RELISE

THE INFLUENCE OF ENVIRONMENTAL DISASTERS ON VALE S/A'S FINANCIAL STATEMENTS AND STOCK MARKET[1]

A INFLUÊNCIA DOS DESASTRES AMBIENTAIS NAS DEMONSTRAÇÕES CONTÁBEIS E NO MERCADO ACIONÁRIO DA VALE S/A

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ABSTRACT

The present study aims to analyze the influence of environmental disasters on Vale S/A's financial statements and their impacts on the Brazilian capital market. This is justified by the importance of understanding how the environmental agenda influences indirect departments within its scope of activity, especially in the economic-financial context and image before the investor market. The study is characterized as descriptive, with a documentary nature and quantitative form. An analysis of Vale S/A's financial statements and market pricing was carried out in the sample period from 2014 to 2021. The results indicate that its profitability was directly affected in the years in which the disasters occurred (2015 and 2019), presenting losses in both periods analyzed, causing the company to increase its level of debt to finance its operations, a contributing factor that influenced the decrease in results with the burden of financial expenses. Furthermore, stock prices were also directly impacted, but the company managed to reverse its performance in the following period, justified by its equity size, market in which it operates and the new organization of the stock exchange. The impact on pricing was found to be short-term, and it took little time for the market to reestablish its confidence in the company. This study opens the possibility of future research in the field of analysis of the performance and evolution of corporate governance policies established in the company, and how the

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improvement of the relationship with its stakeholders brings profitability and added value.

Keywords: financial statements, environmental disaster, financial indicators, market indicators, Vale.

RESUMO

O presente estudo tem como objetivo analisar a influência dos desastres ambientais nas demonstrações contábeis da Vale S/A e os impactos no mercado de capitais brasileiro. Justificando-se pela importância de um entendimento de como a pauta ambiental influencia departamentos indiretos ao seu escopo de atuação, especialmente no contexto econômico-financeiro e de imagem perante o mercado de investidores. O estudo caracteriza-se como descritivo, com caráter documental e de forma quantitativa. Realizou-se uma análise das demonstrações contábeis e da precificação de mercado da Vale S/A no período de amostra de 2014 a 2021. Os resultados indicam que a sua rentabilidade foi diretamente atingida nos anos dos ocorridos (2015 e 2019), apresentando prejuízos em ambos os períodos analisados, fazendo com que a empresa aumentasse seu grau de dívida para financiamento de sua operação, fator contribuinte que influenciou na diminuição dos resultados com a oneração das despesas financeiras. Além disso, pode-se perceber que as cotações das ações foram também diretamente impactadas, porém a companhia conseguiu reverter desempenho logo no período seguinte, justificado por seu porte patrimonial, mercado de atuação e nova organização da bolsa de valores. O impacto na precificação, verificou-se que foi de característica de curto prazo, levando pouco tempo para que o mercado reestabelecesse sua confiança com a empresa. Com presente estudo, abre-se a possibilidade de pesquisas futuras, no campo de análise da atuação e da evolução das políticas de governança corporativa instaurada na empresa, e como a melhora da relação com seus *stakeholders* pode trazer lucratividade e agregação de valor.

Palavras-chave: demonstrações contábeis, desastre ambiental, indicadores financeiros, indicadores de mercado, Vale.

INTRODUCTION

Environmental issues have shown a progressive increase in social and political agendas in recent years, accompanied by discussions on the topic within the financial market and accounting field due to the various particularities this subject holds compared to others. Even entities operating in highly similar sectors have different interpretations regarding the treatment, recognition, and measurement of environmental factors' influence on financial statements and corporate management practices, transmitting this information to investors, clients, suppliers, and society in general (De Oliveira, 2017).

With the establishment of the Paris Agreement on environmental issues in 2015 — replacing the former Kyoto Protocol (1997) and its enforcement set for 2020, the subject became a main topic on the global agenda, influencing investment decision-making in the financial and capital markets. A corporation's image has since come to be determined not only by its financial performance but also by its involvement and concern for maintaining the environment in which it operates (Souza, 2017).

Progressively, entities have been pressured by their investors and other stakeholders to properly disclose all environmental factors that occur directly or indirectly in relation to their operational activities. A low level of disclosure impairs investment analysis since financial statements fail to reflect the full reality of the entity, creating uncertainty for those analyzing them. Transparency in companies' environmental performance is a key factor for their full acceptance in today's globalized market (Sampaio, 2018).

