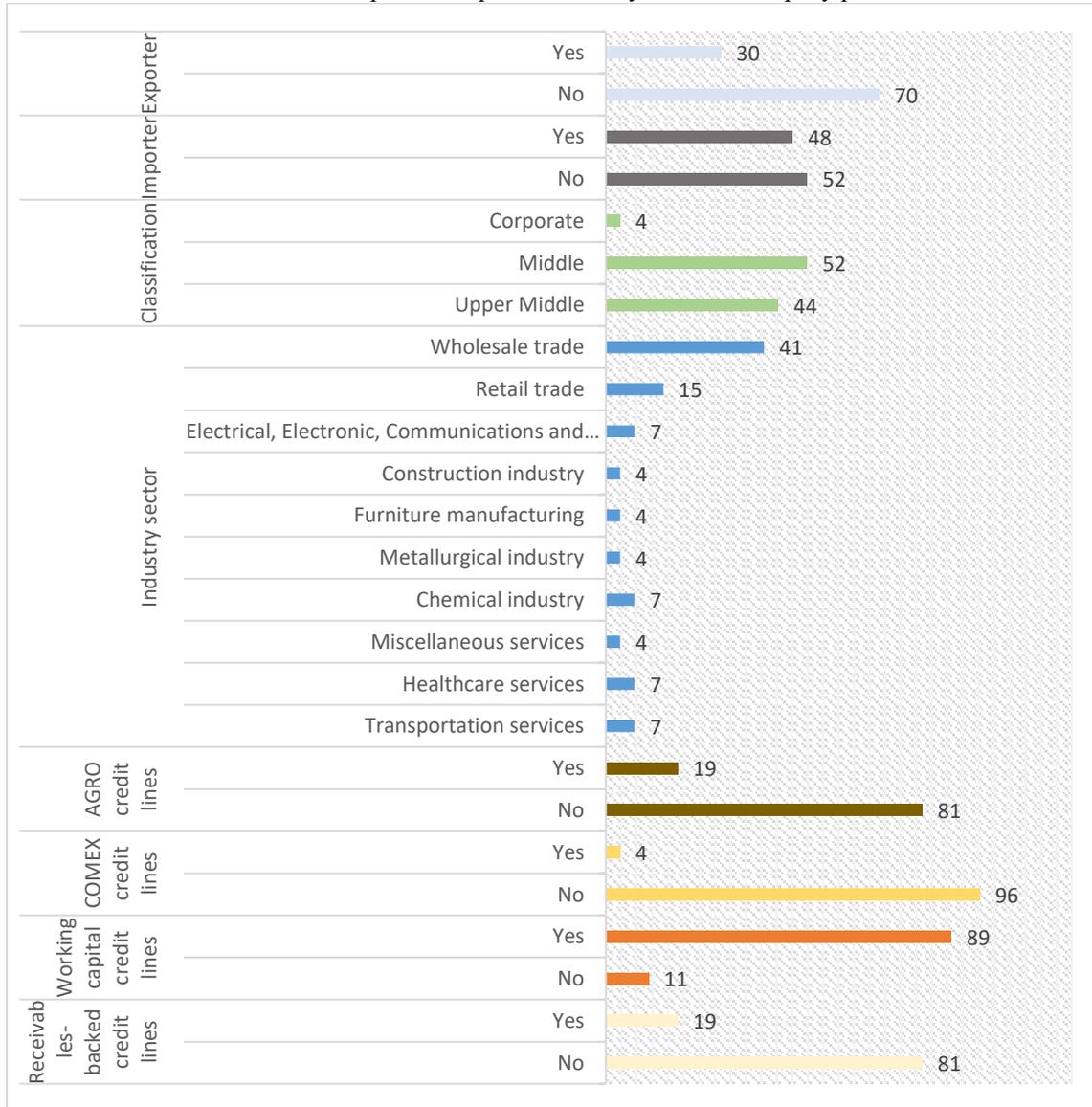
1 Characterization of the Company Profile and Analysis of the Economic Dimension

Picture 1 shows the relative frequency (%) of the financial institution's records for the variables: commercial practice (exporter, importer); revenue classification (Corporate, Middle, Upper Middle); sector of activity; and credit line (agribusiness, foreign trade, working capital, and receivables advance).

