Global Benchmarking of Mining Waste Rules – Brazil

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This report provides additional detail to the completed excel document.

Introduction

The following document and corresponding spreadsheet compare federal and state level legislation in Brazil against *Safety First: Guidelines for Responsible Mine Tailings Management*. Specifically, this analysis reviews Federal Law nº 12.334 and the National Mining Agency's corresponding Resolution Nº 95, as well as the Law n.º 23.291/2019 from the state of Minas Gerais called the *Lei Mar de Lama Nunca Mais* (The Sea of Mud Never Again Law).

Federal Laws and Regulations

On the Federal level **Law nº 12.334** passed in 2020 and updated **Law nº 14.066** February 7, 2022 creates the National Dam Safety Policy and outlines the roles of the National Mining Agency (ANM, in Portuguese) and other government agencies. The objectives of the legislation are:

> **"Art. 3** – The National Dam Safety Policy (*Política Nacional de Segurança de Barragens* - PNSB) has the following objectives: ...
>
> **I** – Ensure compliance with dam safety standards so as to promote prevention and reduce the possibility of accidents and disasters and their consequences; (Stipulated by Law nº 14.066, of 2020) ...
>
> **III** – Promote monitoring and tracking of safety measures employed by those responsible for dams.
>
> **IV** – Create the necessary conditions in order to expand the universe of dam control on the part of the public, based on monitoring, guidance and correction of security actions.
>
> **V** – Gather information that supports dam safety management on the part of governments.
>
> **VI** – Establish technical compliance criteria that will allow assessment of the adequacy of parameters established by public authorities.
>
> **VII** – Promote a culture of dam safety and risk management.

> **VIII** – Define emergency procedures and promote joint action by operating companies, regulators, and civil defence and protection agencies in case of incidents, accidents or disasters. (Included in Law nº 14.066, of 2020) …"

This federal law is codified in ANM's Resolution Nº 95 of 07 February 2022 which established the regulatory framework to implement the The National Dam Safety Policy. Resolution Nº 95 was issued in response to the disasters in Mariana (2015) and Brumadinho (2019), consolidating rigorous technical parameters for stability, monitoring, transparency, and risk management, and is considered a central reference in the implementation of the National Dam Safety Policy (Law No. 12,334/2010, amended by Law No. 14,066/2020). The resolution also established the Integrated Mining Dam Safety Management System and the National Mining Dam Registry, an online portal that tracks tailings dams for the entire country.

However, there is no systematic public oversight of the completeness and consistency of the information recorded in the Integrated Mining Dam Safety Management System. ANM Resolution No. 95/2022, which regulates the National Policy on Mining Dam Safety, does not establish verification and sanction mechanisms for incorrect, incomplete, or missing information. Thus, the reliability of the data depends largely on the self-reporting of mining companies, without effective external control.

The lack of standardization and integration between official information systems on mining dams in Brazil has led to significant data discrepancies. Agencies such as the National Mining Agency (ANM), the National Water and Basic Sanitation Agency (ANA), and state institutions—such as the State Environmental Foundation (FEAM), in Minas Gerais — often present divergent figures regarding the number of existing dams, their risk classification, and the stage of decommissioning of the dam.

The draft of ANM Resolution No. 16453498, published by the National Mining Agency (ANM) on April 21, 2025, marks the beginning of the process of revising ANM Resolution No. 95/2022, currently recognized as the main regulatory framework for mining dam safety in Brazil.

The public consultation conducted by ANM, which was open between April and June 2025, aimed to allow institutions, experts, civil society organizations, and citizens to submit analyses and suggestions before the new standard was approved. However, the draft presented for consultation represents significant losses in relation to Resolution 95/2022, removing technical and conceptual provisions that ensured greater rigor in risk assessment and transparency of information.

It is important to clarify that Brazil does not have specific legislation for the regulation of filtered tailings facilities. The monitoring and safety standards set out in the federal Law nº 12.334 do not apply to filtered tailings facilities, and the information about their safety and stability is not included in the National Mining Dam Registry. Some estimates

indicate that there are over 700 filtered tailings and waste rock facilities in Brazil, and there have already been significant failures of filtered tailing facilities.

