



MINAS IS NO MORE

Evaluation of the economic and institutional aspects of the Vale disaster in the **PARAOPEBA** River Basin

Executive Summary
PoEMAS Research Group

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Executive Summary

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A major point of discussion throughout the report was that when large mining corporations, such as Vale SA, obtain a disproportionate amount of power over other actors (like the state, workers, or communities), the controlling institutions may no longer function properly, and the risk of major disasters increases, as happened in Brumadinho, in the basin of the Paraopeba River. Starting from this main argument, other complementary ideas were presented, analyzing the various aspects that led to a new dam failure barely three years after the disaster in the Doce River basin.

Initially, the report examined the company and its strategies. Firstly, the structural changes that Vale went through related to the intensification of its financing process were assessed. As such, it was established to what degree its operational strategy would be connected to the increasingly central role of financial markets in the company's activities: the behavior of its managers had become increasingly conditioned by financial actors and institutions, favoring shareholder value creation. It was also possible to perceive some recent changes in the relationship between the company and traditional funding bodies, such as the Banco Nacional de Desenvolvimento Econômico e Social (the Brazilian Development Bank) and pension funds connected to state companies, as well as the increasing importance of large investment funds.

Such strategic changes were directly related to transformations in the corporate governance of the company, which has been implemented since 2017; they have been further connected to modifications in long-term public financing policies in Brazil since 2016, and to the structure of private credit in capital markets..

Such an assessment would suggest modifications in the strategic orientation of Vale, which, then, made financial performance a priority by favoring the payment of dividends to shareholders, at the expense of their operational activities. In addition, the choice of managers with close relationships to the financial market, but who did not have specific knowledge of the peculiarities and risks inherent in the mining industry, suggested that the board was unable to create effective internal systems to ensure the operational safety of the mining ventures.

Next, the relationship between Vale and its workers was also assessed. This dimension was essential for understanding the disaster in the Paraopeba basin as an expanded work-related accident. Labor relations created by the company suggested different tactics. On the one hand, the use of outsourcing procedures tended to reduce the unionization of workers and brought both flexibilization and deterioration of the working conditions. On the other hand, Vale succeeded in bringing the directive boards of their trade unions closer to their interests, subduing them to their authority. This dynamic action made it more difficult for workers, in an institutionalized manner, to have enough influence over the company in order to raise the alert on any operational problems. In this sense, data suggest that Vale had a significant reduction in health and safety costs in its ferrous division, despite the expansion

of these within the company's cost structure.

Similarly, the relationships built with state actors showed how Vale, as well as the mineral sector in general, started to exert a growing power on public policy makers and, consequently, on regulatory bodies. The assessment concerning the instrumental power of Vale and other mining companies over politicians in the state of Minas Gerais showed that different tactics were used, such as the financing of electoral campaigns of candidates for executive and legislative bodies (until the election of 2014), the use of a "revolving door", and the occupation of seats on the boards of entities related to environmental control and river basin management.

This disproportionate power over the public policy makers has resulted in a significant reduction in the accuracy of the environmental licensing processes in Minas Gerais. Thus, Law No. 21.972/2016 and State Decree No. 47.042/2016 created, within the environmental structure of the state, the Superintendence of Priority Projects (SUPPRI), the purpose of which was to analyze the licensing processes of projects that were considered priorities. In this context, SUPPRI was created with the power to interfere directly in the licensing of certain projects, especially those considered of interest to the state government.

Another important aspect was the change in the environmental licensing process. Previously, the three-phase Environmental Licensing (Licenciamento Ambiental Trifásico, or LAT), intended for companies that could be large and medium potential polluters, separated the licensing process into three phases: prior license, installation license, and operation license. The new change simplified the three phases into one by means of the Simultaneous Environmental Licensing (Licenciamento Ambiental Concomitante, or LAC1). Also, another environmental norm (the SISEMA Instruction of January 2018) had the specific characteristic of allowing the extension of existing projects to be licensed by LAC1, even if originally the project required the application of the LAT procedures. As such, a significant reduction in the institutional power ended up being regarded as an important element in the reduction of the possibility of environmental control agencies to examine in more detail the conditions of elevated risk associated with mining activities.

After this more general analysis about the power and strategies of Vale, we moved to a more specific assessment in the context of Brumadinho and the Complex Paraopeba II (which included the Jangada and Córrego do Feijão mines).

