

## TRACKING LINKS TO A DISASTER: POWER AND STRATEGY IN VALE'S GLOBAL PRODUCTION NETWORK

Bruno Milanez<sup>1</sup>, Rodrigo Salles Pereira dos Santos, Maíra Sertã Mansur, Tádzio Peters Coelho  
 Universidade Federal do Rio de Janeiro – UFRJ, Rio de Janeiro, (Brasil)  
 Universidade Federal de Juíz de Fora – UFJF, Minas Gerais, (Brasil)  
 Universidade Federal do Maranhão – UFMA – Maranhão, (Brasil)

### ARTICLE DETAILS

#### Article History:

Guest Article  
 Available online August: 01 th 2019

#### Scientific Editor

Ilan Avrichir

#### Keywords

Global Production Networks (GPNs)  
 Iron Ore  
 Tailings Dam

### ABSTRACT

Grounded on the Global Production Network framework, we argue that elements that resulted in the failure of Dam I, property of Vale S.A. in Brumadinho (MG), in 2019, can be interpreted based on the exercise of corporate power, which nullified the existing systems of checks and balances, and the value capture, through reduction of operational costs, in order to increase the payment to shareholders, in a context of increasing financialization. The article is based on literature review and document analysis. The argument is presented using the concept of strategy, which is defined as a repertoire of coordinated actions performed by one or more actors and involves the exercise of power aiming at: (1) increasing its capacity to enhance or capture value; (2) expanding its power or reducing the power of other actors and/or (3) changing the conditions of embeddedness. Using such a definition, then we analyze the opportunities and constraints towards value creation and capture by Vale and relate its strategies to the increasing operational risks of Dam I.

### Introduction

In recent years, the analysis of the performance of transnational corporations (TNCs) has advanced significantly. In this context, approaches such as Value Chain and Global Commodity Chains were used as a basis for the proposition of the Global Production Networks (GPNs) model. This model, however, goes beyond the analysis of economic agents (firms) to also include non-economic agents (state, trade unions, non-governmental organizations, etc.), presenting three main categories of analysis: value, power and embeddedness. Using this model, the concept of strategy was built which, here, was used to evaluate Vale S.A.'s opportunities and constraints to generate, expand and capture value along its extractive chain.

From this analysis, it was identified a context of increasing financialization of the company and, consequently, an increased demand for value

capture by its shareholders and other financial agents. On the other hand, embeddedness conditions (material and network) were identified as limiting Vale's ability to capture value from Chinese steelmills (its main customers). Thus, the alternative strategy left to the company would have been to intensify the capture of value from the production side, by reducing operating costs. This condition, however, only proved viable once the company used specific strategies to reduce the existing systems of checks and balances in Brazil. The significant reduction of these control systems over the company's operations would then be associated with the emergence of the conditions (economic, social and institutional) that would have allowed the rupture of Dam I in Brumadinho in January 2019.

To present this argument, this paper is organized in four sections in addition to this introduction. First, a brief presentation of the GPNs model and, within it, the concept of strategy. Then, using these concepts, we analyze

<sup>1</sup> Contact of the author Email: [bruno.milanez@ufjf.edu.br](mailto:bruno.milanez@ufjf.edu.br)

Vale and how it exerts different forms of power, trying to ensure, when possible, greater value capture. In Section 3, we deal specifically with the Brumadinho disaster situation and how tactics of cost reduction may have impacted the monitoring and preventive maintenance of its dams. Finally, the last section presents the final considerations and main conclusions of the article.

## 1 Global Production Networks and the strategy perspective

### 1.1 The Network as a base for analysis

The GPNs model defines economic globalization as a large-scale process linking raw material extraction, goods production, service provision, transportation, consumption, and waste disposal. Thus, new transnational production systems lead to the functional integration of spatially dispersed activities (Coe, Dicken, & Hess, 2008; Dicken, 2011).

In general terms, the model assesses the role of specific actors, including firms (as well as their suppliers and customers), states, workers and social movements.

With respect to economic agents, the model has the firm as the analytical focus. Corporations are constantly competing to increase their influence to achieve specific economic objectives, such as cost reduction, revenue growth, increase in market share, among others (Henderson, Dicken, Hess, Coe, & Yeung, 2002).

Beyond the firm, the state is conceived as the prototype of the political agent; at the same time, agents and institutional arrangements are considered key elements (Wilson, 2013). Social agents such as workers, social movements and non-governmental organizations (NGOs) are also included, adopting a broad concept of agency (Henderson et al., 2002).

Thus, economic agents conduct structures and processes where a variety of other agents orbit. Thus, the model recognizes that political and social agents have complementary and essential interfaces in the conditioning of economic activities.

In this context, the GPN model adopts three categories to assess the relationship among these agents: embeddedness (social, territorial, network and material), power (corporate, institutional and collective) and value (creation /

extraction, enhancement, capture and destruction) (Dicken, 2011; Hess, 2004; Santos & Milanez, 2015a).

The notion of embeddedness refers to the different forms of social construction of the economy (Granovetter, 2007), so that the GPN approach created a specific typology in an attempt to make it operational. It emphasizes the forms of territorial, network (Henderson et al., 2002), social (Hess, 2004), and material (Santos & Milanez, 2015b) embeddedness.

Power, in general terms, is understood as the ability of an agent to influence the actions of others (Gereffi, 1994; Henderson et al., 2002). Dicken (2011) argues that power relations in a GPN are unequal and depend mainly on access and control of relevant assets, such as capital, technology, knowledge, natural resources, among others. The GPNs model is based on a typology of agent-related power: corporate, institutional and collective (Henderson et al., 2002).

The third category is value, which is based on both the Marxian notion of surplus-value and the more orthodox perspective of economic rent (Henderson et al., 2002; Kaplinsky, 1998). This strategy suggests the need not only to study value creation / extraction, but also to understand the processes of its enhancement and capture. Dicken (2011) still proposes the possibility of value destruction, a relevant concept for the study the extractive sector (Santos & Milanez, 2015a).

Although not incorporated in the original formulation of the model, financialization would constitute an additional process of characterization of value, even if little developed. Thus, Santos (2011) draws attention to the “financial multiplication of value”, while Dörny (2016) emphasizes the role of financial intermediaries in generating economic rent. In addition, Coe, Lai, and Wójcik (2014) advocate the incorporation of finance into the approach, highlighting this sphere as an indispensable dimension to the empirical studies of GPNs.

### 1.2 Building Relationships Between Value, Power, and embeddedness: The Role of Strategies in GPNs

Despite its analytical richness, in its classic format (Henderson et al., 2002; Hess, 2004) the model presents embeddedness, power, and value as independent elements. In contrast, we understand that there are implicit relationships

between these three categories and that agents dispute value-related processes (in their monetary and non-monetary dimensions), so that their success depends mainly on power relations, which are influenced and defined by the conditions of embeddedness. Each group of agents develops a repertoire of actions, defined as strategy<sup>1</sup>, in order to modify these three categories.

Therefore, we propose to incorporate the notion of strategy into the GPN model as a repertoire of coordinated actions performed by one or more agents - largely collective, involving the exercise of power with the objective of: (1) increasing the ability to enhance or capture value; (2) enhancing its own power or reducing the power of other agents; and / or (3) modifying embeddedness conditions, of oneself and those of other agents.

Thus, the concept of strategy is defined from a broad understanding and not restricted to the usual perspective that limits it to "a plan – a consciously planned form of course of action" Mintzberg (1987, p. 11).

In doing so, we also seek to include practical and / or structural pressures (Bourdieu, 2005, p. 34). Therefore, we assume that strategies exist as part of larger structures, determined by asymmetric relationships between multiple agents. In these terms, "decisions (of the dominant as well as the dominated) are only choices among possible ones defined (within their limits) by the structure of the field" (Bourdieu, 2005, p. 27). Thus, this dimension imposes an essentially political perspective (Fligstein, 2002), centered on power relations, both internal and external, between dominant and dominated agents.

Therefore, from our perspective, strategy is understood as a "pattern of flows of action" (Mintzberg, 1987, p. 12) or as "a course of action taken by an agent or group of agents" (Anderson, 2003, p. 14). At the same time, a strategy can be explicit, either formally conceived and documented, or implicit, tacitly created. Finally, the concept of strategy should also include inaction, referring to whatever an agent chooses "to do or not to do" (Dye, 2013, p. 3).

From an analytical point of view, we appropriate and adapt the GPN model to create an operating model. Thus, starting from the groups of agents described in the literature (firms,

consumers, workers, social organizations and the state), we describe six distinct strategies: market, financial, institutional, labor relations, social and territorial strategies.

## 2 Vale and its strategies<sup>2</sup>

### 2.1 Preamble: The embeddedness Conditions

Vale was created in 1942 in the context of World War II. At that time, the Washington Accords made possible a partnership between Brazil, the United States, and the United Kingdom to set up the then Companhia Vale do Rio Doce (CVRD) as a state-owned company to supply the Allies with iron ore. In return, the Washington Accords would make it possible to finance a steel mill in Brazil. Thus, Vale was set up primarily to ensure that the international market had access to the rich iron ore deposits located in the Iron Quadrangle (Quadrilátero Ferrífero MG) and, indirectly, to create the material bases that would enable it to meet the industrialization project in the country (Silva, 2004; Triner, 2011).