Laws in Minas Gerais

After the catastrophic tailings dam failures in Mariana and Brumadinho in Minas Gerais, the state passed additional dam safety measures as codified in Law n.º 23.291/2019, called the *Lei Mar de Lama Nunca Mais* (The Sea of Mud Never Again Law). This state-level law includes more rigid standards for licensing and inspection of tailings dams, as well as timelines for decommissioning upstream tailings facilities.

Implementation and Oversight

Analyses carried out by the Mining Dam Observatory of the Mining and Territory Education Research and Extension Group (ObaM/EduMiTe-UFMG) point to a reduced number of dam inspections in the country, especially in Minas Gerais, the state with the largest number of tailings facilities in Brazil.

The official data systematized by EduMiTe show that, on average, less than 15% of registered dams received direct inspection by the National Mining Agency (ANM) over the two year period analyzed. EduMiTe also found that the peaks in inspection occurred in specific months, concentrated in periods of drought (between June and September), when weather conditions are more favorable for technical access — but which do not coincide with the months of greatest hydrological risk, occurring between December and March, a period of intense rainfall in the region of Brazil with the largest number of dams.

This time lag between inspection and seasonal risk represents a serious preventive gap, since dam failures and instability have historically intensified during the rainy season. In 2024, there were only 312 inspections of mining dams across the country, of which 187 occurred in Minas Gerais. In 2025 (through September), 211 inspections were recorded, 126 of which were in Minas Gerais. Despite a slight recovery in relation to the post-pandemic period (2021–2023), these numbers remain well below actual need, considering that the country has more than 900 mining dams.

Additionally, the National Mining Agency currently faces a serious budget crisis that threatens to paralyze its inspection activities and compromises the safety of mining dams in the country.

Operation Rejeito

Operation Rejeito (Operation Tailings) is a joint action launched on September 17, 2025, by the Federal Police (PF), the Office of the Comptroller General (CGU), the Federal Public Prosecutor's Office, and the Federal Revenue Service, with the aim of dismantling a criminal organization that operated in the mining sector in Minas Gerais through

environmental licensing fraud, corruption, money laundering, and misappropriation of federal assets.

According to the investigations, the criminal group collaborated with public servants from state and federal environmental agencies, manipulating decisions, licensing processes, and environmental authorizations. Front companies were identified, as well as "straw men" for moving funds, in addition to an internal "manual" of corruption, which detailed illegal practices for maintaining the scheme.

Operation Rejeito has resulted in:

- The execution of 22 preventive arrest warrants and 79 search and seizure warrants, and the freezing of assets worth approximately R$ 1.5 billion.
- The arrest of the director of the National Mining Agency (ANM), Caio Mário Trivellato Seabra Filho, and the former superintendent of the Federal Police in Minas Gerais, Rodrigo de Melo Teixeira (current director of Administration and Finance of the Geological Service of Brazil).
- The dismissal or removal from office of several civil servants in state agencies in Minas Gerais, such as directors of FEAM (State Environmental Foundation), IEF, and others.

The investigation estimates that the projects linked to the scheme had an economic potential of more than R$ 18 billion and that the profit obtained from the illegal practices would be at least R$ 1.5 billion. Those investigated may be charged with crimes such as active and passive corruption, environmental crimes, money laundering, criminal organization, misappropriation of federal assets, and obstruction of investigations. The operation highlights a "state capture" by the mining sector, that is, a compromise of agencies that should regulate and supervise, favoring private interests to the detriment of environmental protection and public control.

Operation Rejeito is considered one of the largest dismantling of corruption networks in the environmental/mining sector ever seen in Minas Gerais, as it reveals how licensing and inspection processes were systematically corrupted. It highlights the urgent need for institutional reinforcement in environmental control agencies, greater transparency in licensing, and effective accountability to prevent new environmental disasters and loss of institutional legitimacy.