According to Figure 1, only 29.6% of the companies in the sample export products or services, while 48.1% import products or services. The majority are classified in the Middle segment (51.9%), meaning they have annual revenues between R\$ 30 million and R\$ 200 million, and a small portion fall into the corporate category (3.7%), with annual revenues exceeding R\$ 800 million. The most prominent sectors among the companies in the sample were commerce (55%) and industry (26%). The credit history showed that working capital (88.9%), agribusiness, and receivables advance (both at 18.5%) were the most used credit lines.

Almost 90% of the analyzed companies use working capital credit lines, which are credit solutions aimed at meeting the company's cash flow needs. Credit can be used, for example, to purchase inventory, pay suppliers, and seize business opportunities. It was also noted that the use of foreign trade credit lines is low (3.7% of companies), even though 50% of respondents reported conducting commercial transactions with other countries.

Picture 1 - Descriptive and qualitative analysis of the company profiles



Source: Prepared by the authors (2023), based on the analyzed data

2 Analysis of Quantitative Variables: Economic Dimension

Table 1 presents the results of the descriptive analysis of the following quantitative variables: length of operation; client tenure with the financial institution (FI); approved credit limit; contribution margin; annual revenue; number of creditor financial institutions; total indebtedness in the national financial system; total indebtedness with the FI; percentage of credit taken from the FI; and number of employees.

Table 1 – Descriptive statistics of quantitated variables

Variable	Average	Minimum value	Maximum value
Approved limit (R\$ thousands)	11707	0	32000
Customer tenure (years)	24.4	9	48
Indebtedness at the FI (%)	17.7	0	100
Contribution margin (R\$ thousands)	25.4	0.4	186
Annual revenue (R\$ thousands)	239889	42000	993000
Indebtedness in the NFS (R\$ thousands)	21878	0	95200
Indebtedness at the FI (R\$ thousands)	3785	0	26300
Time in operation (years)	29.7	10	69
Number of employees	335	13	1530
Number of FIs	6.8	2	15

Source: Prepared by the authors (2023).

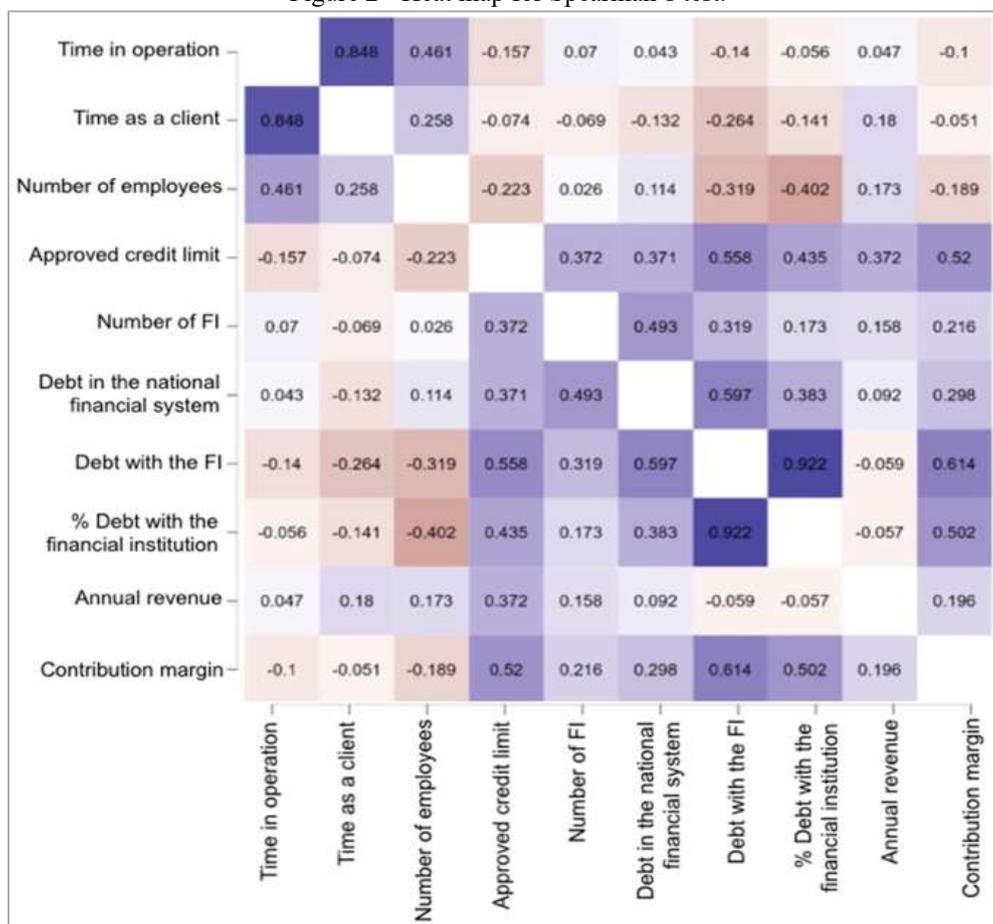
Table 1 shows a significant difference between the minimum and maximum values, indicating that the companies in the study have quite distinct commercial characteristics, especially regarding annual revenue, with the sample including companies with annual revenues ranging from R\$ 42 million to R\$ 993 million; indebtedness in the national financial system, as some companies have no debts contracted with banks; and number of employees, with some companies having as few as 13 employees while others have more than 1,500 employees. This sample scenario is positive for the research, allowing the analysis of company profiles with different characteristics in terms of size, market consolidation through length of operation, capital structure through indebtedness, and so forth.