Starting from a study at the local level, the first element assessed was the economic importance of mining, having in mind its contribution to the municipal budget and employment creation. In terms of economic power, an element to be considered is the size of Vale's revenue in relation to the municipal income. So, while the total gross revenue of Brumadinho's city hall in 2017 was R\$175.5 million, in that same year, the total amount of joint operations of Vale and its subsidiary MBR in the municipality was R\$1,162.0 million, i.e., more than six times the municipal revenue. A second element is their role in the local public budget. In 2018, the municipal revenue of Brumadinho, resulting from the Financial Compensation for the Mining Activity (Compensação Financeira pela Exploração Mineral, or CFEM) and paid by Vale, was R\$16.5 million, which corresponded to 26.4% of the total CFEM of the municipality and 10.5% of its current revenues. Besides, the power of Vale and other mining companies was also related to job creation. Locally, the mining industry corresponded to 21% of direct jobs created in the municipality (not counting outsourced workers, whom the governmental agencies associate with the service industry).

This assessment helped understanding the difficulty that the local opposition movements had in making themselves heard in regard to the environmental impacts of mining activities and the lack of safety measures put in place during the operation. It also pointed out the structural barriers to the implementation of economic diversification proposals in order to revert the municipality's mineral dependence.

Then, an analysis was made on the rupture of Dam I, based on an assessment of the mineral economy. Unlike the case of the Fundão dam, where the cycle of high and low ore prices in the global market became an important component to explain the reduction of investment in safety and maintenance, this was not the case in the event of Dam I.

In this latter case, the correlation identified by the international literature between the ore content and the risk of very serious ruptures in the dams was shown as a better explanation for the rupture of Dam I. According to the literature, mines with lower ore content would not only need proportionally larger dams but also would have relatively higher operating costs due to the necessary management of larger volumes of waste rock and tailings. This condition would reduce the profit margins of such mines, and would generate greater pressure for the reduction of operating costs. The data obtained on the planning of the expansion of the Complex Paraopeba II indicated that it was close to exhaustion, and that Vale had been trying to marginally extend its useful life, which would require a strict management of costs to ensure its economic feasibility. Furthermore, many waste rock piles and dams were close to their limits, which also pointed out the need for higher operation costs and complex solutions to continue operating these structures.

The pressure to reduce operating costs was expressed, in a certain way, by the inadequate management of preventive maintenance in the mines of Jangada and Córrego do Feijão. The analysis of building and operation conditions on the dams of both mines indicated several problems and limitations. For instance, Dams IV, IVa, and Menezes I were repeatedly considered "non-stable" until 2013, when the public prosecutor started a civil action against Vale.

In the specific case of Dam I, it showed a series of building and maintenance problems throughout its history, since 1976. Although many of the problems derived from decisions made prior to Vale's acquisition of the Córrego do Feijão mine, it was possible to identify that the mining company did not deploy enough resources to remedy some important safety flaws. Among the problems identified in different audits, the following should be mentioned: the lack of documentation, both of the project of the initial massif and of the geotechnical tests of different embankments; the unavailability of as-built documentation for specific embankments; the existence of piezometers that were damaged or suspected of not working properly; the non-maintenance of the minimum breadth of the tailings beach; recurrent problems of cracks and breaches in the drainage system; and the postponement of liquefaction analyses requested by auditors.

In general, the assessment of the documents relative to the maintenance of the Complex Paraopeba II indicated that decisions based on short-term priorities may have led the company to circumvent some safety standards. The persistence of such practices not only caused these questionable procedures to be seen as natural from the point of view of risk management, but they also caused an accumulation of failures that made the operation increasingly insecure. As a result, operational failures were ignored or disregarded by the self-monitoring system created by

Vale, which has led the company and the audit firms to underestimate the risks involved in the operation.

After this structural assessment of the Complex, the report tried to assess in greater detail the licensing process for the expansion of activities carried out in 2018. This analysis has shown how the changes in environmental legislation were fundamental in granting the license; it has also shown how such changes allowed the project to be quickly approved without going through procedures that would have required a more refined analysis of the operating conditions.