At the national level, the topic escalated following the tailings dam disasters in Mariana (MG), involving Samarco (a subsidiary of Vale S/A), and in Brumadinho (MG), directly involving Vale S/A. One of the main issues stems from the imminent risk of collapse of the economic system as a result of environmental degradation and the consequent impairment of the environment's economic functions.

The relationship between stock price valuation, investment shares, and the socio-environmental practices of the invested companies supports the argument that the market is becoming increasingly demanding regarding the proper disclosure of environmental information by companies. Consequently, the correct recording and measurement of environmental accounting factors have become a crucial point (Cecon et al., 2018).

Following these events, Vale S/A became a central topic in policy discussions on environmental matters. Therefore, there arises the need to analyze how environmental effects have influenced the company's financial statements.

The process of economic-financial analysis involves the examination and interpretation of accounting records included in financial statements. From these, it is possible to extract and demonstrate a company's financial health and its respective results, which reflect the entity's performance in managing its resources to achieve favorable outcomes, following the accounting principle of continuity. Furthermore, financial investigation enables an understanding of how relevant events influence a company's financial figures (Regert et al., 2018).

In this context, this article raises the following question: What is the influence of environmental effects on Vale S/A's financial statements and stock market performance? The objective is to analyze the influence of environmental effects on Vale S/A's financial statements and stock market behavior.

This study is justified by the importance of providing an understanding of how environmental issues influence departments that are indirectly related to their operational scope, particularly within the context of economic sustainability. In addition, it is valuable to assess the company's management practices during

the analyzed periods, offering parameters for the prevention of future accidents in other similar entities.

This is a subject of growing relevance, as organizations are increasingly seeking governance models that are socially and environmentally conscious. The organizational vision can be summarized by the expression “intentional business”, through which companies seek to overcome neglect toward the environment and climate issues by creating new operational models that positively impact different segments of the population (Beber & Rangel, 2020).

Establishing a solid understanding of the impact of environmental issues on the performance of financial statements is of utmost importance. After all, investors seek solid companies with reputable standings, while customers look for businesses that offer products with ecological credibility, aiming to reduce costs and increase profitability. For these reasons — and many others — environmental awareness is an indispensable topic of discussion (Brito, Lima, & Moreira, 2020).

LITERATURE REVIEW

Environmental management

Since the Industrial Revolution in the 18th century, concerns with environmental issues in the business sector have been of secondary importance. However, due to the intense exploitation of natural resources, their consequent scarcity, and the increasing occurrence of natural disasters, the corporate world began to establish environmental management departments as a way to differentiate themselves and attract new investment markets.

With this environmental degradation, it was no longer sufficient merely to standardize production processes; companies now need to comply with specific regulations to ensure that their methods and products are environmentally safe within the context in which they operate (Colantonio, 2019).

By carrying out such actions, companies can obtain beneficial returns through various means. Some of these include the reduction of production costs, the addition of value to products, the production of new materials based on recycling, the reuse of waste, and the improvement of institutional image — all of which result in environmental and social benefits for both the environment and the population (Zanatta, 2017).

For an effective improvement of institutional image and, consequently, an increase in market value, an organization must develop and implement information transparency systems. Studies show that companies that disclose information related to the environment in which they operate tend to present better market valuations compared to competitors that do not disclose such information (Cecon et al., 2018).

The market has become more demanding. In a study analyzing the association and correlation of indices (environmental, informational, and market valuation), an increase was observed in the degree of correlation among these variables. This result supports the argument found in the literature that the market is increasingly demanding proper disclosure of environmental information by companies (Cecon et al., 2018).

As a result of the need to standardize environmental management and governance practices, the concept of ESG emerged — an acronym for Environmental, Social, and Corporate Governance — which in Portuguese translates to Governança Ambiental, Social e Corporativa. ESG has become a metric guiding good corporate practices. It represents a paradigm shift in the relationship between companies and their investors, as the level of corporate engagement with sustainability has become a key criterion in investment risk analysis (Sitta & Lima, 2020).

Companies have been pressured to adopt ESG indicators to add value, due to the rise of stakeholder capitalism. Corporate performance should not be measured solely by the return provided to shareholders but also by how effectively a company achieves its environmental, social, and governance objectives (Beber & Rangel, 2020).