The correlation between quantitative variables was assessed, starting with the Shapiro-Wilk test to verify whether the sample data distribution followed normality—that is, a p-value greater than 0.05. The multivariate Shapiro-Wilk normality test indicated a deviation from normality (non-normal) with significance below 0.05 ($p < 0.05$). However, since correlations are calculated pairwise, this test is not the most appropriate; rather, the Shapiro-Wilk test for bivariate normality should be used. Therefore, the test was performed to verify whether there is pairwise normality among the variables.

The results of the second test revealed only one normal association, between the variables “Approved Limit (R\$ millions)” and “Number of Financial Institutions” ($\rho = 0.529$), while the remaining correlations showed a p-value below 0.05 and were therefore classified as non-normal. Given these results, Pearson’s correlation was applied to the variables with normal distribution, and Spearman’s correlation was used for the non-normal distributions.

Figure 2 shows the heatmap for the correlation results using Spearman’s test ($\rho < 0.05$). The heatmap represents the intensity of pairwise correlations using colors. Darker shades indicate stronger correlations, while lighter shades indicate weaker correlations – that is, the stronger the relationship between the variables, the darker the association is represented on the heatmap. The correlation test resulted in an individual coefficient, which indicates the strength of the relationship between two variables.

Figure 2 - Heat map for Spearman's test.



Source: Prepared by the authors (2023).

Based on the framework proposed by Rumsey (2016), 45 correlations were found among the quantitative variables, as follows: 2 above 0.7 (strong); 5 between 0.50 and 0.70 (moderate); 10 between 0.30 and 0.49 (weak); and 28 above 0 and below 0.29 (indicating no correlation).

Table 2 – Correlations between the quantitative of the study

Variable	Spearman correlation	
Indebtedness at the FI	% Indebtedness at the FI	0.922
Time in operation	Customer tenure (years)	0.848
Indebtedness at the FI	Contribution margin	0.614
Indebtedness in the NFS	Indebtedness at the FI	0.597
Indebtedness at the FI	Approved limit	0.558
Contribution margin	Approved limit	0.52
% Indebtedness at the FI	Contribution margin	0.502

Source: Prepared by the authors (2023).

As shown in Table 2, the highest correlation occurred between the variables “Indebtedness with the FI” (in R\$) and “% Indebtedness with the FI” (in relation to the total number of Financial Institutions), with a correlation coefficient of 0.922. This indicates that companies with higher

indebtedness amounts at the analyzed financial institution also tend to have a higher percentage of their total indebtedness concentrated with that institution. In other words, this correlation suggests a greater concentration of loans with the analyzed FI among companies with larger volumes of financial obligations to the FI. In this context, it can be observed that the analyzed financial institution holds a larger market share (a market indicator representing a company's participation quota) among companies with greater credit exposure.