Over time, Brazil has become a major player in the global iron market. In the 1960s, the country was responsible for almost 7% of total ore exports; this share was expanded to 25% in the 1980s, remaining around 30% from the 1990s (International Trade Center, 2019; Triner, 2011).

In the 1990s, the neoliberal political agenda was widely adopted by Brazilian governments, leading to the privatization of several state-owned companies. CVRD was privatized in 1997, and changed its name to Vale in 2007. In the privatization process, control of the company was transferred to the Valepar group, formed by pension funds linked to state-owned companies, international groups and national financial groups. Some state participation was also maintained through the National Bank for Economic and Social Development (BNDES) (Mansur et al., 2016).

Subsequently, a movement was initiated to reduce the concentration of Vale's control, as well as to restrict state participation. Vale's so-called "new corporate governance" was ratified at the end of 2017, following the process of converting the Company's preferred shares into common shares. This has created a unified ownership structure in order to comply with B3's New Market and, finally, the incorporation of the controlling group (Valepar) into the firm structure. The ultimate goal of such changes

would be to transform the company into a society without definite control by 2020 (Santos, 2017).

In 2017, Vale had a high market concentration in terms of traded ores, with a special focus on iron ore<sup>3</sup>. It is also characterized by its spatial concentration; despite having operations, offices and joint ventures in around 30 countries, Vale centralizes its activities in Brazil, where 78% of its employees are located (Vale, 2018e).

The iron ore market has an oligopolistic structure that significantly limits competition. In 2015, the seaborne market was controlled by four corporations, Vale (22.5%), BHP Billiton (20.1%), Rio Tinto (19.9%) and Fortescue (12.3%), which accounted for 74.8% of world supply (Löf & Ericsson, 2016, p. 24). Vale expanded its participation in 2016, reaching 24.0% market share (Löf & Ericsson, 2017, p. 35).

The spatialization of Vale's operations is also unevenly distributed. In the case of ferrous minerals, their extraction and processing are almost exclusively carried out in Brazil. The corporation regionalizes iron extraction in four systems. The Northern System is located in Pará, focusing on the Asian and European markets. The Southeast and South Systems comprise the Iron Quadrangle and serve both steel mills located in the Southeast region as well as the international market. The fourth system, Midwest, is located in Mato Grosso do Sul, allowing smaller-scale ore flow through the Paraguay River and Argentine ports (Vale, 2018b, pp. 32-34). Thus, despite some diversification, Vale's production and, as a result, its ability to extract value depend essentially on the company's iron ore reserves in Brazil. Due to this centrality, the strategic analysis presented will focus on the iron ore segment and operations in the country.

## 2.2 Market Strategies

The notion of market strategy refers to geographic and / or sectoral patterns of resource allocation; technological standards; and to the asset portfolio and goods / services trading structure, based on the corporation's positioning in relation to its competitors and political and social **actors** (Santos & Milanez, 2017, p. 13).

Iron ore was the flagship of revenue growth during the commodity boom (Santos, 2016), although the concentration of iron ore was seen as problematic by the corporation, which defined "less dependence on iron ore" as medium-term

goal, relying on "extracting greater value from existing assets" (Vale, 2018d, p. 2). Attempts at diversification, however, were slow and iron remained a key element for the company.

The steel industry consumes all of Vale's iron ore and iron pellets, which explains its revenue dependence on the results of this sector and, indirectly, on the industrial and urban dynamics of emerging economies. Thus, China accounted for 57% of shipments in 2017 - Asia's share reached 71% -, followed by Europe (13%) and Brazil (9%) (Vale, 2018b, p. 37).

In this context, it should be noted that the price negotiation strategy was influenced by the change in the iron ore pricing system in the late 2000s (Bhattacharyya & Deepak, 2012; Ma, 2013; Santos, 2010; Yao, Ma, & Zhang, 2018). Hitherto, two regimes coexisted in a hierarchical manner: the main regime focused on a "benchmark mechanism" (Bhattacharyya & Deepak, 2012, p. 71) of Australian and Brazilian ore; and the complementary one was based on the spot market occupied by Indian ore (Yao et al., 2018, p. 73).

China's conversion into the world's leading consumer has made China Baowu Steel Group Corp. (Baosteel) and China Iron & Steel Association (CISA) opponents of the pricing regime. Similarly, "the development of the Chinese iron ore market" (Sukagawa, 2010, p. 56) raised prices and led to the expansion of iron supply in the spot market. These changes led to Chinese buyers dropping out the benchmark system in 2009 and the introduction of a quarterly price. Thus, the pricing regime became "a combination of quarterly price and spot adjustment" (Bhattacharyya & Deepak, 2012, p.78).

<sup>2</sup> A more detailed discussion of the use of the model to evaluate Vale's strategies can be found in Milanez et al. (2018).

<sup>3</sup> Vale also has operations involving different minerals such as nickel, copper and coal. The importance of ferrous minerals is key, with emphasis on iron ore (54.5%) and pellets (16.7%), in the composition of the company's operating revenues. Base metals accounted for 20.2% of revenues, comprising nickel and other products (13.7%) and copper (6.5%). Coal is third in importance, accounting for 4.6% of revenue in 2017 (Vale, 2018b, p. 2).

Thus, Vale, pressured by the position of its competitors, better positioned geographically in Australia and with better trading conditions, had to follow the decisions of its main market in defining the pricing system. These conditions began to affect, mainly, the time horizon of Vale's market strategy, increasingly by the short term, as well as imposing limits on its ability to set the prices of its products.

### 2.3 Financial strategy

As a consequence of the capital-intensive nature and market risks associated with mineral extraction activity, mining companies are faced with problems related to mobilization and internal management and, mainly, to the external sourcing of funding giving rise to specific financial strategies. These strategies respond fundamentally to the available debt and proprietary control options, which are predominantly defined by agents and structures outside the corporation and, therefore, directly impact the processes related to value capture and the conditions of exercising corporate power (Santos, 2017).

In Vale's specific case, the dividend policy and financial strategy became even more central to the company's operations. In 2017, its capital expenditures reached the lowest level since 2005, totaling US \$ 3.8 billion, a 29.8% decrease compared to 2016 (Vale, 2018b). This fact suggests that the operational dimension of its activities has been losing relevance in the company's resource allocation structure in view of the financial dimension.

Vale's capital stock is comprised of about 5.3 billion common shares. Until 2016, its shareholding composition gave prominence almost exclusively to the then controlling group. With the changes in corporate governance, a new bylaw were established and, in December 2017, Vale completed its listing in B3's New Market segment (Vale, 2017a).

Following Vale's entry into the New Market, international institutional investors such as BlackRock, Inc and the Capital Research and Management Company (CRMC) became more prominent. Its shareholding does not yet indicate decision making power in the company, but its growth compared to the year 2016 is noteworthy. In this new structure, the main shareholder continued to be Litel Participações (37%),

followed by CRMC (15%), BNDESPar (15%), Bradespar (12%), BlackRock, Inc. (11%) and Mitsui (10%) (Vale, 2018b, p. 115). In this context, the increased participation of investment funds in the equity composition tends to increase the pressure for increased short-term return to shareholders.

In recent years, the corporation's main sources of funds have been operational cash flow and loans, complemented by asset disposals (Vale, 2018b, p. 103).

First, the company's cash flow is structurally dependent on iron ore prices, which have been showing more volatile behavior recently (Market index, 2018). The company's second largest source of external funding is loans. In 2017, Vale borrowed \$ 1.5 billion. Accordingly, Vale issued US \$ 1.0 billion in bonds through its wholly-owned subsidiary Vale Overseas Ltd. due in 2026 (Vale, 2018b, p. 103). Although in a limited extent, Vale continues to rely on public credit as a means of financing its operations. In 2017, the company maintained agreements with BNDES regarding credit lines available (Vale, 2018b, p. 105). Third, debentures (debt securities) are another important fundraising instrument by the company. This financial mechanism provides for more diffuse fundraising, with long-term debt with low interest rates (Wainberg, 2017).

In summary, although public loans alone are Vale's main external funding mechanism (48.4%), if private credit (41.6%) and bond issuance (9.8%) are added, private agents have assumed greater importance in the company's financing structure. Thus, Vale seems to be adapting its strategies to obtain financial resources, reducing the importance of government in its governance structure and increasing the ~~participation~~ participation of financial agents, such as investment funds, as a way to facilitate access to external resources.

Accordingly, private agents are becoming Vale's main financiers. As a consequence, confirming this trend, Vale will have to prioritize their demands in order to ensure the maintenance of its operations. Not surprisingly, in 2017 it applied a policy of systematically cutting production costs, disciplining investments and focusing on its core business, with the aim of reducing debt and increasing its ability to pay dividends. In this scenario, the company made a systematic effort to increase its shareholders' compensation. Despite a net loss of \$ 12.6 billion

in 2015, the total amount paid to shareholders that year was \$ 1.5 billion. In 2016, the payment was considerably lower (US \$ 250 million), and this reduction may be associated with the contributions made to Samarco (Vale and BHP Billiton joint venture) due to the expenses associated with the Fundão dam rupture in the previous year. Payment to shareholders, however, recovered rapidly, growing steadily in 2017 (\$ 1.4 billion) and 2018 (\$ 3.3 billion) (Vale, 2019b). Thus, the return to shareholders has become one of the central elements of the corporation's financial strategy in recent years (Vale, 2018b, p. 121).