With the ESG framework incorporated into business practices, market valuation began to take this indicator as a reference. Once these practices are adopted, companies become more responsible and attractive to both consumers and capital markets, resulting in greater profitability and creating an advantage over firms that do not adopt such measures (Sitta & Lima, 2020).

The inclusion of sustainability in corporate practices should be seen as an irreversible trend, directly linked to strategies for value creation and profitability. Communication with stakeholders must go beyond demonstrating financial performance — it should also show how the company contributes positively to the social and environmental context, adding value to it. By establishing this healthy connection, reinforcing credibility and reputation, companies will, in return, experience a proportional increase in their market value driven by investor and consumer demand (Beber & Rangel, 2020).

Among the performance indicators of environmental policies, the Corporate Sustainability Index (ISE) was created to reflect the returns of a portfolio composed of companies recognized for their commitment to social responsibility and environmental sustainability, serving as promoters of good practices in the corporate environment. The index has become a benchmark, as it is based on efficiency and economic development directly linked to environmental balance, social justice, and corporate governance (Silva & Lucena, 2019).

Sustainability indices have emerged as mechanisms to improve the flow of information in the capital market, assisting in the valuation of traded assets. A more transparent market facilitates the attraction of new investors, increasing the circulation of securities — particularly for companies that have adapted to established rules and structured environmental policies focused on risk mitigation and sustainable development. Consequently, companies that adhere to these standards are expected to achieve higher returns on equity and lower capital costs (Zago, Jabbour & Bruhn, 2018).

Therefore, harmony among four key elements is essential: economic development, environmental preservation, social justice (through quality public services), quality of life, and the conscious use of natural resources (Both & Fischer, 2017).

Environmental accounting

Environmental accounting plays the role of analyzing and recording environmental assets and all their related changes, accounting for all environmentally relevant events that occur within an entity. In this sense, the generation of information is highly significant, as it allows companies to establish better control over their activities concerning environmental issues and to demonstrate to society that the organization is engaged and committed to environmental actions. Through the internal control provided by environmental accounting, it becomes possible to empirically demonstrate, in numerical terms, that its implementation is essential for clean production — reducing costs and producing goods and services aligned with environmental policies (Renosto, 2011).

In the scope of environmental accounting, it is possible to identify specific accounting groups. The first is environmental assets, which encompass all expenditures incurred by the entity to prevent or reduce the environmental impacts that its operations may generate. It is important that such expenses are segregated from others so that all stakeholders are aware of the company's environmental concerns and to ensure accurate information disclosure (Brito, Lima, & Moreira, 2020).

Environmental assets can therefore be understood as the goods acquired by companies to control, preserve, and restore the environment (Ribeiro et al., 2017).

Environmental liabilities, in turn, comprise all expenses related to mitigating environmental damage caused by issues beyond planning or operational failures. For example, when an entity improperly disposes of waste, its environmental liability includes the expenses incurred to minimize or eliminate the impacts caused by those polluting agents (Brito, Lima, & Moreira, 2020).

Environmental liabilities represent the total damages caused to the environment and, consequently, the obligation to repair them. Entities that engage in activities using various natural resources may cause environmental alterations. Thus, environmental liabilities represent the result and evidence of all impacts caused to the environment by any organization that have not been remedied throughout its operational activities (Nunes, 2021).

Within the income statement accounts, environmental revenues refer to income derived from services associated with environmental management, such as the distribution of recycled products or the reduction of water or energy consumption. Their primary purpose is to ensure conscious production control, with profit not being the main driver. With the incorporation of environmental value enhancement into business ideology, revenue generation naturally follows — through higher-quality products, improved brand image, increased demand, and consequently, better financial results (Nunes, 2021).

Environmental revenues arise naturally as the organization adapts to environmental regulations. It is extremely important to properly recognize such revenues, as without accurate information control, they may be overlooked or embedded within other environmental events. Determining environmental

revenues alongside related expenses is crucial so that results can demonstrate whether the resources applied are sufficient, excessive, or insufficient. This allows the company to identify its critical and optimal operational points (Abreu, Ferracini, & Silva, 2021).