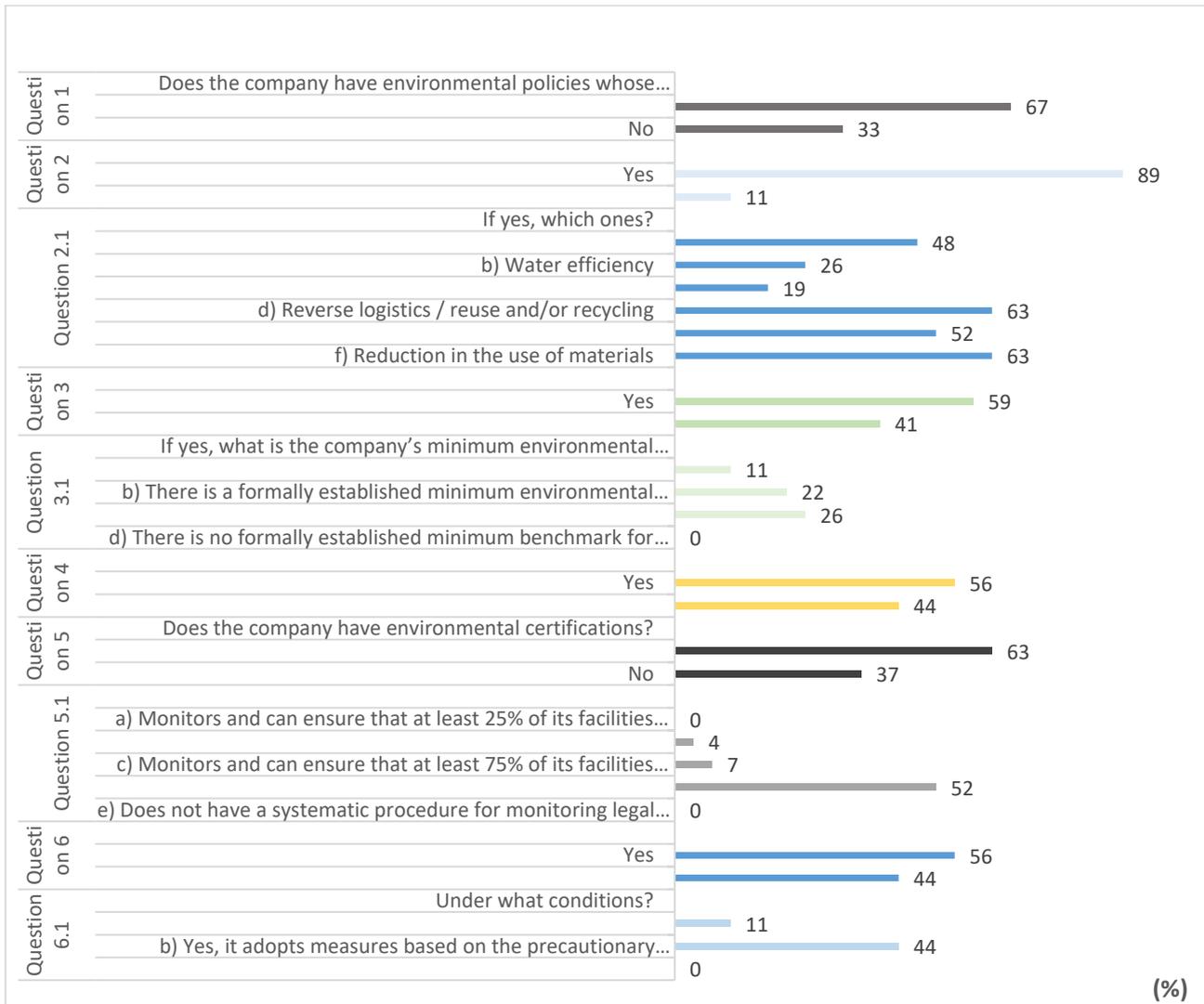
The second correlation in Table 2, with a coefficient of 0.848, indicates a strong association between the length of operation of the companies and the duration these companies have been clients of the financial institution, demonstrating the strong presence the FI has in serving and providing financial solutions to companies from the beginning of their activities.

In this regard, it is observed that the companies in the study have characteristics such as indebtedness of up to R\$ 20 million in the National Financial System and up to R\$ 5 million with the analyzed financial institution, resulting in the highest frequency of companies falling within the 0 to 20% market share range (% indebtedness with the FI) at up to 20% participation. It is also noted that there is a higher concentration of companies with an approved credit limit of up to R\$ 10 million, and these companies contribute approximately R\$ 50,000 monthly to the financial institution's economic results. Regarding the length of operation, the highest frequencies are observed in the classes between 15 and 25 years, indicating that the FI has well-established corporate clients in its field of activity. Finally, the presence of outliers in the sample is highlighted, such as a company with approximately 70 years since its founding and another with a margin of nearly R\$ 200,000 per month contributing to the financial institution's results.