1. Ban upstream dams at new mines, and safely close existing upstream facilities

Brazil is one of the few jurisdictions in the world to have banned the use of upstream dams. Additionally, ANM's RESOLUTION Nº 95 from February 7, 2022, which implements Law nº 12.334 from September 20, 2010, introduces a series of

requirements that are more protective than *Safety First: Guidelines for Responsible Mine Tailings Management*:

> **CHAPTER VIII –** CONCERNING REGULATORY MEASURES FOR THE LOCATION OF MINING DAMS ...
>
> **Art. 58.** In order to reduce the risk of failure – especially by liquefaction – of upstream construction method dams, or dams erected by a method reported as unknown, the operating company must:
>
> **I –** have an executive technical plan for de-characterization of the structure, which must also consider systems that stabilize the existing dam or the construction of a new containment structure situated upstream, both in accordance with the project designer's technical specifications, so as to minimize the risk of failure by liquefaction and to reduce any inherent potential harm, guided by safety and following all safety criteria in this Resolution and in Norm ABNT NBR 13.028 or other norms that may succeed them.
>
> **II –** Carry out the work of existing dam stabilization or the construction of a new containment structure situated upstream, in accordance with the project designer's technical specifications.
>
> **III –** Complete the de-characterization of the dam by 25 February 2022, according to the deadline established in § 2, art. 2-A of Law nº 12.334 of 2010, which may be extended by the ANM upon presentation of technical justification, as long as endorsed by the Licencing Authority of Sisnama (National Environmental System).
>
> **§ 1** In cases where an extension is needed for the completion of the de-characterization process, due to a technical impediment, as per definition of subparagraph VIII of art. 2 of this Resolution, the operating company must present their request to ANM no later than 25 February, 2022, with a technical justification for such request, which must then be forwarded to the Licencing Authority of Sisnama.
>
> **§ 2** The technical plan mentioned in subparagraph I, as well as the technical justification for extension of the deadline referred to in § 1 of this article, must be prepared by an independent third-party team, formed by professionals legally accredited by CONFEA/CREA (Federal Council of Engineers/Regional Council of Engineers).

2. Mandate the use of Best Available Technologies, in particular for filtered tailings

We did not find any reference to "*Require the use of Best Available Technology for tailings, particularly in the case of filtered* tailings" in Federal Law No. 12,334, dated September 20, 2010, or in its regulations: ANM Resolution No. 95, dated February 7, 2022. However, State Law 23.291/2019, of the State of Minas Gerais, innovates by recommending the use of the best available technique for the disposal of tailings in

dams, but without specifying whether it applies to filtered tailings. It reads "Proof of the existence of the best available technique and alternative location with less potential for risk or environmental damage, for the accumulation or final or temporary disposal of industrial or mining tailings and waste in dams." This text could be equivalent to "*Require the use of Best Available Technology for tailings, particularly in the case of filtered* tailings," however, it refers only to the disposal of tailings in dams (without mentioning "*filtered tailings*"), and is valid only for the State of Minas Gerais.

3. Appropriate monitoring systems must be in place to identify, disclose, and mitigate risks

Federal safety legislation and regulations do not clearly and explicitly cite the expression *"Adaptive Management Plans*" for the monitoring tailings facilities, but they do mention "...*the development of management practices based on clearly identified results and monitoring to determine if management's actions are achieving the desired results. ...*".

It may be that there are internal ANM regulations that use the term "*Adaptive Management Plans"*, but if they exist, the author did not have access to these norms, regulations and procedures.

In any event, in the case of tailings dams, the ANM requires monitoring instruments and has access to "*Numeric and measurable performance criteria based on predictions of engineering behavior.*" In other words, even if Law nº 12.334 and its main regulation, ANM Resolution Nº 95, do not directly cite the term "Adaptive Management Plans*"*, it is clear that they include *management and monitoring practices and numeric and measurable performance criteria based on predictions of engineering behavior*.