In this sense, the participation of SUPPRI was of specific relevance, which, due to the lack of a system of checks and balances, acted with disproportionate discretion, making room for a considerably more flexible interpretation of the existing legislation. So, its decision to accept a project that relied on a series of activities and infrastructure works that had never been licensed, considering it an “expansion,” was, to say the least, *sui generis*. Moreover, the way SUPPRI ignored the legislation concerning the location criteria, and its interpretation that the installation of certain infrastructures would have major implications regarding its immediate operation, were essential to authorize the licensing by means of LAC1. Such a measure not only limited the possibilities of the assessment of the project, but also restricted the analysis of its potential environmental impacts.

In addition to an assessment of the conditions that led to the collapse of Dam I, the report also presented initial considerations regarding the impact and consequences of the disaster.

A study of the characteristics of the race and income of the population affected by the collapse in the first several kilometers of the tailings’ path indicated a greater presence of low-income, primarily black people. Thus, it was found that the resident population in the area methodologically defined as being affected by Vale’s tailings in Brumadinho was predominantly composed of non-whites (63.8%), a population percentage higher than the municipal (52.5%) and state (54.6%) averages, even in rural areas (respectively 59.8% and 59.5%). In the areas considered to be the most affected populations and residences, namely Parque Cachoeira and Córrego do Feijão, the percentage of non-white persons was 70.5% and 58.8%, respectively. In 2010 (the year when the census was completed), the average monthly nominal income for people over 10 years of age with and without income in the area investigated was R\$475.25; this was 7% less than the minimum wage for that period.

However, despite the racial profile being mostly non-white, and the population in the affected areas being predominantly poor, the report drew attention to the fact that we should not disregard or diminish in any way the losses and pain of other residents. While establishing a debate about environmental injustice and environmental racism, the intention is not to determine who the affected people are, nor how many there are. The report especially does not intend to disregard those who do not correspond to the average profile of the population identified in the impacted areas, or those who were directly affected but reside in other localities that also suffered the Dam’s impact, or who were present in the area of the disaster for various reasons (particularly as workers). In this sense, other variables—in addition to the geographical location of households—are essential to be able to define who the people affected were, and it is up to them to identify themselves as such.

Another element in the consequences of the disaster referred to the payment to workers, victims, and their families. It could be seen that Vale refused to comply with several requests from relatives of the victims, from workers who

survived, and from the unions. Given the positioning of the company, the support from different social movements for those who were affected, as well as the performance of the task force created by institutions within the legal system, were vital in reducing the imbalance in the correlation of forces between the community and the company.

In close connection to the social element, another necessary analysis refers to the current and potential economic impact of the collapse, even though it might be still a preliminary one. In this sense, it was necessary to understand the challenges faced by the municipality of Mariana after the Fundão dam collapsed. In the period from 2014 to 2018, the CFEM paid in Mariana showed a sharp drop and went from R\$133.7 million (value adjusted by the IPCA, the Broad National Consumer Price Index) down to R\$106.1 million. Similarly, Mariana's current incomes were reduced from R\$445 million to R\$264.6 million during that same period. Regarding jobs in Mariana, from November 2015 to December 2016, 652 workers were fired in the mining industry, a tendency that was kept in the following year with the loss of another 515 jobs.

In Mariana, in addition to the mineral sector, economic alternatives such as agriculture also suffered a deep impact, with a strong decline in the planted area after 2015. For instance, maize production had a drastic reduction and fell from 6,480 tons to 80 tons; in turn, the cultivated area decreased from 2,000 hectares to 53 hectares.

Similarly, in the case of Brumadinho, the decline of the current municipal income was also to be expected due to the shutdown of the Complex Paraopeba II. In addition to the revenue decrease, there has been an increase in the expenses of the municipality because of the problems arising from the collapse, due not only to the involvement of the public health system but also to the destruction of the municipal infrastructure, namely the roads. To this scenario, the damages to tourism and fishing sectors must also be added. Local agriculture was particularly impacted, as approximately 400 small farmers living along the Paraopeba river faced great losses.

The examples of Mariana and Brumadinho show, in a striking way, the risks of economies that depend so heavily on mineral extraction. Commonly, the mineral dependence is directly related to the depreciation of economic alternatives; in the Brazilian experience, in general, large-scale mining develops at the expense of other economic activities. This reality became even more evident after the collapse of the tailings dams. As such, these disasters force the debate on economic diversification and reduction of dependence on all mining towns.