#### 2.4 Institutional strategy

As an institutional strategy, we define the initiatives of corporations that involve the exercise of their power directed at the state and public agents. Thus, we conceptualize institutional strategy as the set of actions used in an attempt to “exert a strong and consistent regulatory influence” (Szablowski, 2007, p. 8) on political agents.

The literature lists a variety of tactics adopted by corporations in an attempt to influence public officials. Fuchs (2013) organizes these tactics into three dimensions. First, the author describes the material structuralist perspective, associated with the economic power of companies. Secondly, she mentions the ideational structuralist dimension, based on the creation of symbols and narratives by companies. Finally, the author addresses the instrumental perspective, which focuses on the direct influence of corporations on state agents through lobbying, campaign financing, and revolving door.

From the point of view of tactics of a material structuralist nature, such practices are more visible in the municipal sphere, since Vale has a much higher revenue than the municipalities where it operates, which gives it disproportionate economic power. For the implementation of such tactics, the most common instrument is the establishment of partnerships and the financing of public works. As for its specific performance in Brumadinho, an element to be considered is the size of the company in the municipality. Thus, while the total gross revenues made by the Brumadinho City Hall in 2017 totaled BRL 175.5 million, in the same year, the total joint operations of Vale and its subsidiary MBR in the municipality were BRL 1,162.0 million, that is,

more than six times the city revenues. A second element would be its role in the local public budget. In 2018, Brumadinho's municipal revenue from the Financial Compensation for Mineral Exploration (CFEM) paid by Vale was BRL 16.5 million, which would correspond to 26.4% of the municipality's total CFEM and 10.5% of its current revenues (ANM, 2018; SICONFI, 2018).

This material power would have a direct impact on strengthening corporate power at the ideational level. As Vale carries out a series of public works, it is seen as a benefactor, which considerably lessens social contestation and pressure on the company. For example, in a survey conducted in the Itabira region, where Vale was founded:

[the] same confrontation was in the hands of the politics that always circulated around the Vale do Rio Doce, you know[...] and that Vale ... it bought consciences out there and a lot of people, a lot of people, as it didn't have the courage to confrontation, you know, suffered, many people died because of it [...] (Interview with community leadership of Santa Maria de Itabira (MG), conducted in 2015 by B. Milanez and R. S. P. Santos).

A similar situation seemed to occur in Brumadinho, prior to the rupture of Dam I. Despite the existence of an active movement of social contestation to the company's operations since 2011, it remained restricted to the vicinity of Vale's operations, motivated mainly by issues associated with the expansion of operations and impacts on water (Campos, 2015) without apparently, be broadly incorporated by the urban population.

From an instrumental point of view, Vale's economic power and embeddedness conditions as a former state-owned company seem to have provided it with a particularly high level of power in its relationship with public agents, both at the federal and state levels. This can be seen from campaign financing, privileged access to decision-making spheres and the use of the revolving door.

The financing of election campaigns was an important strategy of Vale until its ban in 2015. In the 2012 and 2014 elections, Vale was the main mining company campaign financier, contributing BRL 30 million and BRL 22.7 million, respectively (Oliveira, 2013, 2015). At the federal level, in the

2014 election, Dilma Rousseff's candidacy directly received BRL 12 million from Vale group companies, while Aécio Neves's campaign was supported with BRL 3 million. At the state level, the Governor of Minas Gerais, Fernando Pimentel (PT), received a total of BRL 3.1 million (Coelho, Milanez, & Pinto, 2016).

Associated with this, Vale now has broad access to decision-making bodies. For example, during the discussion of the 2030 National Mining Plan in 2010, the Ministry of Mines and Energy (MME) organized eight workshops mainly with government organizations, while Vale joined four of these workshops (MME, 2011). Similarly, suggestions made by Vale to employees of the state of Minas Gerais in workshops held in 2014 regarding the simplification of environmental licensing were later incorporated in the review of the legislation (Angelo, 2019).

A third practice associated with the instrumental perspective is the revolving door between corporations and government agencies. For example, when Vicente Humberto Lôbo Cruz (former director of Vale Fertilizantes) was appointed by the Temer government to Secretary of Geology, Mining and Mineral Transformation at MME, in 2016, he nominated former Vale directors or consultants to all four directorship positions of his secretariat (Milanez, Coelho, & Wanderley, 2017).

Thus, it is possible to identify the diversity of tactics used by Vale in its relationship with the state. Its power at national, regional and local levels would allow it to obtain differentiated access to the decision-making process. This access tends to enable more favorable conditions for value capture, particularly from a production standpoint. On the other hand, it weakens external monitoring and control structures that should, among other things, ensure the security of its operations.

## 2.5 Labor Relations Strategy

Among the different forms of creation, enhancement and value capture by corporations, labor and union relations are crucial; therefore, the relationship between company and workers should occupy a central space in GPN analysis (Ramalho & Santos, 2018).

Labor costs, wages, and working conditions are generally objects of mining companies'

strategy to capture value. However, the agency is not restricted to mining companies and the state alone, and because it is a network analysis, it should also include workers and unions. These agents try to influence decision-making processes along GPNs, relating to the various spheres of the state itself, adopting specific strategies and making up resistance. From the point of view of Vale's operations, strategies related to forms of hiring and dismissal have great relevance. In labor relations, we highlight as the main tactic, the use of outsourced forms of hiring. Although not exclusive to Vale, outsourcing in the company covers much of the work relationship and is central to the expansion of value creation. In 2015, out of 166,300 workers, 92,200 were outsourced, or 55.4% of the total. In 2018, the number dropped to 54.6 thousand outsourced workers in a total of 124.9 thousand, or 43.7% of the total (Vale, 2018e, 2019d), which did not vary in relative terms between 2017 and 2018, but still remains quite significant.<sup>4</sup>

Although Vale does not provide data on the allocation of direct workers and third parties in its operations, the latter is disproportionately important in activities of infrastructure maintenance (including dams), as suggested by data on the contracts of the workers who died in the Samarco disaster in Mariana (see Mansur et al., 2016). Thus, the standard of working conditions at Vale, specifically with regard to health and safety, focuses on cost reductions, particularly in the support sectors. For example, in Itabirito (MG), the Regional Labor and Employment Superintendence (SRTE) fined the company, having identified 309 drivers linked to the subcontractor Ouro Verde in a "situation analogous to slavery" (Valor Econômico, 2015; Xavier & Vieira, 2017).

With regard to trade union relations, managing relationships with worker representation bodies is also an important strategy. In this sense, Vale has historically sought to bring union leaders closer to their interests, subordinating them in different ways. One of the main tactics has been to support the formation of slates that dispute the leadership of the unions, as well as the dismissal of employees who are willing to form slates to oppose Vale and their legal preclusion (Aguar, 2019; Bertollo, 2017).

The weakening of the workers' organization can be associated as an important factor that

made possible the breaking of Dam I. The unions would be one of the main elements of workers' resistance against the process of precariousness of safety conditions. However, this task proves increasingly challenging. A strengthened union could be able to question the company regarding working conditions, including the construction, maintenance and monitoring of dams. However, as unions are weakened, workers are less able to exert pressure and ensure that health and safety are maintained.

## 2.6 Social strategy

When we specifically address corporate social strategies, we refer to "the influence corporations have on the emotional, cognitive, and agency patterns of civil society, understood from multiple and interactive scales" (Santos & Milanez, 2015a, p. 12). From this perspective, Corporate Social Responsibility (CSR) practices are extremely important.

There are indications in the business literature about the relationship between CSR programs and the expansion of Vale's corporate power in the territory (Giffoni Pinto, 2015). In its report to the US Securities and Exchange Commission, the company clarifies to shareholders that has been subject itself to social challenge from various groups and that this situation may occasionally cause losses (Vale, 2017a, p. 5). However, social strategy is not limited to CSR discourses and practices. The tactics that make up such a strategy are any actions previously outlined that can manage the social protest of groups which are critical to business activity and ensure the support of the state, in all spheres, and local communities to "improve access to resources in increasingly challenging or remote environments" (ESMAP, Mundial, & ICMM, 2005, p. 14). These tactics may consist of coercive, violent and / or convincing mechanisms.

For example, the legal mechanisms used by the company do not necessarily seek their legitimacy but their operational safety. "If the interruption is caused by interdictions related to social conflicts, several areas of Vale – Community Relations, Business Security, Legal and Communication, among others – are triggered, in accordance with the Railway Interdiction Assistance Plan" (Vale, 2018e, p. 130). In many cases the prohibitory interdiction legal instrument is used throughout the company's logistics structures, whether in the Northern System or the

Southeast System, to prevent occupations and prevent economic losses. According to data from Agência Pública, from 2013 to 2017 Vale used the prohibitory interdiction in 25 cases, on the Carajás Railroad only (Domenici, 2017).

In short, we can identify a wide range of tactics used by Vale in its relationship with society. Thus, we could say that CSR actions aim to guarantee the company's reputation, both locally, nationally and internationally. The target of these actions are mostly communities around the operations, but not only. This organized action, in a way, helps to explain the low rate of contestation faced by the company in Brumadinho, prior to the breaking of Dam I.

On the other hand, judicial and police tactics, while being within the scope of social strategy, are not geared to corporate image, have a more hostile face and are generally used against social movements and residents who systematically resist certain corporate practices. Although beyond the scope of this work, further research will be needed to assess the extent to which such strategies can be adopted to address the criticism that may eventually arise locally in the event of failure to meet the demands of people hit by the dam breach.