Environmental expenses represent all efforts — direct or indirect — related to any costs, regardless of disbursement, associated with goods or services aimed solely at environmental preservation and the remediation of potential damage caused by the entity’s activities (Ribeiro et al., 2017).

Environmental expenses are defined as all costs related to the environment that are not directly linked to the company’s productive activity; rather, they are expenses incurred in environmental management during the reporting period (Abreu, Ferracini, & Silva, 2021).

They are understood as all expenditures incurred by an entity within a given period that are environmentally related but not tied to its production activities. All financial outlays connected to environmental recovery and preservation are considered environmental expenses (Melo & Paiva, 2020).

Finally, environmental costs refer to the investments made by a company with the goal of achieving returns such as an improved image among stakeholders and a reduction in future environmental indemnity expenses. The assessment and allocation of environmental costs within an organization are essential for decision-making, allowing managers to adopt procedures that enhance corporate performance (Abreu, Ferracini, & Silva, 2021).

Measures related to environmental management that aim to reduce natural resource consumption, restore ecosystems degraded by pollutant emissions, and recycle raw materials or other materials used in the production process should be treated as environmental costs. The value of these resources — expressed in terms of the goods and services employed — must be recognized as environmental costs and subsequently accounted for as such (Brondani, Rossato, & Trindade, 2009).

METHODOLOGICAL PROCEDURES

Through the proposed analysis, conducted via documentary research, the study sought to develop an understanding of the level of influence that environmental aspects exert on a corporation's financial and accounting sectors, as well as to analyze their impact on stock prices in the capital market. The objective was to empirically demonstrate the relationship between environmental disasters and the structuring of results in financial statements.

Based on the characteristics of the analysis presented, it can be classified as descriptive in terms of its objectives, since its main purpose is to describe specific characteristics and to establish relationships between variables using standardized methods of data collection, selection, and consolidation. Descriptive research defines what is, focusing on four main aspects: description, recording, analysis, and interpretation of the data presented. It always maintains a clear and defined objective to guide the research direction and determine the expected outcomes (Encimas & Santana, 2019).

Regarding the procedures adopted, the analysis is characterized as documentary research, carried out through data collection from information disclosed by Vale S/A in its standardized financial statements. Documentary research allows for the organization of information that may otherwise be dispersed, thus emphasizing its importance as a valuable research source (Raupp & Beuren, 2003).

In terms of problem approach, the analysis has a quantitative nature, as it deals with numerical aspects and results that can be measured. By applying mathematical language to describe relationships between variables, it is characterized by the use of statistical tools — both in data collection and in data processing (Raupp & Beuren, 2003).

The research was based on digitalized financial statements and relevant facts disclosed by Vale S/A through digital channels, including Brasil Bolsa Balcão (B3) and the company’s investor relations website. Additional data and indicators were collected from the Economática® database, which consists of a set of advanced analytical modules operating on comprehensive databases, generating information for indicator analysis.

The analysis covered the documentation available for the most recent ten-year period with completed fiscal years, resulting in a sample period from 2014 to 2021. The research aimed to identify relevant environmental events and their corresponding accounting entries recorded by the company during this timeframe. Subsequently, the extracted data were organized and compiled into a tabular format to facilitate interpretation and analysis, allowing for verification of indicator behavior throughout the sample period.

The data and indicators collected were compiled and structured according to the checklist presented in Chart 1.

Chart 1 – *Checklist* of indicators

Financial Indicators	**Description**
LC	Current Liquidity
LG	General Liquidity
DB	Gross Debt
DB / ATIVO	Gross Debt / Total Assets
RL	Net Revenue
LL	Net Income
ML	Net Margin
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
DL / EBITDA	Measure of Financial Leverage
ROA	Return on Assets
ROE	Return on Equity
Market Indicators	**Description**
Average Closing Price	Average of the stock closing prices in the market
Liquidity	Speed at which an investor can exit their stock position
Tradability	Measures the trading volume of a given asset
GDP	Gross Domestic Product
TB	Trade Balance

Source: Economática® (2022).

To carry out the effective analysis of the data, the indicators were first defined and later organized into tables for the evaluation of the corresponding periods of occurrence, making it possible to assess the evolution within the defined sample.