Also, considering the consequences, the report pointed out some issues concerning changes in the assessment of the stability conditions of tailings dams, and changes in legislation concerning the safety of dams.

Throughout February, a series of communities located in Self-Rescue Zones (ZAS) were evacuated due to the adoption of stricter criteria for defining the stability conditions of the dams by the National Mining Agency (ANM). These evacuations happened in the municipalities of Barão de Cocais, Itatiaiuçu, Nova Lima, and Ouro Preto. During these evacuation procedures, the lack of communication on the part of companies was blatant; there were cases in which people were not properly informed about the true reason for the evacuation. In addition, the process occurred without a proper timeframe being set for the return of those persons, or any real action plan of the corrective measures.

The need for more stringent standards for the dams' stability assessment in Brazil became evident on March 31, the

deadline for the mining companies to submit the stability conditions statements to ANM. The register of the National Policy for Dam Safety included, at the time, 425 mining dams registered in the national territory. Of this total, 56 (13%) dams did not have their stability certified, 36 (8.5%) of which were in the state of Minas Gerais. Among the dams that did not renew their certificates of stability, 39 (9%) did not deliver the proper documentation and 17 (4%) were considered “not stable”.

According to the criteria then in effect, the assessment of Dam I was that it could be considered stable, yet it showed several flaws in the inspection system and its parameters. Accordingly, the understanding of the ANM and the auditing companies of the need to modify the conditions by which the stability of the dams was certified proved to be an important process of institutional learning. Therefore, despite the economic challenges identified in the short term, and relative to the temporary interruption of activities in some of the mines, it became evident that the adoption of stricter parameters for measuring dams’ stability was a fundamental condition to reduce the risk of further disasters.

In its last analytical section, the report focused on the early changes in legislation implemented after the collapse of Dam I. In this context, we analyzed Joint Resolution SEMAD/FEAM No. 2.765/2019, ANM Resolution No. 4/2019, and State Law No. 23.291/2019.

Joint Resolution SEMAD/FEAM No. 2.765/2019, issued just five days after the collapse of Dam I, was the first to be published. Considering how fast it was issued, the superficial manner in which it was handled, and the lack of public debate in its preparation, the measure has proved extremely inefficient in building a solution to the problem.

Resolution ANM No. 4/2019 produced advances that were more practical, although there were still gaps and limitations that need to be reviewed to ensure that the proposed objectives are achieved. In the first place, it lacks some definitions to ensure its clarity; for example, on decommissioning, it would be important to list which “alternative methods” would be considered environmental and technically acceptable for the disposal of tailings. Secondly, it would be necessary to reconsider the issue concerning the ZAS; ANM should also prevent the building of new dams that may put existing communities within the ZAS, and include a solution for the dams with communities that already live within ZAS. Finally, the resolution was vague in its use of the words “decharacterization” and “decommissioning”, which may generate legal questions about the proper way of dealing with existing dams.

State Law No. 23.291/2019, published by the state of Minas Gerais, was a much broader instrument for reducing the risks associated with the construction and operation of tailings dams. This may be because of the broad participation and debate that happened during its preparation, which gave room to the inclusion of different perspectives on the problem. Mostly, the intention of this law was to prevent the errors and institutional failures associated with the collapse of the Fundão dam and Dam I from happening again. The law forced the installation, the operation and the expansion of dams to be mandatorily licensed using the three-phase model (LAT). To obtain the Prior License (LP), mining companies will have to submit the project of the dam with its final dimensions, preventing the projects from being submitted on a piecemeal fashion, which usually hides the total impact and risk of the dams. Also, to obtain the Operating License (LO), the mining companies must have bond for the socioenvironmental recovery in cases of disaster or the deactivation of the dam. The law also established that the

public hearings relative to the licensing of dams should include the participation of people from the municipalities located along the river basin. It forbade licensing for the construction, installation or expansion of dams if there are communities living within a ZAS. It prohibited the license for the operation or expansion of dams with an upstream height increase. Finally, the law also forced mining companies to make public all the information analyzing the water level within the dam and some geotechnical parameters.

Despite the advances identified in the assessment of those rules, new adjustments are still considered necessary. In the first place, having in mind that two state and one federal (infra legal) regulations were assessed, it would be desirable to unite such measures by changing the federal dam safety legislation. Such legislation would need, among other things, to unify the understanding on the decharacterization of dams, since there seems to be a disagreement about such definition.