## 2.7 Territorial strategy

The notion of territorial strategy consists of actions aimed at controlling the space, resources, goods and people in the territories and networks in which companies operate, interacting with different agents and at multiple scales. In other words, the territorial strategy is carried out through the direct and indirect action of the extractive corporations in the space towards accessing, controlling, expanding and replacing, constantly and safely, their mineral assets, aiming to expand value capture processes and to ensure that ore circulation occurs without constraints. We systematized the territorial strategy in flow control and planning, domain of areas and resources, space planning and design, and political and capital displacement.

---

<sup>4</sup> The recent absolute and relative reduction in the number of outsourced workers is explained by the demobilization of labor generated by the completion of projects, especially of the S11D Project in Pará, since its use is more intense in construction, expansion and infrastructure reform. Thus, the reduction in the participation of outsourced labor was a consequence of the very precariousness of this form of hiring.



Flow control and planning comprises tactics for controlling surfaces, lines, and points through space management and control. The action takes place either to give fluidity or to create restrictions to the flow of people and goods in the corporate territory (Rehner, 2012; Silveira, 2007). To ensure that flows occur smoothly, Vale also employs access control tactics for railways and other traffic infrastructures, such as surveillance cameras, walls, prohibitive warning signs, fences and gates in access roads (Wanderley, 2012). In a field survey on the water quality of the Paraopeba River conducted shortly after the Dam I breach, it was found that there were strategic points of access to the river controlled by companies acting on behalf of Vale. Contracted workers even imposed restrictions on researchers in carrying out material collection work, while maintaining overt vigilance on their research activities (Felippe, 2019).

Regarding the domain of areas and resources, it should be taken into account that the distribution of mineral reserves occurs unevenly in space according to geological formation. As a result, extractive corporations now employ tactics aimed at land grabbing, control of mining grants, access to rights and privileges related to particular areas. In view of this, one of the tactics practiced by Vale is to dominate the land through legal or illegal purchase, land grabbing, expropriation and compulsory displacement in areas of servitude (Bedinelli, 2016; INESC, 2017). Again, similar actions were identified in deals for the payment of compensation to residents affected by the breach of Dam I. In the agreements prepared by Vale, one of the conditions would be that residents, in order to receive compensation, should transfer to Vale the rights related to their properties. However, residents were not informed at the time of signing that Vale already had a mining right for the region's subsoil (Possato, Zuba, & Andrade, 2019).

Finally, political displacements of scale, and consequently of power, and spatial displacements of capital are recurrent tactics to increase corporate power, or to diminish the power of other territorial agents, and to capture more value. The purpose of displacements in general is to reorganize the network territory and the scalarity of the actions of mining corporations, allowing greater fluidity of capital and political action. The rescaling of power is a tactic contained

in what Cox (1998) called the scale politics. The most mobile actors jump between scales and have the ability to create or redefine scales, which does not prevent those with the least possibility of scalar displacement not to do so. A power scaling tactical mechanism may be seen in the formation of new territorial management scales, as was the case of the Renova Foundation's area of operation, managed by Vale and BHP Billiton, after the dam burst in Mariana (União et al., 2016), which is a new sub-national and suprastate scale, for which a specific governance structure has been established, relatively independent of the powers associated with the federative levels.

In this sense, it must be taken into account that territorial strategies have a strong component of power exercise. While identifying such strategies in relation to communities is more common, they can be used in situations involving both the state and other companies. Rather than generating or capturing value directly, territorial strategies act mainly on the embeddedness conditions, whether material or territorial, changing the operating conditions of both the corporation and the agents with which it relates.

## 2.8 Some thoughts on Vale's strategies

From the analysis of Vale's strategies and its (non) capacity to exercise power, we identified that the company acts as an element of transfer and connection between international processes and domestic dynamics. Thus, by operating in a globalized, highly concentrated, and increasingly financialized market, the company has lost its power in the international sphere and, consequently, its ability to capture value from the revenue side. As a way to compensate for this loss and sustain its profitability, it turns to increasingly intensive practices of extracting / capturing value from extractive operations and constantly seeking to reduce operating costs.

This diagnosis can be identified from the assessment of Vale's position in the ore markets in which it operates, which is strongly dependent on iron ore and its operations in Brazil. The iron market, in particular, has been showing a downward trend in revenues, mainly associated with the emergence of new competitors (in particular Fortescue) and a significant expansion of operations in Australia, with a consequent

reduction in logistics costs, when compared to activities in Brazil. Thus, product valuation policies – for example through the launch of the Brazilian Blend Fines, BRBF –, or attempts to increase market share in the iron ore sector show very limited results. At the same time, Vale's attempts to diversify markets, with increasing participation of base metals, have been insufficient.

Similarly, the company faced this unfavorable scenario while completing the process of transforming itself from a “state-owned company” into a “true corporation”. If, on the one hand, it diminished the influence of the state on its decisions, on the other, it became more strongly linked to the global capital market as a source of external resources. This market has been characterized by the increased participation of investment funds, which have raised their influence on Vale's organizational structure. Overall, they are increasingly pushing the company for short-term results.

In order to meet these requirements, Vale appears to have greater leeway in Brazil, particularly because of its ability to exercise power at the national, regional and local levels, which is reflected in a privileged willingness to influence government decisions, to reduce mobilization of workers and influence public opinion. This capacity guarantees the company favorable conditions of territorial and social embeddedness in the country.

Given this privileged situation, there is a quest to maintain profitability (and the ability to transfer value to shareholders) by reducing operating costs. In part, these objectives depend on the creation / extraction of value from the intensification of the exploitation of workers, either by outsourcing, or by the precariousness of their working conditions, or even by reducing investment in health and safety.

The deepening of this behavior pattern, however, proves to be highly dangerous in a high risk activity, such as mineral extraction. Thus, by using its power on multiple scales, at the national level, Vale nullified the existing system of checks and balances and, even after the Fundão dam rupture, could act without alarms or effective warning systems being installed. Thus, the

analysis suggests that the pursuit of increased value capture has annulled the company's internal and external monitoring and control systems, which created the conditions for the disaster associated with the disruption of Dam I, as discussed below.

### **3 The Brumadinho Disaster from a GPNs' Perspective<sup>5</sup>**

#### **3.1 Recent behavior in operating expenses and security investments**

Based on the analysis presented in the previous section, it is argued that the pressure exerted by shareholders in an increasingly financialized context, coupled with the difficulty of increasing revenues due to competition, led Vale to seek a constant reduction of operating costs. This effort seems to have been particularly intense in Brazil, where the company concentrates its and, as also discussed earlier, its power. As part of this effort there would have been a reduction in investments in health and safety of operations, which would increase the risk of Vale's activities and possibly the chance of disasters, such as occurred in Brumadinho.

Vale only discloses its expenses in aggregate form, which limits the verification of such hypothesis. To do so, however, we take the following line of argument. First, the overall company and ferrous industry data for operating costs and safety investment, respectively, are presented. Next, the operational situation of the Paraopeba II Complex<sup>6</sup> dams is discussed. Thus, from the compiled information it is argued that Vale, despite knowing the structural problems of Dam I, had not been making the proper investments in preventive and corrective maintenance of its dams in general.

As mentioned in Section 2.3, in the recent context of financialization, Vale has been making a consistent effort to increase its shareholders' compensation. Thus, the data provided by the company show that the total paid to shareholders increased more than 100% between 2015 and 2018<sup>7</sup>. In the last year analyzed, the payment reached 9.1% of net operating revenues, the highest percentage in the last four years (Vale, 2019b).

Also, if we analyze the price of iron ore during this time, the increase of its average price was 25% (World Bank, 2019). Similarly, the amount of

iron ore exported by Brazil grew by only 6% during the period analyzed (International Trade Center, 2019). Therefore, the increase in shareholder remuneration does seem to be explained solely by an increase in iron price nor by the demand for iron. On the other hand, as shown in Table 1, over the years, Vale seems to have made a permanent

effort to contain its operating costs. While operating revenue grew 56 percent, cost of goods sold increased only 18 percent. As a result, the share of product costs fell from 80.2% of net operating revenue over this period, freeing up greater value to be transferred to shareholders.

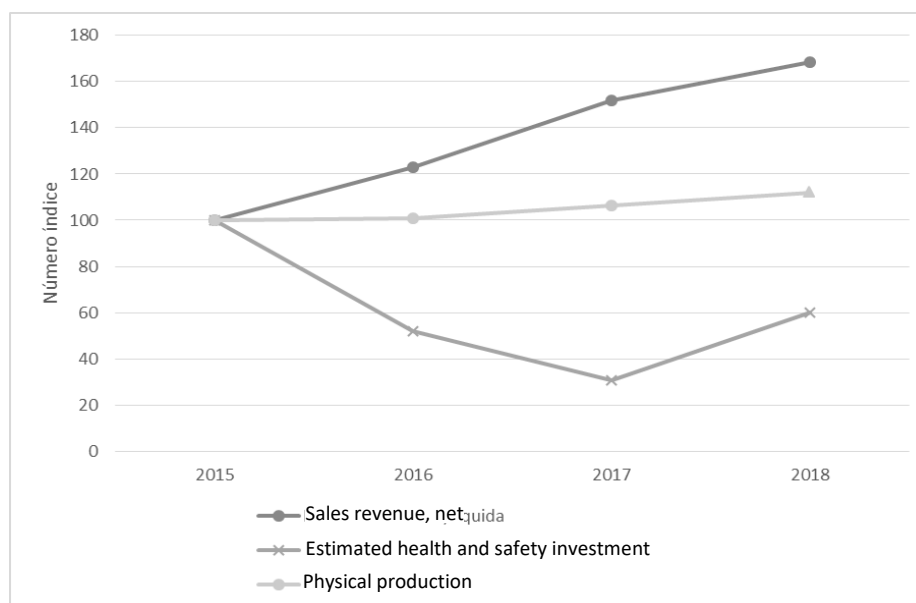
Table 1: Vale's cost of goods sold and net operating revenue (2015-2018)

Period	Cost of goods sold (US \$ million)	Net operating revenue (US \$ million)	Operating cost / operating revenue (%)
2015	18,751	23,384	80.2
2016	17,650	27,488	64.2
2017	21,039	33,967	61.9
2018	22,109	36,575	60.4

Source: Adapted from Vale (2019b).