3 Analysis of the questionnaire responses: environmental dimension

Figure 3 summarizes the responses given by the managers of the 27 analyzed companies regarding questions 1 to 6 of the questionnaire. Regarding the first question, it was found that approximately 67% of the companies have environmental policies, with guidelines incorporated into their planning and management processes. The second question refers to eco-efficiency practices. In this regard, 89% of the companies stated that they carry out some activity involving eco-efficiency. Among the practices mentioned, the most notable are reverse logistics, reuse or recycling, and reduction in material consumption (question 2.1), cited by about 67% of the respondents.

Figure 3 - Managers' responses to questions 1 to 6.1 of the applied questionnaire



Source: Prepared by the authors (2023).

Regarding environmental performance (question 3), most respondents reported conducting internal assessments, with approximately 26% of the companies having a formally established minimum environmental performance reference, aimed at legal compliance, mitigation of significant risks to the environment and human health, and sustainable use of environmental services and natural resources. Concerning environmental certification and the need for environmental licenses (questions 4, 5, and 5.1), most of the companies in the study stated that they possess some type of environmental certification, environmental license to operate their business, and monitoring of their activities to ensure that their facilities and processes comply with environmental licensing requirements.

Questions 6 and 6.1 of the questionnaire inquired about specific procedures for managing environmental aspects that are not included in current legislation. In this regard, more than half of the companies stated that they voluntarily adopt environmental management procedures (there is no legal

requirement), with the main measures based on the precautionary principle aimed at reducing potential risks.

Figure 4 presents the responses from the managers of the 27 interviewed companies to questions 7 to 12 of the questionnaire.

Figure 4 - Results of questions 7 to 12 of the applied questionnaire



Source: Prepared by the authors (2023).

Question 7 addresses the company's objectives in energy management (use, consumption, and efficiency). It was found that only 7% of respondents reported not having the goal to manage the energy consumed in their operations, while nearly half of the companies analyzed revealed that cost reduction is the main motivation for energy management.

Questions 8, 9, and 10 ask managers about how the company manages energy, water, and liquid effluents generated at their facilities. In this regard, only 4% of the companies reported adopting a systematic approach to energy management (question 8), including a specific policy, definition of roles and responsibilities, risk and opportunity assessment, objectives and targets, performance indicators, energy review, and internal audit. Approximately 40% of them carry out monitoring with specific energy performance indicators.

Regarding water use management (question 9), none of the companies reported having a structured program for efficient water consumption that covers all relevant units and processes within

the company. Additionally, nearly 20% of them do not monitor water management in their operations at all. It is also noteworthy that 33.4% of the companies interviewed do not use water in their production processes.

Regarding effluent management (question 10), most companies reported not carrying out this practice, stating that they do not generate liquid waste in their production process. Additionally, 33.4% adopt some operational control procedures to ensure their performance complies with licenses, permits, and authorizations, when applicable.

Question 11 concerns the Solid Waste Management Plan (PGRS). In this regard, it was found that most companies (85.2%) fully comply with this requirement or are in the process of regularization (3.7%), as it is a legal obligation to have the PGRS implemented in all production units subject to this regulation.

Finally, the last question of the questionnaire addresses the use of an inventory for managing greenhouse gas (GHG) emissions. The inventory is a tool aimed at increasing the company's transparency and control over its impacts on climate change, through the accounting and disclosure of GHG emissions resulting from its operations. It should be used as a basis for a company's carbon management, upon which actions related to emission reduction opportunities and process improvements will be supported (Naseer et al., 2023; B3 Stock Exchange, 2022). Despite the importance of GHG emissions management in controlling environmental impacts from operational activities, only 15% of the companies interviewed reported conducting a GHG emissions inventory.

4 Correlation analysis of the questionnaire results: environmental dimension

Table 3 presents the results of the most significant correlations (i.e., strong and moderate) between the variables derived from the questionnaire responses.