Similarly, while Law nº 12.334 and ANM Resolution Nº 95, do not specifically cite the expression "*numeric trigger levels to signal imminent risks"*, it is clear that it does require all information and instruments needed to function in this sense: "*signal imminent risks, such as piezometer readings, supernatant pool characteristics, tailings and tailings water chemistry and other.*" And, while "*Mitigation measures designed for each criterion or trigger,"* are not required, the ANM has all the necessary information and instruments to "*avoid catastrophic or other type of facility failure*" to function in this sense. Lastly, while the law and corresponding regulations do not specifically cite the expression "*an evaluation of the effectiveness of the measures taken"*, it is clear that, in the case of tailings dams, ANM has all the necessary information and instruments to carry out an "*evaluation of the effectiveness of the measures taken*".

While the ANM is required to make certain documents publicly available, including Emergency Action Plans, at present, civil society cannot gain access to many of the reports and raw data generated by the operating company.

For example, in 2025, we at the NGO Forum Permanente São Francisco tried insistently to obtain some of the data used to calculate the dimensions of dam overflow and rainwater drainage systems. This data is essential for planning spillways, channels and

gutters that would reduce the probability of dam failure and landslide to a minimum in case of intense rains.

The Forum also requested the reports of the Dam Safety Plan and of the Regular Dam Safety Inspections for dams that have a High Potential of Associated Harm. Both documents are essential for mining dam safety, required and monitored by the National Mining Agency – ANM – in order to enforce compliance with the Law.

The ANM does not make these two reports available on its site and has imposed a series of obstacles for the Forum. Other information requested by the Forum that was not provided by the ANM included inspection reports for the monitoring of mining dams associated with high potential harm in the State of Minas Gerais, and the response from the ANM to the company on the appropriateness of the dam design and content of the reports.

4. Towards safer closure with no credible failure modes

Brazilian legislation — especially Law No. 14.066 and ANM Resolution No. 95 — establishes the general concept for the closure and decommissioning of dams, but the definition is not as explicit as or exactly aligned with Safety First. There is no specific legislation at the federal and state levels that regulates the closure of filtered tailings facilities or waste rock piles.

Federal and state legislation mention that a Mine Closure Plan must be presented at the start of mining activities, but do not provide details. At the federal level, a Mine Closure Plan (PFM) is required for mining applications, which precedes the licensing process, i.e., before socio-environmental impact studies. Federal legislation requires that the PFM be updated before the mine is closed. In Minas Gerais, the Mine Closure Plan is mandatory as part of the licensing process. Federal legislation establishes a specific licensing process for decommissioning dams that requires a project that comply with Brazilian technical standards.

Brazilian legislation focuses on eliminating the function of tailings dams and stabilizing the site, providing for monitoring for an indefinite period when necessary, but the decision of how long is left to the discretion of the companies. The legislation does not provide the same operational and preventive definition as "*no credible failure mode*" in the Safety First.

Decharacterization projects for dams and waste rock piles are developed based on the deactivation of the structures, that is, when they no longer receive tailings, sediments, or waste. Once the decharacterization process is complete, the mining company is no longer responsible for the dams and waste rock, meaning that there is no provision for perpetual monitoring, even if the tailings and waste rock remain in the structures after the decharacterization process is complete. The definition and details of the dam decommissioning process were only incorporated into the legislation after the Vale collapse in Brumadinho. The changes occurred in Federal Law No. 14.066, Decree No.

10.965, ANM Resolution No. 68.2021, and ANM Resolution No. 95/2022. Decharacterization is a legal requirement restricted to mining dams, specifically those built using the upstream method.

Federal regulation states that the regulatory agency will consider a dam "decommissioned" when the mining company responsible carries out a project in such a way that the dam no longer has the characteristics of a dam and is “stabilized.” However, part of, or even all of the tailings, remain in the structure, which is then removed from the ANM's Mining Dam Registry, which can cause future problems. There is a time frame for monitoring decharacterized structures, but this is carried out by teams hired by mining companies, supposedly independently. The ANM, as the regulatory agency, and the regulatory agencies at the state level, should evaluate the decharacterization, however, considering their limited staff capacity and the efficiency of this analysis is questionable.