In addition to overheads, it is also worth evaluating the behavior of Vale's ferrous minerals sector. As presented in [Graphic 1](#), physical production of ferrous minerals grew steadily between 2015 and 2018, which would suggest an expansion or intensification of its operations. At the same time, the company's net sales revenue in this segment was increased by almost 70% in the same span. Still based on data provided by the

company, despite the Fundão dam disruption in 2015, the estimated investments in the maintenance of health and safety operations went through significant cuts in the interval. With 2015 as a reference, the values in the following years were equivalent to 52% (2016), 30% (2017) and 60% (2018) (Vale, 2015a, 2016a, 2017b, 2018c).



Graphic 1: Sales revenue, physical production and estimated health and safety investment in Vale's ferrous minerals segment

Source: Adapted from Vale (2015a, 2016a, 2017b, 2017c, 2018a, 2018c, 2019a, 2019c).

These data suggest that, at least in the ferrous minerals segment, investments in health and safety did not keep up with neither revenue growth nor physical output growth. As Vale did

not provide security investment data for the Paraopeba II Complex, it is not possible to say to what extent there was an increase or reduction in security expenses specifically in the

operations in Brumadinho. However, as discussed in the next section, there is evidence that, despite structural problems identified in Dam I, Vale has not been investing enough resources in monitoring or preventive maintenance of its dams.

### 3.2 Dam I rupture from an Economic Perspective

When the Fundão dam, owned by mining company Samarco, broke down, an important debate was formed to try to understand to what extent economic aspects would favor the understanding of the disaster. To a large extent, this discussion followed Davies and Martin (2009), proposed that it is possible to verify a relationship between ore price fluctuation and the likelihood of tailings dam disruption, so that such disasters would tend to be most likely in post-boom times. In large part, the hypotheses presented by the authors helped to explain the rupture of the Fundão dam, whose construction and operation history were very similar to those identified in the model by Model Davies and Martin (2009), as demonstrated by Santos and Wanderley (2016).

On the other hand, the same model, at first glance, did not seem fully suited to Vale's Dam I case. Unlike Fundão, Dam I was an old dam that had been decommissioned in 2016, that is, three years before it broke down.

In this sense, the discussion proposed by Bowker and Chambers (2017) proved to be more appropriate to construct an economic explanation of Dam I disruption.

Their work is based on statistics and relationships identified in a large database on dam disruptions worldwide. One of its conclusions is that there is a correlation between the occurrence of severe dam failures and the purity of the extracted ores. This correlation would have strengthened especially after the price boom of the 2000s. The authors clarify that this would be explained both by the fact that mines with lower ore contents are associated with proportionally larger tailings dams, and because they are economically less profitable, forcing companies to work at lower cost levels, which would lead in a reduction in security spending and, consequently, an increased chance of disruptions.

Thus, they indicate that continued operation under such conditions would prevent the

management of tailing dams according to the best available techniques.

The data released on the situation of Paraopeba II Complex suggest a strong similarity between its operating context and the scenario outlined by Bowker and Chambers (2017).

The Córrego do Feijão mine began operations in 1923 and the Jangada mine began operations in 1974. In 2010, the expectation was that Córrego do Feijão pit would be exhausted in 2014 and that the Jangada pit would cease its activities in 2018 (Vale, 2011).

In the mining plan for the years 2012-2017, the relationship between waste (material of no value to the mining company) and crude ore that would be produced by the complex ranged from 1.62 to 2.38 (Nicho Engenheiros Consultores Ltda., 2014), considered a high ratio for iron mining.

A high sterile production ratio would mean material handling expenses within the mine, as well as costs with the construction, operation and maintenance of the sterile piles. Thus, the information available about the Complex indicates that there would be a relatively high generation of sterile and waste (Nicho Engenheiros Consultores Ltda., 2014), that is, although economically viable, the mines would operate with high costs and low operating margin.

In a way, Vale decided to maintain the operation of this Complex based on a misreading of price behavior in the late 2000s.

In this context, the company had proposed the "Zero Dam" project, which had as its objectives the recovery of ore from the tailings (Franca, 2009). Despite the low iron content present in the tailings of these dams, Vale relied on investment in new magnetic separation systems to make the project technically feasible (Brito, 2011).

---

<sup>5</sup> A deeper discussion of the economic and institutional factors associated with Dam I disruption can be found in Milanez et al. (2019).

<sup>6</sup> Paraopeba II Complex is integrated by the Jangada and Córrego do Feijão mines. Already in 2008, Vale jointly processed ore from the two pits as a way of optimizing the existing structure and reducing operating costs.

<sup>7</sup> This consists of the total paid to shareholders in the form of dividends and interest on equity.

If, on the one hand, with this project, Vale would be able to extend the life of its mines and postpone the costs of decommissioning and environmental remediation; on the other hand, the maintenance of almost depleted pits, or even the improvement of the tailings stored in the dam, would require the operation of an old support infrastructure (dams, dikes and waste piles), close to its capacity limit and with high operating costs. Necessarily the continuity of the operations of this complex required of Vale significant investments in preventive maintenance to ensure its safety. However, as described below, this did not appear to be the scenario in which the Complex was found.

### 3.3 The operating conditions of Paraopeba II Complex

As a way to ensure the safety of existing tailings dams in Minas Gerais, the state government has the Tailings and Waste Dams Management Program, which systematizes the results of safety reports prepared by audit firms hired by mining companies. These reports may present three conclusions about dam conditions: those in which the auditor ensures that they are stable; situations where, due to data unavailability, there is no conclusion about the stability of the dams; and those where stability is not guaranteed.

In this sense, Paraopeba II Complex proved to be an emblematic example of the failures of this self-monitoring system. In the case of existing water dams, Dams IV, IVa and Menezes I repeatedly had their stability not guaranteed by the auditor between the years 2011 and 2013 (FEAM, 2019). Due to Vale's inaction and lack of state government initiative, this situation was only resolved after Vale was the subject of a Public Civil Action filed by the Public Prosecution Service (Vale, 2016b)<sup>8</sup>.

In addition to stability issues, in the recent past, auditors have often identified problems in the monitoring and maintaining of Vale's dams in the Paraopeba II Complex. For example, in an inspection of Dam IV, conducted in 2008, the auditor recommended the implementation of corrective measures in the overflow system, as it was undersized and was at risk of overflow (Brandt Environment, 2014). Similarly, the report on Dam VI presented by Nicho Engenheiros Consultores Ltda. (2010a) recommended the stabilization of erosive processes on the edge of the dam spillway and an audit mentioned by Brandt Environment (2014) the

emergence of water downstream of the dam. In the case of Dam VII, the auditor concluded that the upstream slope was unstable for the condition of a rapid demotion and recommended the dam decommissioned. He also pointed out that there were planned monitoring instruments that had not been installed (Brandt Environment, 2010). Finally, in the Menezes I and Menezes II dams, inappropriate conditions of sizing of hydraulic structures and emergence of water were identified (Brandt Environment, 2010, 2014). Although not exhaustive, the aspects raised by the audits show the regularity with which operational problems arose in the water dams that made up the Paraopeba II Complex. This suggests that monitoring and preventive maintenance procedures were not properly addressed by Vale.

However, such behavior was not only limited to water dams, but could also be identified in relation to Dam I. This dam was much larger than the others and, unlike them, designed to store mining tailings. Despite these particularities, it has also presented throughout its history a number of problems associated with its monitoring and maintenance.

Before detailing some of these aspects, however, it is important to describe, even briefly, the constructive characteristics of Dam I. This is due to the fact that it is a structurally problematic dam and, therefore, should have been the object of great attention and care by Vale.

Dam I was built in 1976, with a height of 18 m, underwent 10 risings and a final height of 86 m. As described below, its track record presented constructive problems that should have caught the attention of auditors and oversight bodies.

An important issue with this dam was the heterogeneity of its tailings beach composition. The beaches consist of a strip of material created to reduce contact of the water stored in the dam with the body of the slope. In order for them to function properly, these beaches must be essentially made up of bigger particle size material. However, in the case of Dam I, for almost 30 years (1976 - 2005) the dam was operated without a specific tailings disposal directive. As the dam was of the upstream type, the beach on which eight of the ten elevations were made was

<sup>8</sup> On the other hand, Dam I had its stability guaranteed by the auditor a few months before breaking. A similar situation occurred with Samarco's Fundão dam. These two tragedies eventually demonstrated the ineffectiveness of the self-monitoring system in place in Brazil and the need to build another effectively independent dam monitoring system.

not homogeneous and had layers with different compactness, some being softer, others more compact. This particularity created a greater risk of water accumulating near the slope and could compromise its stability (Emerman, 2019; Pirete da Silva, 2010; Tüv Süd, 2018).