Table 3 – Strong and médium correlations between questionnaire variables

Variable		Spearman correlation	<i>p</i>
Question 2	Question 7 (b)	0.742 (negative)	< 0.001
Question 1	Question 2.1 (e)	0.734	< 0.001
Question 2.1 (e)	Question 6	0.63	< 0.001
Question 2.1 (b)	Question 2.1 (c)	0.588	0.001
Question 2.1 (e)	Question 3	0.559	0.002
Question 6	Question 2.1 (b)	0.529	0.005
Question 3	Question 11 (b)	0.503	0.007

Source: Prepared by the authors (2023).

It was found that the strongest correlation is negative (-0.742) and occurred between the variables “eco-efficiency practices” and “energy management aimed at ensuring energy supply and risk management.” This correlation indicates that companies reporting no eco-efficiency practices do manage their energy use with the objective of guaranteeing energy supply and managing the risks involved in energy consumption.

Similarly, the correlation analysis showed that companies with a well-structured environmental policy, whose guidelines are embedded in their planning and management processes, are the ones that invest the most in eco-efficiency practices (correlation of 0.734). Energy efficiency itself fosters cost and risk reduction while simultaneously reducing pressure on natural resources and

ecosystems (Badunenko et al., 2021; Semieniuk et al., 2021; Melo et al., 2018). In this sense, for example, an organization that replaced its fleet of combustion engine vehicles with electric vehicles aligns itself more closely with a low-carbon economy and is environmentally more sustainable, as this action mitigates greenhouse gas emissions and global warming.

The results also showed that companies that implement actions to reduce the environmental impacts of their activities conduct environmental performance assessments (correlation 0.559); adopt specific procedures for managing environmental aspects not required by current legislation (correlation 0.630); and are legally required to have a Solid Waste Management Plan (correlation 0.503).

The establishment of formal commitments by the company regarding environmental aspects is essential for effective environmental management. It is expected that a specific environmental policy, or one that encompasses and integrates various management topics (for example, occupational health and safety, environment, and quality), includes a commitment to the continuous improvement of environmental performance, compliance with applicable legislation and standards, and a preventive approach to environmental aspects and impacts (Ribeiro et al., 2020; Li et al., 2018; Cristófaló et al., 2016).

Regarding the Solid Waste Management Plan, waste management by organizations requires a comprehensive approach throughout the entire life cycle of products and services, so that all possible strategies and opportunities for reducing material use and consequently waste generation are considered. This implies taking these aspects into account from the design of products and services through the consumption and post-consumption stages. It also includes, whenever possible and necessary, reverse logistics, reuse, recycling, proper final disposal, and appropriate destination (Popescu et al., 2021; Azmi et al., 2021; Schneider and Macedo, 2020). Environmental management practices in general, as well as those related to the management of solid waste and hazardous materials, must necessarily include diagnostic actions carried out in all company units, processes, and activities (ISE B3, 2022).

Finally, the companies that reported adopting specific procedures for managing environmental aspects, even when not legally required, also engage in water efficiency (correlation 0.529) and seek to reduce greenhouse gas emissions (correlation 0.588) in their production processes as eco-efficiency practices. Large companies, even those with low-impact activities, need policies that ensure they have adequate knowledge to manage their realities. Water and wastewater management is necessary to guarantee operations from legal, operational, and financial perspectives. Actions in this regard are crucial for sustainability in the watersheds and water systems where companies are located and interact; furthermore, they help rationalize resource use by eliminating waste and reducing costs (ISE B3, 2022). Along these lines is energy management, which is a strategic aspect of business administration from both financial and environmental performance perspectives, since, as already mentioned in this work, energy efficiency inherently reduces costs and risks.

5 Correlation Analysis Between the Economic and Environmental Dimensions

The results of the Spearman correlation analysis between the variables comprising the economic and environmental dimensions of this study revealed coefficients with both positive and

negative values ranging from 0.4 to 0.5 (Table 4). Therefore, it can be concluded that there is only a moderate correlation between them.