Brazil has points aligned with Safety First especially regarding the need for stability and post-closure monitoring. However, the legal framework is more conceptual than technical-operational, and does not explicitly mention the principle of “no credible failure mode” or “perpetual maintenance.”

At the federal level, the Mine Closure Plan requires mining companies to prove their financial capacity to cover the costs of closure, maintenance, and possible accidents through financial guarantees (such as insurance, securities, or guarantee funds). Similarly, at the state level, the Mar de Lama Nunca Mais provides for a bond to cover the costs of decommissioning dams. However, in practice, there are no specific regulations and this action has not been implemented, thus also remaining at the conceptual level rather than the technical-operational level.

There are no specific regulations detailing what constitutes “unacceptable risk,” as required in Safety First. ANM Resolution 95/2022 provides a general concept of “unacceptable risk” as “*a situation in which work should not be started or continued until the risk has been reduced. If it is not possible to reduce the risk, even with unlimited resources, the work must remain prohibited*,” but in practice there are no mechanisms to operationalize how to identify an unacceptable risk. Although the environmental licensing process provides for an Environmental Impact Study and Report (EIA/RIMA) in which the impacts should be addressed, EIAs/RIMAs are incomplete, use questionable methodologies and outdated data—including climate data—and underestimate impacts and overemphasize mitigating and “compensatory” measures. There are no examples of situations in which an EIA/RIMA for a license identified “unacceptable risks.”

ANM Resolution 95/2022 also provides that, in the case of dams classified as unacceptable risk, "the entrepreneur must immediately, under penalty of embargo or suspension of mining dam activity, interrupt the discharge of effluents and/or tailings into the reservoir, and maintain the monitoring, maintenance, and conservation services of the tailings and sediment containment structure until it is reclassified to the ALARP

or acceptable level." In other words, they consider that the mining company will resolve whatever causes the dam to be considered an unacceptable risk, taking only the structural issues of the dam into account and not situations that involve unacceptable risk due to the location of a dam – such as in a region where there are people in a Self-Rescue Zone or water catchments supplying a large number of people who would be immediately impacted in the event of a breach and/or leak.

There is no federal or state (Minas Gerais) legal provision that specifically addresses bankruptcy declarations or that imposes any restrictions on sales to junior companies. In Brazil, mineral resources are owned by the federal government. Therefore, in the case of the sale of a mining company, the process also involves the transfer of mining titles. This even precedes the licensing process in the case of a venture that wishes to start a mine or mining complex in a given location.

With regard to bankruptcy and liability, there is no specific legislation that expressly states who assumes responsibility for the dam and the mine in the event of the mining company's bankruptcy—but, combining the applicable legislation, doctrine, and court decisions, it can be inferred that liability continues and that environmental liabilities are not extinguished by bankruptcy.

Federal (12.334/2010, 14.066/2020, 6.938/1981) or state (Mar de Lama Nunca Mais Law) regulations do not contain an explicit provision that automatically transfers responsibility to another agent when the mine or mineral operator declares bankruptcy. What they establish are ongoing obligations of safety, monitoring, safety plans, duty of repair, and requirement of guarantees, which are assumptions that, if there is succession or corporate change, someone will continue to be liable. In legal practice, it is argued that environmental liability is perpetual in nature, a matter of public order, and is not extinguished by bankruptcy. In other words, even if the mining company goes bankrupt, the environmental and dam safety obligations do not disappear—whether through the inclusion of environmental liabilities in the bankruptcy estate, the liability of successors, or the liability of former controllers.