In addition, during the audits the lack of documentation regarding the dam construction was identified. According to Tüv Süd (2018), there were no records of geotechnical investigations referring to the initial massif design, nor documents referring to the 4<sup>th</sup> and 5<sup>th</sup> elevation geotechnical investigations. The absence of such documents made it difficult to properly understand the conditions of these structures.

Although these problems were generated prior to Vale's acquisition of Dam I, the company was aware of their existence. Therefore, the company would have been expected to have created even stricter protocols for its preventive maintenance and monitoring. However, different audits show that this was not the case.

In 2010, reports pointed to the presence of damaged, unidentified or suspected piezometers not functioning properly. In these documents, auditors also recommended recovery of drains and channels as well as validation of existing liquefaction studies. (Brandt Environment, 2010; Niche Engenheiros Consultores Ltda., 2010b). In another report, published four years later, there were references to anomalous piezometer readings, indicating the need for investigations into the dam foundation structure and the operating conditions of the internal drainage system (Brandt Environment, 2014). A year later, another report referred to an appearance of water at the foot of the dam; and reinforced the need for further analysis of the possibility of liquefaction (Vale, 2015b). Subsequently, some of these problems continued to be reported, including the emergence of cracks in the drainage system and the existence of damaged or inactive piezometers (Tüv Süd, 2018).

Thus, what is noticeable is that despite the knowledge of the constructive problems presented by Dam I, Vale had not been maintaining an adequate routine to monitor its conditions preventive maintenance actions. In principle, this scenario is consistent with a context of reduced investments in health and safety and a reduction in

concerns about operational aspects of the company.

### Final Considerations

Throughout this text we have proposed to use the GPN model to analyze Vale's strategies and present a possible interpretation for the emergence of the context that allowed the disaster associated with the disruption of Dam I.

The evaluation of the extractive network in which Vale operates shows a company very dependent on a product (iron ore) and a customer (China) and, for reasons of material (distance from the Chinese market and concentration of its competitors in Australia), with diminishing power over its consumers and a low ability to increase its value capture by selling its products.

At the same time, changes in company configuration associated with the process of increasing financialization have led to an increase in the power of financial agents and, consequently, greater pressure for increasing short-term returns.

As a way out of this pressure, the company made use of its socially conditions in Brazil (state-owned company history, to public agents and high economic power) to expand its ability to capture value from extractive activities. To this end, CSR campaigns ensured their legitimacy with society, weakened trade union organizations reduced workers' opposition to precarious working conditions and lobbying public spheres environmental monitoring and control systems. As a result of these initiatives, the company was able to ensure a relative reduction of its operating costs and a greater availability of financial resources to be transferred to shareholders.

However, at the same time as these transformations occurred, the systems of and balances that could guarantee that extractive operations were carried out at safe levels were also reduced.

In this context, the continuity of operations of an old and vulnerable structure such as Dam I proved to be the adoption of disproportionate risks that unfolded in the dam's disruption, the death of 270 people and the destruction of the Paraopeba River. Our analysis, therefore, proposes to present a broader reading of the disaster context, which looks beyond Brumadinho

and seeks to identify multiple aspects that may not only be associated with this disaster, but may also trigger others, whether in the context of Vale or other mining companies. Therefore, the adoption of such a perspective suggests that preventive actions should look beyond the issue of dam safety and discuss both institutional, social and economic aspects of the current Brazilian mineral model.

However, this is still an initial analysis of the use of the GPNs model for extractive network evaluation in the Brazilian context. Thus, the present text seeks to suggest possible paths for

future research. Firstly, it should be considered that the analytical model used is under construction, still needing further elaboration and refinement. Second, there is the need to evaluate the performance of other mining companies, to understand how the strategies identified here are generalizable to other companies in the sector, whether in Brazil or in other countries. Finally, it should be emphasized that although our main concern is to evaluate corporate strategies, other agents (social movements, workers, the state, etc.) also act actively in relation to corporations, and the study of their strategies should be incorporated into a research agenda on extractive GPNs.

### Referências

Aguiar, T. T. (2019). *O solo movediço da globalização: relações de trabalho na Vale S.A.* (Doutorado), University de São Paulo,

Anderson, J. E. (2003). *Public policymaking: an introduction* (5 ed.). Boston; New York: Houghton Mifflin Company.

Angelo, M. (2019, 22 Fev). Vale ditou regras para simplificar licenciamento ambiental em MG. *Repórter Brasil*. Retrieved from <https://reporterbrasil.org.br/2019/02/vale-ditou-regras-para-simplificar-licenciamento-ambiental-em-mg/>

ANM. (2018). Maiores Arrecadadores CFEM. *Agência Nacional de Mineração*. Retrieved from [https://sistemas.dnpm.gov.br/arrecadacao/extra/Relatorios/cfem/maiores\\_arrecadadores.aspx](https://sistemas.dnpm.gov.br/arrecadacao/extra/Relatorios/cfem/maiores_arrecadadores.aspx)

Bedinelli, T. (2016, 12 Dez). Os sem-terra desafiam a gigante Vale na Amazônia. *El País*. Retrieved from [https://brasil.elpais.com/brasil/2016/11/23/politica/1479905291\\_797076.html](https://brasil.elpais.com/brasil/2016/11/23/politica/1479905291_797076.html)

Bertollo, K. (2017). *Mineração e superexploração da força de trabalho: análise a partir da realidade de Mariana-MG*. (Doutorado), Universidade Federal de Santa Catarina, Florianópolis.

Bhattacharyya, S. S., & Deepak, P. K. (2012). Comprehending the changing global iron ore trade service system and the dynamics of pricing.

*International Journal of Business and Globalisation*, 9(1), 70-89.

Bourdieu, P. (2005). O campo econômico. *Política & Sociedade*, 4(6), 15-58.

Bowker, L. N., & Chambers, D. M. (2017). In the dark shadow of the supercycle tailings failure risk & public liability reach all time highs. *Environments*, 4(75), 1-21.

Brandt Meio Ambiente. (2010). *Mina Córrego do Feijão - Relatório de Avaliação de Desempenho Ambiental (RADA)*. Retrieved from Belo Horizonte:

Brandt Meio Ambiente. (2014). *Mina da Jangada e Mina Córrego do Feijão - Relatório de Avaliação de Desempenho Ambiental (RADA)*. Retrieved from Belo Horizonte:

Brito, A. (2011, 23 Ago). Minério em alta faz Vale investir em recuperar toneladas de rejeito. *Folha S. Paulo*. Retrieved from <https://www1.folha.uol.com.br/fsp/mercado/me2308201130.htm>

Campos, C. M. (2015). *As práticas empresariais à luz da Justiça ambiental: análise de um conflito entre água e mineração em Brumadinho, Minas Gerais, de 2011 a 2015*. (MBA), Fundação Getúlio Vargas, Belo Horizonte.

Coe, N. M., Dicken, P., & Hess, M. (2008). Global production networks: realizing the potential. *Journal of Economic Geography*, 8(3), 271-295.

Coe, N. M., Lai, K. P., & Wójcik, D. (2014). Integrating finance into global production networks. *Regional Studies*, 48(5), 761-777.

- Coe, N. M., & Yeung, H. W.-C. (2015). *Global Production Networks: theorizing economic development in an interconnected world*. New York: Oxford University Press.
- Coelho, T. P., Milanez, B., & Pinto, R. G. (2016). A empresa, o Estado e as comunidades. In M. Zonta & C. Trocate (Eds.), *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale / BHP Billiton* (pp. 183-227). Marabá: Editorial iGuana.
- Cox, K. R. (1998). Spaces of dependence, spaces of engagement and the politics of scale, or: looking for local politics. *Political geography*, 17(1), 1-23.
- Davies, M., & Martin, T. (2009). *Mining Market Cycles and Tailings Dam Incidents*. Paper presented at the 13th International Conference on Tailings and Mine Waste, Banff, AB. <http://www.infomine.com/publications/docs/Davies2009.pdf>
- Dicken, P. (2011). *Global shift: mapping the changing contours of the world economy*. New York: The Guilford Press.
- Domenici, T. (2017, 23 Nov). Estrada de ferro Carajás: Processados pela Vale. *Agência Pública*. Retrieved from <https://apublica.org/2017/11/processados-pela-vale/>
- Dörny, S. (2016). The geographies of industrialised finance: probing the Global Production Networks of Asset Management. *Geography Compass*, 10, 3-14.
- Dye, T. R. (2013). *Understanding public polic* (14 ed.). Saddle River: Pearson Education, Inc.
- Emerman, S. H. (2019). *English-language summary of a 2010 Master's thesis on the stability of the failed dam at the Córrego do Feijão Mine*. Retrieved from Spanish Fork, UT:
- ESMAP, Mundial, B., & ICMM. (2005). *Toolkit. Ferramentas para Desenvolvimento de Comunidades. Versão Preliminar*. Retrieved from <http://www.ibram.org.br/sites/1300/1382/0000087.pdf>
- FEAM. (2019, 08 Feb). Gestão de barragens. *Fundação Estadual do Meio Ambiente*. Retrieved from <http://www.feam.br/monitoramento/gestao-de-barragens>
- Felippe, M. F. (2019). [Comunicação pessoal. Relato de campo].
- Fligstein, N. (2002). *The architecture of markets: An economic sociology of twenty-first-century capitalist societies*: Princeton University Press.
- Franca, P. (2009). *Projetos de disposição de rejeitos na Vale: diversidade de soluções, riscos e desafios*. Paper presented at the 13o Congresso Brasileiro de Mineração, Belo Horizonte. <http://www.ibram.org.br/sites/1300/1382/00000551.pdf>
- Fuchs, D. (2013). Theorizing the power of global companies. In J. Mikler (Ed.), *The handbook of global companies* (pp. 77-95). West Sussex: John Wiley & Sons.
- Gereffi, G. (1994). The Organization of buyer-driven global commodity chains: How U.S. retailers shape overseas production networks. In G. Gereffi & M. Korzeniewicz (Eds.), *Commodity chains and global capitalism*. Westport: Praeger.
- Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78-104.
- Giffoni Pinto, R. (2015). *Dos riscos das políticas às políticas do risco: um estudo sobre os "riscos sociais corporativos" e suas formas de gestão*. (Doutorado), Universidade Federal do Rio de Janeiro, Rio de Janeiro.
- Granovetter, M. (2007). Ação econômica e estrutura social: o problema da imersão. *RAE Eletrônica*, 6(1), 1-41.
- Henderson, J., Dicken, P., Hess, M., Coe, N. M., & Yeung, H. W.-C. (2002). Global production networks and the analysis of economic development. *Review of International Political Economy*, 9(3), 436-464.
- Hess, M. (2004). 'Spatial relationships? Towards a reconceptualization of embeddedness. *Progress in Human Geography*, 28(2), 165-186.
- INESC. (2017, 28 Nov). Vale no centro do conflito de terra em Canaã dos Carajás. Retrieved from <http://amazonia.inesc.org.br/materias/vale->