A second problem that has still not been faced concerns the abandoned dams. Many dams considered high risk are currently linked to companies that are either bankrupt or that have simply terminated their activities. To considerably reduce the risk of people living downstream of those dams, this problem should be dealt with by government, either directly or by charging the sector that jointly bears responsibility for this environmental liability.

A third problem concerns populations who currently live within a ZAS. The ANM resolution ignored that concern, and the solution presented by Law No. 23.291/2019 appeared to be insufficient. There are several problems and concerns directly related to the permanence of the population in those areas—due to both the endless feeling of risk and the procedures used to remove them or evacuate the areas. The public powers should not avoid dealing with this problem.

Finally, none of the new regulations has changed the self-monitoring system of the stability of dams. As such, the possibility remains for mining companies to choose and pay the auditors who will prepare the stability reports. This relationship gives the mining companies a disproportionate amount of power over the auditing companies, in many cases, making it unfeasible to have independent reports. This model of self-monitoring is associated with the difficulties in identifying the actual stability conditions of the dams, both in the cases of Fundão and Dam I.

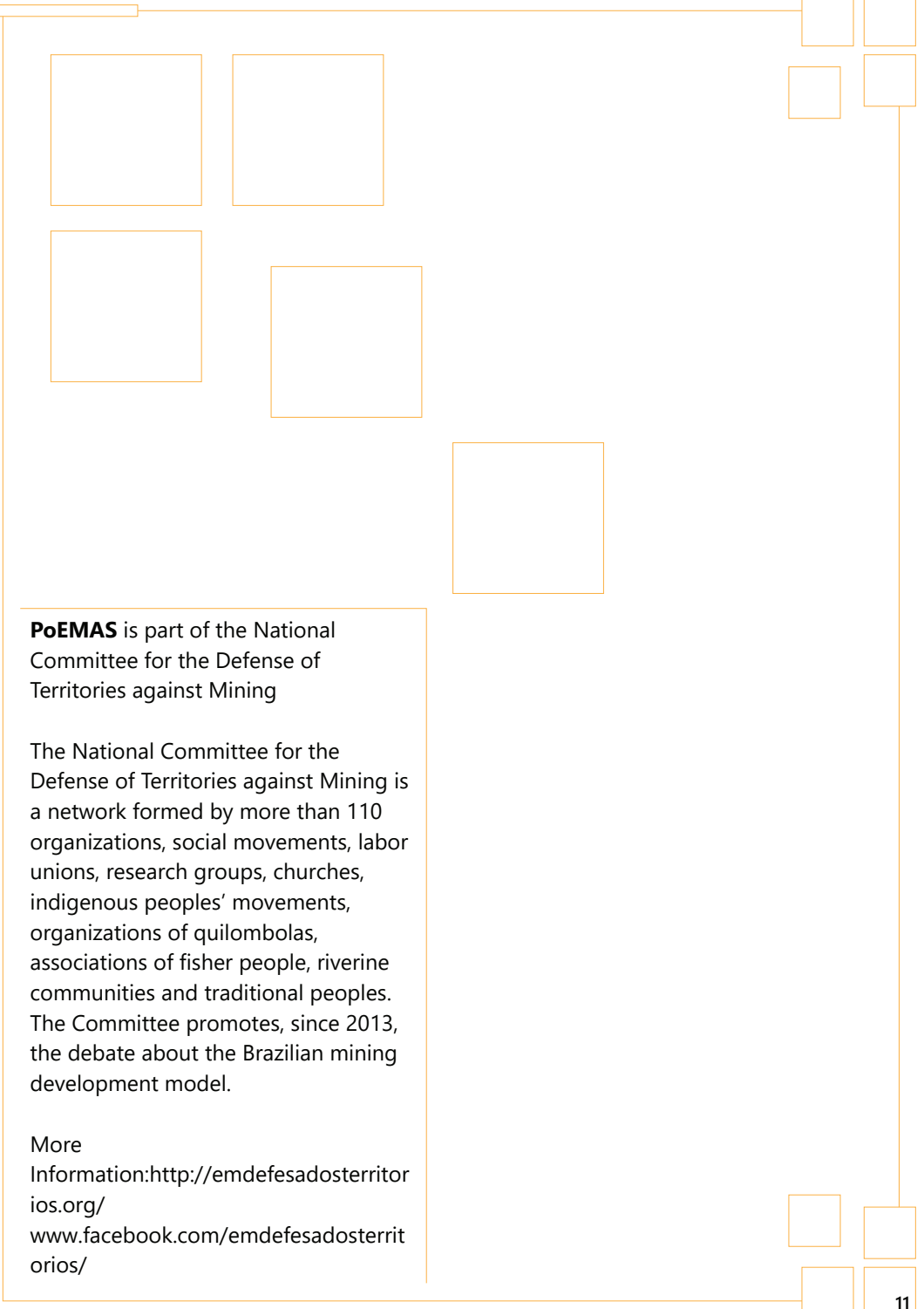
Thus, this assessment showed that the new regulations show some advances to a greater or lesser degree. However, due to the urgency with which they were made, they created some divergence. Soon it will be necessary to create a unifying legislation that will put together the main aspects of these regulations, in addition to covering the gaps they left behind.