Additional considerations:

In larger mining complexes, where there are several tailings dams and and waste rock piles in the same mining project, the decommissioning processes may occur for dams located near other tailings structures (waste rock piles and other dams) that remain active, particularities not usually considered in decommissioning processes and complicating the situation of “closing” these structures. The Integrated Mining Dam Safety Management System of the ANM and the current decharacterization policies treat each dam individually. This is fragmented and incompatible with the reality of the risks, since the impacts of a breach, leak, or failure transcend administrative boundaries, following the course of rivers and affecting different municipalities along the same river basin. It is essential that safety and decharacterization analyses adopt the watershed approach and the concept of Dam Complexes, allowing for the assessment of

synergistic and cumulative effects between different structures. This territorial integration is essential to improve disaster prevention, ensure water security, and protect populations living downstream from mined territories.

Information on the decommissioning of mining dams in Brazil is available at SIGBM Público | ANM - Agência Nacional de Mineral. Data extracted from this system on October 16, 2025, indicate the existence of 149 dams in the process of decommissioning in the country. Among these, 111 structures (74.5%) adopted the solution of maintaining the remaining structure, which means that part of the tailings was kept inside the decommissioned dam, without being completely removed. Only 27 structures (18.12%) opted for the total removal of tailings, a solution considered safer from an environmental and risk reduction perspective.

This lack of uniformity between information presented by government agencies compromises transparency and the capacity for social monitoring, making it difficult to monitor safety actions and the decommissioning of structures. An emblematic example is the divergence between the SIGBM Público | ANM - National Mineral Agency and the Desativando Bombas-relógio system, maintained by the Public Prosecutor's Office of Minas Gerais (MPMG). According to the latter, of the 54 dams raised upstream in Minas Gerais, only 10 were effectively decommissioned within the legal deadline established by the Mar de Lama Nunca Mais Law (State Dam Safety Policy). On October 16, 2025, the website recorded 23 decommissioned dams among the 54 upstream structures existing in MG. This number is not necessarily the same as that recorded by the ANM. The MPMG's selection is different from that of the ANM because it refers only to upstream dams undergoing decommissioning. Therefore, in addition to the different variables considered in the MPMG information system (upstream dams) and the ANM (dams in the PNSB or not), the records referring to the same dams in relation to the decommissioning process are also different.

5. Address financial risks, including proper financial assurance and insurance

State law in Minas Gerais requires a proposal of environmental assurance to ensure social and environmental recovery in case of disaster or for dam closure during the environmental licensing process, and an environmental bond to obtain an environmental license. However, despite the requirement for environmental bonds, the decree regulating this law (State Decree No. 48,747/2023 - Art. 2) has rendered the bond meaningless by reducing its value to an amount that is insufficient (by up to 3,000 times) for the legal purposes that justified the creation of the bond. The decree requires the bond take into consideration the effect of inflation and any changes in the mining project that may cause a change in the dam reservoir’s footprint and are updated every five years. State Decree No. 48,747/2023, Art. 5 allows self-bonding for financial assurance, but stipulates that “the guarantees provided for in this decree may be provided by the entrepreneur's controllers, in which case the value of the guarantee shall be increased by 30% (thirty percent).”

6. Make information regarding mine safety publicly available in relevant languages

The ANM has established an online portal to provide the public with information about tailings dams across the country. According to the ANM this is "...so that every citizen has access to the ANM's National Mining Dam Registry and to an up-to-date classification of Brazil's mining dams, their statistical data and locations, through dashboards that include geophysical maps created with the aid of a Geographical Information System, permitting greater integration with ANM'S mining dams safety information."

Classification by hazard category for tailings dams such as high, medium or low is regulated by law and designated according to the technical characteristics or building method, the state of upkeep, the age of the facility, and the dam's compliance with the Dam Safety Plan. Information about consequences and hazards are produced by regulatory agencies according to hazard category, associated potential harm, and volume, according to accepted criteria established by the National Council of Water Resources - Conselho Nacional de Recursos Hídricos (CNRH). However, none of these classifications or information about consequences is generated or undertaken by the board of directors or corporate management, who merely sign the reports produced by regulatory agencies.