Table 4 – Correlation between economic and environmental dimension variables

Variable		Spearman correlation	<i>p</i>
Indebtedness in the NFS	Question 7 (d)	0.455	0,017
Number of FIs	Question 6.1 (b)	0.448 (negative)	0,019
Number of employees	Question 9 (f)	0.444	0,020
Question 6	Company classification	0.424 (negative)	0,027
Annual revenue	Question 5.1 (c)	0.418 (negative)	0,030
Indebtedness in the NFS	Question 6.1 (a)	0.409	0,034
Question 2.1 (c)	Number of FIs	0.407 (negative)	0,035
Question 3	Annual revenue	0.407 (negative)	0,035
Annual revenue	Question 3.1 (c)	0.407 (negative)	0,035
Importer	Question 8 (d)	0.407	0,035
Question 1	Exporter	0.401 (negative)	0,038
Number of employees	Question 7 (a)	0.4	0,039

Fonte: Elaborado pelos autores (2023).

The highest correlation coefficient found between the variables (0.455) suggests that the interviewed companies with higher levels of debt in the National Financial System (SFN) do not aim to increase energy efficiency, unlike companies with lower bank indebtedness, which also monitor the management of environmental aspects not required by current legislation but do not develop specific actions for this purpose (correlation 0.409).

Despite the inference that companies with higher bank debt do not aim to improve energy efficiency, it is possible that these companies have other objectives for energy management, such as cost reduction, which was the goal indicated by 44% of the companies that manage energy. Additionally, approximately 90% of the companies in the study reported having eco-efficiency practices in their operational activities.

Companies that are clients of many financial institutions adopt measures based on the precautionary principle, aimed at reducing potential risks; this is a specific procedure for managing environmental aspects not required by Brazilian legislation (correlation -0.448), and they practice GHG emissions reduction as an eco-efficiency strategy (correlation -0.407). Financial Institutions (FIs) have strong influence, meaning they have the capacity to encourage good practices and, through them, improve both as companies and as financiers, promoting improvements in the socio-environmental performance of their clients (Lima and Ribeiro, 2021). In this sense, there is an inseparable link between the greater environmental development of companies and their relationship with a larger number of agents in the financial system.

The interviewed companies with a higher number of employees do not manage water usage because they do not use water in their production processes (correlation 0.444). On the other hand, companies with a lower number of employees tend not to have an energy management policy (correlation 0.400). Through data analysis, it is possible to verify that companies with fewer employees belong to the wholesale trade sector. This sector is characterized by the resale of new or used goods, without transformation, to retailers, industrial, agricultural, commercial, institutional, and

professional users, or to other wholesalers; or it acts as a commercial representative or trade agent in the purchase or sale of goods to these users (IBGE, 2023). In other words, this is a sector with low materiality in the management of energy, water, and liquid effluents in its operational activities, as it involves the resale of products without transforming them.

Additionally, the results of this study suggest that companies classified as Upper Middle (annual revenues between R\$ 200 million and R\$ 800 million) adopt environmental management procedures without legal obligation, while Middle companies (annual revenues between R\$ 30 million and R\$ 200 million) tend not to adopt such measures (correlation -0.424). Companies with higher revenues may require more stringent environmental licenses for operation and, possibly for this reason, they monitor their environmental performance not only to ensure legal compliance but, above all, to mitigate significant risks of their activities to the environment and human health and to practice the sustainable use of environmental services and natural resources. As a rule, companies focus their environmental management on environmental aspects that are regulated or subject to environmental legislation, or that are the object of technical requirements from environmental agencies.

In the procedures for assessing environmental aspects and impacts, the existence of legislation is, although not exclusively, a determining criterion for evaluating significance. However, there are situations where no legal requirements or technical demands are established, but there is sufficient evidence or even proof of potentially significant risks to human health and the environment (Sarai and Kokke, 2021; Lima and Ribeiro, 2021; Ribeiro et al., 2020; Melo et al., 2018; Cristófalo et al., 2016). In this context, it is natural that larger and more established companies in the market, even with low-impact activities, require a policy that ensures adequate knowledge for managing their specific reality (Semieniuk et al., 2021; Hellvig, 2021; Badunenko et al., 2021; Godoy and Saes, 2015).

Finally, sustainability initiatives in foreign trade include a variety of practices and policies that companies implement to demonstrate their commitment to sustainability (ISE B3, 2022). The results reveal that exporting companies of products or services analyzed in this study do not have environmental policies whose guidelines are integrated into their planning and management processes (correlation -0.401). Exporting companies account for approximately 55% of the organizations in the sample that reported not having environmental policies with guidelines embedded in their planning and management processes. This result is significant, as exporters represent only 29% of the sample. In this context, 62% of the exporting companies reported not having eco-efficiency practices in their activities, and only 37% have environmental certification. However, all exporting companies reported being fully compliant with the Solid Waste Management Plan in the units where it is legally required.