Finally, the report presented some recommendations for limiting the power of the mining corporations over the state and the communities, in order to rebalance the correlation of power and to guide public policies that may reduce the chance of further disasters like those at Fundão and Dam I. These recommendations can be systematized as follows:

- To end the self-monitoring process of dams by auditors who are selected and paid by mining companies;
- To create mixed committees to monitor the safety of dams, including experts, workers, and community representatives;

- To change the environmental licensing process to make it more rigorous and insightful, particularly in the state of Minas Gerais;
- To strengthen the supervision and control entities, both in the mineral industry (ANM) and in the environmental area (IBAMA, FEAM, IGAM, etc.);
- To demand that mining companies provide resources that minimize the disruptions caused by the closure of mines and mitigate the impact of socioenvironmental disasters and compensate for them;
- To propose legislation to unify the new rules and overcome the conceptual and operational differences existing between them (e.g., the concepts of deactivation, decharacterization, and decommissioning);
- To prepare policies that guarantee the decommissioning of abandoned dams, as well as ensure the safety of communities living within the ZAS;
- To create systems that will cause the mining companies to adopt technological solutions for the treatment and disposal of tailings other than dams;
- To guarantee assistance to all people affected by the collapse of the Fundão dam and Dam I;
- To prepare policies of economic diversification in mining towns; and
- To create deliberative procedures guided by the interests and needs of workers and communities that live in mining regions.

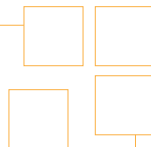
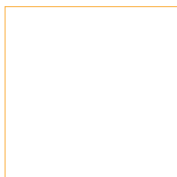
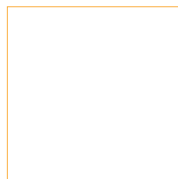
In summary, the institutional and economic situation that led to the disaster on the Paraopeba river, as well as on the Doce river in 2015, is complex and does not have a simple solution. It results from a long process where the mining sector has created roots in the economy and in the politics of Minas Gerais and of Brazil. Obviously, we did not intend to cover all possible analyses in this study. We sought, on the contrary, to open a debate about what happened in Brumadinho which, to some extent, is like other disasters related to the mining industry. It is, therefore, an independent assessment, one that intends to assist the actions of social movements, non-governmental organizations, workers in the mining industry, and public authorities. However, those groups and organizations are the main players involved, and their demands must be considered central during the transition to another mining model. As such, we attempt to contribute to those who demand guaranteed rights for the people affected and remediation of the environmental impacts, and to add to the academic and political debate about the mining activity in Brazil.

A diagram consisting of several empty rectangular boxes of various sizes connected by thin orange lines. A horizontal line at the top connects a small box on the left to a cluster of four boxes on the right. A vertical line on the right side connects the bottom of the four-box cluster to a cluster of three boxes at the bottom right. In the center-left area, there are four boxes arranged in a 2x2 grid. Below this grid is a single box. To the right of that is another single box. Further right is a larger box. At the bottom left, there is a large rectangular box containing text.

PoEMAS is part of the National Committee for the Defense of Territories against Mining

The National Committee for the Defense of Territories against Mining is a network formed by more than 110 organizations, social movements, labor unions, research groups, churches, indigenous peoples' movements, organizations of quilombolas, associations of fisher people, riverine communities and traditional peoples. The Committee promotes, since 2013, the debate about the Brazilian mining development model.

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