Additionally, the study sought to highlight the main relevant events that occurred in the company related to incidents with direct or indirect influence from the environmental sector, together with the variation in the market price of common shares. The scope of analysis was restricted to disasters of national and international impact. The data were compiled through records organized in chronological order, with the purpose of establishing a foundation for a historical evolution timeline. These data were extracted from material fact reports disclosed on the Stock Exchange (B3) and news published in the country’s main media outlets.

With the data organized and tabulated, an analysis of the behavior of the collected indicators was structured, aiming first to highlight the impact of the environmental sector on the corporation’s operational and financial performance throughout the analyzed period. The study also sought to establish a correlation between the relevant events and the behavior of the financial indicators presented in the analyzed statements, thereby demonstrating the relevance and importance of environmental issues in corporate performance.

ANALYSIS OF RESULTS

The corporation Vale S/A is a publicly traded company with its shares listed on stock exchanges in several countries, including Brazil (São Paulo), the United States (New York), and Spain (Madrid). The company began its operations in 1942 as a state-owned enterprise and was privatized in 1997. However, its shares have been traded since 1943, when it first launched its securities on the Brazilian stock exchange, which was located in Rio de Janeiro at the time. Later, in 1968, its shares were also listed on the São Paulo market.

Following its privatization, the company underwent significant market expansion, issuing shares on the New York Stock Exchange in 2000 and later, in July 2008, on Euronext in Paris (France). Vale has a highly diversified base of both domestic and international investors, with approximately 47% of its capital (as of November 2020) held by foreign investors.

In 2015, the municipality of Mariana (Minas Gerais), located in the Metallurgical Zone of the state — also known as the Iron Quadrangle — was affected by the collapse of the Fundão Dam, managed by Samarco S.A., a mining company jointly controlled by Vale S/A and the Anglo-Australian company BHP Billiton. The event released a wave of mud and mining waste that directly affected 38 municipalities, home to approximately 1.1 million people (IBGE, 2015). Furthermore, the Doce River was almost entirely contaminated, with the flow of waste reaching its mouth in the state of Espírito Santo, about 650 kilometers from the site of the accident (National Water Agency, 2016).

Another extremely significant disaster occurred on January 25, 2019, when the dam at the Córrego do Feijão Mine, located in Brumadinho (Minas Gerais) and directly managed by Vale S/A, burst. The collapse caused the waste from Dam I to overflow into two other dams in the complex, spreading tailings over an extensive area and ultimately draining into the Paraopeba River. It is estimated that the social and environmental damages resulted from the release of 11.7 million cubic meters of mud, causing 259 confirmed deaths among residents and company employees, with additional individuals still missing to this day (Pacchello, 2021).

The tailings covered an area of approximately 297.2 hectares of land, most of it near riverbeds. The incident severely impacted the ecosystems of the Paraopeba and São Francisco Rivers by contaminating their water sources, obstructing their channels, and affecting hydroelectric dams in the region. Fertile lands were also damaged, as soil quality, water resources, and broader ecosystem interactions were gravely compromised, leading to a significant decline in agricultural production in the microregion (Pacchello, 2021).

Table 1 presents the main financial indicators reported by Vale S/A for the period from 2014 to 2021, showing the company's performance throughout the analyzed sample. The study sought to highlight the principal ratios within each subarea: payment capacity (liquidity), indebtedness (debt), revenue and results (net revenue, net income), profitability (return on assets and equity), and financial cycle.

Table 1 – Financial Indicators

Data *X* Indicadores	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
LC	1,88	1,47	2,01	1,45	1,67	1,23	1,67	1,47
LG	0,46	0,49	0,57	0,59	0,66	0,64	0,69	0,68
DB (in billions)	76,5	112,6	95,5	74,3	59,9	59,8	78,0	76,9
D.B. / ATIVO	24,7	32,6	29,6	22,7	17,5	16,2	16,3	15,4
RL (in billions)	88.3	85.5	94.6	108.5	134.5	148.6	208.5	293.5
LL (in billions)	1.0	(44.2)	13.3	17.6	25.7	(6.7)	26.7	121.2
M.L	1,13%	(51,6%)	14,0%	16,2%	19,1%	(4,5%)	12,8%	41,2%
EBITDA (in bilions)	27.7	(14.8)	37.2	46.4	55.4	17.0	68.7	157.7
DL EBITDA	2,38	-	2,20	1,30	0,68	1,78	0,12	0,07
ROA	0,07	-13,31	4,12	5,39	7,54	-2,35	5,21	24,31
ROE	0,15	-31,83	9,74	12,54	16,02	-5,26	14,73	64,20

Source: Research data.