6 Recommended Best Practices

Here are 8 recommended best practices to enhance the economic-environmental performance of the analyzed financial institution:

1. Engage with companies that do not consider the financial institution (FI) as their main business partner to understand why these clients use products/services from other financial institutions instead of those offered by the analyzed FI.
2. Develop strategies to conduct business with ESG-focused products/services, targeting the

companies mentioned in item 1. It is worth noting that approximately 40% of the companies participating in the study do not have any credit product with the analyzed FI but do have debt with another financial institution.

3. Create a corporate sustainability questionnaire to gather information from clients. This will enable the FI to better understand how clients are addressing ESG practices, such as raw material consumption, management of water and energy resources, solid waste handling, and whether they have any carbon neutrality policies.

4. Establish criteria to rank clients based on their socio-environmental responsibility practices. In other words, implement a system to record the socio-environmental practices adopted by companies in their production processes, so that those with better evaluations have preferential access—especially in terms of pricing—to products and services aimed at generating positive socio-environmental impact.

5. Establish ESG practices training/course as a prerequisite for those exercising the role of relationship manager in the wholesale segment of the financial institution. “Training is simply one of the highest leverage activities a manager can do to improve a company’s performance.” — Andrew Grove, former CEO of Intel.

6. Create environmental sustainability initiatives for companies operating in foreign trade, especially those involved in exports. The study showed that these companies are less engaged in environmental issues. Therefore, encouraging these companies to adopt environmental sustainability practices brings positive impacts in creating value for them by conquering new markets, as well as directly contributing to the development of the societies affected by their operations. Some initiatives that can be adopted include:

- Environmental certification: Companies can seek environmental certifications, such as ISO 14001, which demonstrate that their production and logistics practices meet strict environmental standards;
- Carbon emissions management: Adoption of carbon emissions management practices to minimize their environmental impact. This may include adopting cleaner technologies, reducing waste and emissions, and investing in renewable energy projects.

7. Create initiatives to encourage companies to prepare greenhouse gas (GHG) emissions inventories. Only 15% of the companies reported having a GHG emissions inventory. Since the inventory is a tool aimed at increasing transparency and giving companies control over their impact on climate change, by requiring it, financial institutions (FIs) would be indirectly encouraging clients to manage and control the volume of emissions produced by their operations, ultimately leading to a reduction in their environmental impact. Some initiatives that can be adopted include:

- Client identification: Identify and register clients who have a GHG emissions inventory;
- Incentivize clients who have a GHG emissions inventory by granting access to differentiated products and services;
- Incentivize clients who demonstrate a reduction in GHG emissions—through their inventories—by granting access to differentiated products and services.

8. Create initiatives/incentives for acquiring the debts of companies with better social and environmental performance. The study showed that the FI's share in the companies' total debt (market share) is 17%. This indicates room to expand in this market segment. Some initiatives that can be adopted include:

- Company classification through the application of a corporate sustainability questionnaire;

- Definition of strategic parameters, that is, establishing criteria—based on the company's social and environmental classification—for access to credit lines that will be used to purchase debts held by other financial institutions.

Final Considerations

This article investigated the relationship between the environmental performance of 27 medium and large-sized companies located in the region of Maringá, in the state of Paraná, with annual revenues ranging from R\$30 million to R\$800 million, and their use of credit operations from a major Brazilian financial institution. It was found that most of the companies analyzed carry out corporate sustainability actions, having environmental policies with guidelines embedded in their planning and management processes. Additionally, most companies (90%) reported engaging in eco-efficiency practices within their business operations. However, it is worth noting that only 15% of the companies interviewed reported conducting a greenhouse gas (GHG) emissions inventory. This gap represents an opportunity for the financial institution to develop specific actions aimed at encouraging companies to measure and report their emissions.

In addition to the above, this study identified business opportunities for the financial institution related to the corporate sustainability practices of its clients. These opportunities aim to enhance both the economic and environmental performance of the financial institution and its corporate clients. In this regard, through the recommendations presented in Table 1 of this article, the financial institution stands to benefit economically and environmentally, while also enabling a shift toward more sustainable behavior among companies. This, in turn, promotes capital generation with direct benefits to the client and indirect benefits to the community and the environment.

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