no-centro-do-conflito-de-terra-em-canaa-dos-carajas/

International Trade Center. (2019). Trade map: trade statistics for international business development. Retrieved from <http://www.trademap.org>

Kaplinsky, R. (1998). *Globalisation, industrialisation, and sustainable growth: the pursuit of the Nth rent* (365). Retrieved from Brighton

Löf, A., & Ericsson, M. (2016). Iron Ore Market Report 2016. *Engineering and Mining Journal*, 217(11), 22-26.

Löf, A., & Ericsson, M. (2017). Iron Ore Market Report 2017. *Engineering and Mining Journal*, 218(11), 32-37.

Ma, Y. (2013). Iron ore spot price volatility and change in forward pricing mechanism. *Resources Policy*, 38(4), 621-627.

Mansur, M., Wanderley, L. J. M., Milanez, B., Santos, R. S. P., Pinto, R. G., Gonçalves, R. J. A. F., & Coelho, T. P. (2016). Antes fosse mais leve a carga: introdução aos argumentos e recomendações referentes ao desastre da Samarco / Vale / BHP Billiton. In M. Zonta & C. Trocate (Eds.), *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco / Vale / BHP Billiton* (pp. 17-49). Marabá: Editorial iGuana.

Market index. (2018). Iron Ore 37yr price history. *Market index*. Retrieved from <https://www.marketindex.com.au/sites/default/files/commodities/iron-ore-price-history.xlsx>

Milanez, B., Coelho, T. P., & Wanderley, L. J. M. (2017). O projeto mineral no Governo Temer: menos Estado, mais mercado. *Versos - Textos para Discussão PoEMAS*, 1(2), 1-15.

Milanez, B., Magno, L., Santos, R. S. P., Coelho, T. P., Giffoni Pinto, R., Wanderley, L. J. M., . . . Gonçalves, R. J. A. F. (2019). Minas não há mais: avaliação dos aspectos econômicos e institucionais do desastre da Vale na bacia do rio Paraopeba. *Versos - Textos para Discussão PoEMAS*, 3(1), 1-114.

Milanez, B., Santos, R. S. P., Magno, L., Wanderley, L. J. M., Mansur, M. S., Giffoni Pinto, R.,

. . . Coelho, T. P. (2018). A Estratégia Corporativa da Vale S.A.: um modelo analítico para Redes Globais Extrativas. *Versos - Textos para Discussão PoEMAS*, 2(2), 1-43. doi:10.13140/RG.2.2.17430.60483

Mintzberg, H. (1987). The strategy concept I: five Ps for strategy. *California Management Review*, 30(1), 11-34.

MME. (2011). *Plano Nacional de Mineração 2030*. Brasília: Ministério de Minas e Energia, Secretaria de Geologia, Mineração e Transformação Mineral.

Nicho Engenheiros Consultores Ltda. (2010a). *Mina Córrego do Feijão recuperação de pellet feed da barragem I e VI e estruturas associadas - Estudo de Impacto Ambiental (EIA)*. Brumadinho.

Nicho Engenheiros Consultores Ltda. (2010b). *Mina Córrego do Feijão recuperação de pellet feed da barragem I e VI e estruturas associadas - Plano de Controle Ambiental (PCA)*. Brumadinho.

Nicho Engenheiros Consultores Ltda. (2014). *Mina da Jangada - continuidade das operações da mina da Jangada - Estudo de Impacto Ambiental e Plano de Controle Ambiental EIA/PCA Tomo I*. Belo Horizonte.

Oliveira, C. R. (2013). *Quem é quem nas discussões do novo código da mineração*. Rio de Janeiro: IBASE.

Oliveira, C. R. (2015). *Quem é quem nas discussões do novo código da mineração 2014* Rio de Janeiro: IBASE.

Pirete da Silva, W. (2010). *Estudo do potencial de liquefação estática de uma barragem de rejeito alteada para montante aplicando a metodologia de Olson (2001)*. (Mestrado Profissional), Universidade Federal de Ouro Preto, Ouro Preto.

Possato, V., Zuba, F., & Andrade, N. (2019, 27 Mai). Brumadinho: terrenos atingidos pela lama da Vale têm potencial de mineração. *G1*. Retrieved from <https://g1.globo.com/mg/minas-gerais/noticia/2019/05/27/brumadinho-terrenos-atingidos-pela-lama-da-vale-tem-potencial-de-mineracao.ghtml>

- Ramalho, J. R., & Santos, R. S. P. (2018). Trabalho e ação sindical em Redes Globais de Produção. *Tempo Social*, 30(1), 9-29.
- Rehner, J. (2012). Territorios corporativos: Una reflexión desde la geografía económica para evitar la axiomatización de los discursos. *Espacios*, 2(4), 27-42.
- Santos, R. S. P. (2010). *A forja de Vulcano: siderurgia e desenvolvimento na Amazônia Oriental e no Rio de Janeiro*. (Ph.D.), Universidade Federal do Rio de Janeiro, Rio de Janeiro.
- Santos, R. S. P. (2011). Redes de produção globais (RPGs): contribuições conceituais para a pesquisa em ciências sociais. *Revista Pós Ciências Sociais*, 8(15), 127-141.
- Santos, R. S. P. (2016). *Análise de Conjuntura: boom e pós-boom da mineração*. Paper presented at the Seminário 'Modelo de Extrativismo Mineral sob Crítica', Vitória (ES).
- Santos, R. S. P. (2017). A nova governança corporativa da Vale S.A.: um percurso político em direção à "true corporation". *Versos - Textos para Discussão PoEMAS*, 1(4), 1-20.
- Santos, R. S. P., & Milanez, B. (2015a). *Redes Globais de Produção (RPGs) e conflito socioambiental: A Vale SA e o complexo minerário de Itabira*. Paper presented at the VII Simpósio Internacional de Geografia Agrária, Goiânia.
- Santos, R. S. P., & Milanez, B. (2015b). *A RGP da Anglo American e conflitos socioambientais na mineração de ferro: valor, poder e enraizamento no Projeto Minas-Rio*. Paper presented at the 39<sup>o</sup> Encontro Anual da ANPOCS, Caxambu, MG.
- Santos, R. S. P., & Milanez, B. (2017). Estratégias corporativas no setor extrativo: uma agenda de pesquisa para as Ciências Sociais. *Caderno Eletrônico de Ciências Sociais*, 5(1), 01-26.
- Santos, R. S. P., & Wanderley, L. J. M. (2016). Dependência de barragem, alternativas tecnológicas e a inação do estado: repercussões sobre o monitoramento de barragens e o licenciamento do Fundão. In M. Zonta & C. Trocate (Eds.), *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco / Vale / BHP* (Vol. 2, pp. 87-137). Marabá: Editorial Iguana.
- SICONFI. (2018). Consultar Declaração. *Sistema de Informações Contábeis e Fiscais do Setor Público Brasileiro*. Retrieved from [https://siconfi.tesouro.gov.br/siconfi/pages/public/declaracao/declaracao\\_list.jsf;jsessionid=uqR1rUadzSJK5xsKBDdguk.node1](https://siconfi.tesouro.gov.br/siconfi/pages/public/declaracao/declaracao_list.jsf;jsessionid=uqR1rUadzSJK5xsKBDdguk.node1)
- Silva, M. Z. (2004). *A Vale do Rio Doce na estratégia do desenvolvimentismo brasileiro*. Vitória: EDUFES.
- Silveira, M. L. (2007). Los territorios corporativos de la globalización. *Geograficando*, 3(3).
- Sukagawa, P. (2010). Is iron ore priced as a commodity? Past and current practice. *Resources Policy*, 35(1), 54-63.
- Szablowski, D. (2007). *Transnational law and local struggles: mining, communities and the World Bank*. Oxford and Portland, Oregon: Hart Publishing.
- Triner, G. D. (2011). *Mining and the state in Brazilian development*. London: Pickering & Chatto.
- Tüv Süd. (2018). *Revisão periódica de segurança de barragem mina Córrego Feijão - Barragem I - Relatório técnico*. Retrieved from
- União, Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis, Instituto Chico Mendes de Conservação da Biodiversidade, Agência Nacional de Águas, Departamento Nacional de Produção Mineral, Fundação Nacional do Índio, . . . BHP Billiton Brasil Ltda. (2016). *Termo de Transação e de Ajustamento de Conduta*. Brasília.
- Vale. (2011, 28 Abr). Formulário 20-F. Relatório Anual 2010. Retrieved from [http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/20F\\_2010\\_p.pdf](http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/20F_2010_p.pdf)
- Vale. (2015a). *Formulário de Referência 2015*. Rio de Janeiro: Vale S.A.
- Vale. (2015b). *GARAL 644/2015 Ref PA COPAM 245/2004/046/2010 - Rev. LO 211/2011 - Revalidação Mina Córrego do Feijão*. Nova Lima: Vale S.A.