Based on the data presented in Table 1, it can initially be observed that the company has maintained a solid structure for meeting its financial obligations, with liquidity ratios consistently above 1.0 and showing stable behavior without high volatility. This stability is justified by its conservative cash flow policy, maintaining a steady and high level of cash reserves — increasing from approximately R$14 billion in 2014 to R$65 billion in 2021, a 364% growth during the period — with minimal impact from the Brumadinho and Mariana accidents, reflecting the company's tight control over cash management. In 2021, cash represented 13% of total assets.

Another significant factor is the maintenance of a positive working capital balance, with suppliers appropriately aligned with the volume of receivables. In 2015, a temporary reduction in current liquidity was observed, influenced by events involving its subsidiary Samarco, for which Vale S/A needed to increase its debt by approximately R$36 billion to finance the company's operations. Short-term credit lines were provided since Samarco had its licenses suspended and mining activities halted. A similar reduction occurred again in 2019, this time due to the Brumadinho disaster, in which Vale S/A was directly involved. In this case, liquidity was affected by the immediate recognition of approximately R$7.5 billion in liabilities related to the accident, in addition to provisions and increased obligations caused by the production shutdown at the site.

Despite these events, the company's indebtedness remained under control. Although there was a temporary increase in 2015, the overall debt ratio declined steadily in relation to total assets, falling from 24.7 to 15.4, showing that the funds raised for Samarco were short-term and quickly settled. In the case of Brumadinho, a similar increase in gross debt was noted, but with a milder effect on the overall financial position.

Regarding revenue, the company showed consistent growth, reaching R$293 billion in 2021 — approximately 330% higher than in 2014. This growth resulted from improvements in production processes with higher quality refining, increased international market share, and the significant appreciation of commodities. Export performance was particularly strong due to large infrastructure and economic expansion projects in China, as well as continued demand from the United States and European countries for minerals used in the construction, automotive, and technology industries.

When analyzing results and profitability in relation to total and shareholders' equity, both indicators followed a progressive upward trend, in line with revenue growth. The peak was reached in 2021, with net income of R$121 billion and a remarkable net margin of 41%. This outcome can be attributed to the appreciation of the U.S. dollar, which favored exports, and the rise in international iron ore prices driven by post-pandemic economic recovery and increased demand.

In 2015, the main burden on results came from the sharp increase in financial expenses, largely related to credit operations used to finance Samarco's activities and the decline in production caused by the interdependence between the two companies. During this period, total financial expenses reached approximately R$62.7 billion. In addition, the company recorded an impairment adjustment of around R$34 billion, related to its investment in Samarco and fixed assets whose production had significantly declined due to legal restrictions following the incident.

In 2019, the year of the Brumadinho disaster, the main factor affecting results was the direct recognition of provisions related to the event, amounting to approximately R$28.8 billion. These provisions covered search and rescue operations, environmental and social remediation, production stoppages and relocations, as well as various fines imposed by regulatory and judicial authorities. The company again recorded asset impairment losses, mainly in its basic ore and nickel extraction plants, due to operational difficulties in production and processing. Expected production levels for the remaining useful life of the mines were significantly reduced, along with the shortening of the lifespan of several other mines that were suspended due to seismic activity.

In line with results and margins, EBITDA showed a similar performance, with progressive growth demonstrating the company's ability to convert revenue into operational resources. Notably, even in 2019 — a year marked by severe economic, financial, social, and environmental stress — Vale still achieved a positive EBITDA of R$17 billion, reflecting the resilience of its operations.

From this analysis, it is evident that Vale S/A has maintained consistent profitability growth both on total capital and shareholders' equity, reaching ratios of 24% and 64% respectively in 2015 and 2019. This demonstrates efficient resource allocation and highly profitable operations, driven by a strong international commodities market. The only periods in which the company was not profitable were those directly affected by environmental disasters, which imposed significant financial and operational challenges. The company's primary focus during these times was on addressing environmental and social impacts, which eroded and compromised overall profitability.

Accounting policies also evolved following the 2015 and 2019 disasters. After the Mariana incident, the company faced difficulties in segregating and clearly reporting contingent liabilities. By 2019, having already joined the Novo Mercado, Vale was able to more effectively identify and disclose contingent liabilities directly related to the disaster, through a specific liability account titled Brumadinho Event.

Table 2 presents stock market indicators, demonstrating the performance of Vale's shares during the analyzed period. This allows for an assessment of market perception regarding the company's performance, management decisions, and future outlook.

Table 2 - Market Indicators

Data	Average Closing Price	Liquidity	Tradability	GDP	Trade Balance
2014	14,56	1,91	2,00	0,10%	(3,9) BI
2015	9,12	2,00	2,03	-3,80%	19,6 BI
2016	18,09	1,99	2,00	-3,30%	47,7 BI
2017	29,62	3,36	3,76	1,30%	67 BI
2018	39,04	4,89	5,79	1,80%	58,3 BI
2019	41,88	4,25	4,93	1,20%	48 BI
2020	71,59	3,94	4,67	-3,90%	50,9 BI
2021	75,07	4,75	5,89	4,60%	61,2 BI

Source: Research data.

The indices presented in Table 2 include the average closing price on the last trading day of each year, stock liquidity, trading activity index, and the macroeconomic indicators of GDP and Trade Balance, which are factors of direct influence on the capital market.

Vale S/A is a publicly traded company listed on the São Paulo Stock Exchange (B3), the New York Stock Exchange (NYSE), and the Madrid Stock Exchange (LATIBEX). As such, its securities are subject to strict regulations, guidelines, and oversight by authorities such as the U.S. Securities and Exchange Commission (SEC) and Brazil’s Comissão de Valores Mobiliários (CVM). This requires a high level of control and extremely structured corporate governance standards — clear, transparent, and aimed at generating value for both majority and minority shareholders.

It can be observed that the company’s stock has experienced increasing trading volume, with investors progressively expanding the number of transactions. The Market Liquidity and Tradability indices doubled over the analyzed period, reaching 4.75 and 5.89 respectively in 2021. This was a key factor in adding value to its shares, providing greater confidence and comfort to new investors.

This trend is largely explained by the progressive growth of the Brazilian stock market, which has attracted thousands of new domestic and foreign investors — reaching approximately 4.2 million individual investors in 2021, according to data released by B3.

Furthermore, on December 22, 2017, Vale announced in a press release that its shares would begin trading on B3’s special listing segment known as Novo Mercado. Companies in this segment adhere to highly differentiated corporate governance standards, applying practices that go beyond legal requirements, especially regarding transparency, equality, monitoring, and control. This move increased investor confidence, both domestic and foreign, and significantly boosted trading volume.

From the analysis, it can be seen that during the periods of the Mariana disaster (involving its subsidiary Samarco in 2015) and the Brumadinho disaster in 2019 (in which the company was directly involved), the stock's tradability indices on the exchange remained stable. This occurred because shares largely shifted between investors — some reducing their exposure due to the events, while others saw an opportunity to enter the company, believing in its recovery potential and the strong momentum of the sector in which it operates.

In terms of market pricing, the average closing price for each year shows an upward trend, rising from R$14.56 in 2014 to R$75.07 in 2019 — an increase of approximately 415% over the analyzed period. This appreciation can be attributed mainly to the company's strong performance in international markets, with significant growth in export volumes. Commodities — especially raw minerals — saw strong price increases globally, driven by robust demand from countries investing heavily in infrastructure development, such as China.

These findings align with Barbosa and Barros (2021), who state that the main factor affecting the company's market value was the delay and difficulty in communicating the incidents, which created uncertainty regarding the company's exposure and actions rather than the actual extent of the financial impact.

As shown by the performance of Brazil's trade balance, results have been positive since 2015, and its growth paralleled the appreciation of Vale's stock, reaching approximately R$61.2 billion in 2021. This occurred independently of Brazil's Gross Domestic Product (GDP) performance, which faced significant declines due to political and fiscal crises during the period.

In 2015, following the Samarco accident, the company's stock prices were directly affected — starting the year at around R$13.80 and falling to R$8.00 after the disclosure of the incident and Vale's involvement with Samarco. The

market reacted with strong selling pressure, as investors perceived risks related to the company’s exposure in the region. The main concern was the lack of clear information regarding Vale’s actual role in Samarco and how the disaster could affect its liabilities and environmental expenses, highlighting the importance of transparent corporate governance.