- Vale. (2016a). *Formulário de Referência 2016*. Rio de Janeiro: Vale S.A.
- Vale. (2016b). *Mina da Jangada e Mina Córrego do Feijão - Relatório de Avaliação de Desempenho Ambiental - RADA*. Belo Horizonte: Vale S.A.
- Vale. (2017a, 10 Abr). Formulário 20-F. Relatório Anual 2016. Retrieved from [http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/Vale\\_20-F\\_FY2016\\_-\\_p.pdf](http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/Vale_20-F_FY2016_-_p.pdf)
- Vale. (2017b). *Formulário de Referência 2017*. Rio de Janeiro: Vale S.A.
- Vale. (2017c). *Produção e vendas da Vale no 4T16*. Rio de Janeiro: Vale S.A.
- Vale. (2018a). *Demonstrações Financeiras 31 de dezembro de 2017. IFRS em US\$(Português)*. Retrieved from Rio de Janeiro: [http://www.vale.com/PT/investors/information-market/quarterly-results/ResultadosTrimestrais/vale\\_IFRs\\_BRL\\_3T18p.pdf](http://www.vale.com/PT/investors/information-market/quarterly-results/ResultadosTrimestrais/vale_IFRs_BRL_3T18p.pdf)
- Vale. (2018b, 13 Abr). Formulário 20-F. Relatório Anual 2017. Retrieved from [http://www.vale.com/EN/investors/information-market/annual-reports/20f/20FDocs/Vale\\_20F\\_2017\\_i.PDF](http://www.vale.com/EN/investors/information-market/annual-reports/20f/20FDocs/Vale_20F_2017_i.PDF)
- Vale. (2018c). *Formulário de Referência 2018*. Rio de Janeiro: Vale S.A.
- Vale. (2018d). *Relatório da Administração. Desempenho da Vale em 2017*. Retrieved from Rio de Janeiro: <http://www.vale.com/PT/investors/information-market/quarterly-results/ResultadosTrimestrais/RELATORIO%20DA%20ADMINISTRACAO%202017.pdf>
- Vale. (2018e). *Relatório de Sustentabilidade 2017*. Rio de Janeiro.
- Vale. (2019a). *Demonstrações Financeiras 31 de dezembro de 2018. IFRS em US\$(Português)*. Retrieved from Rio de Janeiro: [http://www.vale.com/PT/investors/information-market/quarterly-results/ResultadosTrimestrais/vale\\_IFRs\\_BRL\\_3T18p.pdf](http://www.vale.com/PT/investors/information-market/quarterly-results/ResultadosTrimestrais/vale_IFRs_BRL_3T18p.pdf)
- Vale. (2019b, 13 Abr). Formulário 20-F. Relatório Anual 2018. Retrieved from [http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/Vale\\_20-F%20FY2018%20-%20final\\_p.pdf](http://www.vale.com/PT/investors/information-market/annual-reports/20f/20FDocs/Vale_20-F%20FY2018%20-%20final_p.pdf)
- Vale. (2019c). *Produção e vendas da Vale no 4T18*. Rio de Janeiro: Vale S.A.
- Vale. (2019d). *Relatório de Sustentabilidade 2018*. Rio de Janeiro: Vale S.A.
- Valor Econômico. (2015, 16 Mar 2015). Vale é autuada por manter pessoas em condição análoga a de escravo. Retrieved from <https://www.valor.com.br/brasil/3956532/vale-e-autuada-por-manter-pessoas-em-condicao-analoga-de-escravo>
- Wainberg, R. (2017, 12 Dez). O que são debêntures? Pergunta muito comum no mercado financeiro. *Suno Research*. Retrieved from <https://www.sunoresearch.com.br/artigos/o-que-sao-debentures/>
- Wanderley, L. J. M. (2012). Recursos minerais na Amazônia brasileira: impactos e perspectivas. In J. Malerba (Ed.), *Novo Marco Legal da Mineração no Brasil: para quê? Para quem?* Rio de Janeiro: Fase.
- Wilson, J. D. (2013). *Governing global production resource networks in the Asia-Pacific steel industry*. Hampshire: Palgrave Macmillan.
- World Bank. (2019, 03 Mar). World Bank commodity price data (The Pink Sheet). *World Bank*. Retrieved from <http://www.worldbank.org/en/research/commodity-markets>
- Xavier, J. B., & Vieira, L. P. O. (2017). Interdito proibitório: instrumento de perseguição e isolamento da lutas populares. *Caderno Eletrônico de Ciências Sociais*, 5(1), 71-93.
- Yao, J., Ma, L., & Zhang, L. (2018). From Lab Experiments to Real Negotiations: An Investigation of International Iron Ore Negotiations. *Negotiation Journal*, 34(1), 69-87.

## ABOUT AUTHORS

- **Bruno Milanez**, - Universidade Federal de Juíz de Fora – UFJF, Minas Gerais, (Brasil). E-mail: [bruno.milanez@ufjf.edu.br](mailto:bruno.milanez@ufjf.edu.br) Orcid id: <https://orcid.org/0000-0002-5330-7407>
- **Rodrigo Salles Pereira dos Santos** - Universidade Federal do Rio de Janeiro – UFRJ, Rio de Janeiro, (Brasil). E-mail: [santosrodrigosp@googlemail.com](mailto:santosrodrigosp@googlemail.com)
- **Maíra Sertã Mansur** - Universidade Federal do Rio de Janeiro – UFRJ, Rio de Janeiro, (Brasil). E-mail: [anadido@gmail.com](mailto:anadido@gmail.com) Orcid id: <https://orcid.org/0000-0002-2833-813X>
- **Tádzio Peters Coelho** - Universidade Federal do Maranhão – UFMA – Maranhã, (Brasil). E-mail: [tadzioguaiabera@gmail.com](mailto:tadzioguaiabera@gmail.com) Orcid id: <https://orcid.org/0000-0001-8770-8893>

## BUSCANDO CONEXÕES PARA O DESASTRE: PODER E ESTRATÉGIA NA REDE GLOBAL DE PRODUÇÃO DA VALE

Bruno Milanez, Rodrigo Salles Pereira dos Santos, Maíra Sertã Mansur, Tádzio Peters Coelho  
Universidade Federal do Rio de Janeiro – UFRJ, Rio de Janeiro, (Brasil)  
Universidade Federal de Juíz de Fora – UFJF, Minas Gerais, (Brasil)  
Universidade Federal do Maranhão – UFMA – Maranhão, (Brasil)

---

### DETALHES DO ARTIGO

---

Histórico do Artigo:  
Artigo Convidado  
Disponível online: 01 de agosto de 2019

Editor Científico  
Ilan Avrichir

---

#### Palavras-chaves:

Redes Globais de Produção (RGPs)  
Minério de Ferro  
Barragem de rejeito

---

### RESUMO

---

Utilizando o modelo das Redes Globais de Produção, argumenta-se que os fatores que levaram ao rompimento da Barragem I, da Vale S.A., em Brumadinho (MG) em 2019, podem ser interpretados a partir do exercício de poder corporativo, que anulou os sistemas existentes de pesos e contrapesos, e da captura de valor por meio da redução de custos operacionais para garantir o aumento da remuneração aos acionistas, em um contexto de crescente financeirização. O artigo é construído a partir de revisão bibliográfica e análise documental. A construção do argumento se inicia a partir da construção do conceito de estratégia, definida como um repertório de ações coordenadas desempenhadas por um ou mais agentes que envolve o exercício do poder com o objetivo de: (1) aumentar a capacidade de ampliar ou capturar valor; (2) expandir o poder ou reduzir o poder de outros agentes; e/ou (3) modificar condições de enraizamento, próprias e as de outros agentes. Lançando mão dessa definição, em seguida, apresenta-se uma análise de restrições e oportunidades de geração e captura de valor pela Vale e da associação de suas estratégias com um aumento do risco operacional da Barragem I.

---

### Cite it like this:

Milanez, B., dos Santos, R., Mansur, M., & Coelho, T. (2019). Tracking Links to a Disaster: Power and Strategy in Vale's Global Production Network. *Internext*, 14(3), 265-285. doi:<http://dx.doi.org/10.18568/internext.v14i3.561>