In 2019, during the Brumadinho dam collapse — this time involving the company directly — Vale’s shares suffered a sharp decline, dropping from around R$44.00 to approximately R$33.00 immediately after the event. This reflected market apprehension regarding the financial and operational consequences. Unlike in 2015, however, the decline was short-term: prices recovered to pre-disaster levels within the same year, ending with an average of R$75.07. This rapid recovery was due to transparent communication and the company’s strong financial position, which allowed it to absorb the losses effectively.

These results are consistent with Cecon et al. (2018), who found that Brazilian companies known for generating high environmental impact in their main activities tend to achieve higher market valuations when they maintain transparency and objectivity in disclosing environmental information, compared to competitors that do not.

Similarly, Beber and Rangel (2020) emphasize that incorporating sustainability into corporate strategy is directly linked to profitability and value creation. Transparent communication and positive relationships with stakeholders during crises, such as environmental disasters, can reduce both the magnitude and potential impact on financial performance and corporate reputation.

With the mining market remaining strong during the period, while some investors reduced their exposure to the company, others viewed the situation as an opportunity to enter the sector and benefit from its growth potential.

In conclusion, from a financial perspective, environmental disasters had a direct impact on the company’s results and profitability structure. Negative performance was observed in 2015 and 2019, mainly due to expenses related to fines, reparations, and environmental and social recovery actions. Moreover, the company needed to increase its debt levels — generating additional financial expenses — to sustain strategic operations.

In the capital market, Vale’s shares underwent a transformation, becoming increasingly liquid assets. Transparency and clear communication with investors proved essential to restoring market confidence in a short period.

FINAL CONSIDERTIONS

Based on the results, it was identified that, from a financial standpoint, the company’s performance deteriorated during the same periods in which the environmental disasters occurred. Negative results were observed in both 2015 and 2019, mainly due to the high volume of expenses related to fines and measures taken to mitigate and repair the environmental damage. Another factor that contributed to the erosion of profit margins was the increase in financial expenses, driven by a higher level of corporate indebtedness. This was necessary to provide cash flow relief and finance operations, which, in both cases, had been temporarily interrupted.

It can be noted that Vale S.A. demonstrated solid financial health and a well-structured balance sheet, which enabled it to withstand the crises and achieve an immediate recovery in the following periods, maintaining its ability to meet obligations and generate returns on both assets and equity.

Regarding market valuation, it can be seen that the company’s shares showed a significant increase in trading activity and liquidity on the stock exchange, offering greater security to investors. This improvement can be largely explained by the growing number of new investors and the company’s inclusion

in the Novo Mercado segment, which requires strict governance standards emphasizing transparency and equality among shareholders.

In both disaster events, the company’s stock prices were negatively impacted, as the market reacted with selling pressure due to uncertainty and difficulty in assessing how much the incidents would affect the company’s continuity and how long recovery would take. Following its financial indicators, however, Vale S.A. managed to regain market confidence, and its share prices entered an upward trend, supported by strong operational performance and a highly favorable export market.

Furthermore, the importance of transparency and clarity in communicating incidents, actions taken, and the company’s short-, medium-, and long-term strategic goals became evident. As observed, Vale S.A.’s stock suffered a greater and longer-lasting impact in 2015 compared to 2019, influenced by stakeholders’ limited access to comprehensive information and their difficulty in forming a clear outlook on operations and understanding how the incident occurred to prevent similar events.

The adoption of sustainable practices within corporate standards has become an irreversible path, directly linked to strategies for adding value and generating results. By establishing healthy connections that reinforce credibility and reputation, companies can achieve market gains by attracting new investors who trust organizations that demonstrate a strong commitment to the environment in which they operate.

For future research, it is recommended to expand the scope of analysis to include Vale S.A.’s corporate governance practices and how they directly influenced the events, as well as the company’s relationship with its environment and stakeholders. This includes examining the strategic planning and actions implemented, and highlighting how the disasters prompted changes in governance policies that increased transparency and encouraged compensation for the damages caused. Such analysis can provide a deeper understanding of how environmental responsibility directly contributes to a corporation’s financial health and public image. Additionally, it would be relevant to assess how the economic sector in which a company operates can influence stakeholders’ perceptions and shape its overall value and reputation.

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