While the federal legislation covering dams calls for making publicly available all information concerning dam safety and stability it does not include Environmental and Social Impact Assessments. However, the laws that regulate federal and state environment licensing call for the delivery and public availability of Environmental Impact Studies (EIAs) and Environmental Impact Reports (EIRs), which include the Environmental and Social Impact Assessments (ESIAs).

Federal legislation and regulations do not provide for the publication of documents pertaining to licensing or accident preparedness. Also the public has had difficulty gaining access to information about monitoring of tailings dams carried out by the ANM. The public has no access to information concerning ground stability, geology, watersheds, fault lines, etc. or concerning emergency response.

Federal dam safety legislation and regulations do not require that all information be made available, free of charge, by the operating companies and by regulatory agencies, as soon as possible, in one or more languages, as needed, in an accessible format and in simple language whenever possible, including all raw data obtained, entry parameters, and any updates of models and simulations done as part of the continuous environmental monitoring.

Brazilian law and regulations regarding the disposal of mining tailings applies strictly to their storage in tailings dams. Part of the information regarding tailings dams is made available, in Portuguese, in an open and easy to use system, the Integrated System of Mining Dams Safety - *Sistema Integrado de Gestão de Segurança de Barragens de*

Mineração (SIGBM). However, the SIGBM does not allow access to some of the main reports, such as, for example:

1- The Regular Inspection Report - *Relatório de Inspeção de Segurança Regular (RISR)*: this document is an integral part of the Regular Safety Inspection, compiling information collected on site which will guide the structure's stability analysis
2- The Periodic Review of Dam Safety - *Revisão Periódica de Segurança de Barragem (RPSB)*: a study whose objective is to diagnose the general dam safety condition, applying state-of-the-art criteria to the project, the update all hydrological data and changes in conditions both upstream and downstream from the facility, and to indicate actions to be taken by the operating company for maintaining the safety of dams covered by the National Dam Safety Policy - *Política Nacional de Segurança de Barragens (PNSB)*.

It is also important to remember that the following information is inaccessible or considered confidential:

1- Maximum precipitation volume and maximum expected outflow per day and per hour used in calculations and sizing of rainwater spillover in extreme events considered for both dams and filtered tailings facilities;
2- Erosivity calculations for front and side slopes of tailings dams and filtered tailings facilities, in extreme rain weather events;
3- Calculations devised for the preparation of filtered tailings facilities foundations in terms of the weight they will carry; and the
4- Maximum height to be attained by the filtered tailings facilities, as a function of the characteristics of the material that will be stacked so that it does not become liquified or rupture under its own weight.

7. Climate Change

Brazilian dam legislation does not require that modelling and design take into account climate change, and we still do not yet have legislation that applies to filtered tailings facilities. However, Art. 24 of ANM Resolution Nº 95 states that the "RSIR (Regular Safety Inspection Report) must take into account historical series of precipitation and outflow, hydrologic and hydraulic studies in order to certify the structure's safety."

The sizing of water overflow systems for tailings dams, including spillways, considers only past data. ANM's Resolution Nº 95 says "T*he Regular Safety Inspection Report must take into consideration historical series of precipitation and outflow*" and "*The reservoir's spillway draining capacity, according to return period considered, must be reassessed based on available data of the reservoir's watershed precipitation and outflow, ...*"

According to the Minas Gerais Environment Foundation - FEAM (*Fundacao Estadual de Meio Ambiente de Minas Gerais*), the existing dam spillways have been calculated based on precipitation of 300 to 350 mm/day for rains of ten-thousand years, and 350 to 400 mm/day for PMP (Probable Maximum Precipitation). Values greater than these can

cause dam overflow, as well as sliding of dam slopes, and reservoir and tailings stack instability.

Extreme rain events occurring in Brazil and elsewhere in the world have easily reached more than 400mm/day as, for example:

- 04/10/2021 – Liguria (Italy) – 740.6 mm in 12 hours and 883.8 mm in 24h
- 21/03/2022 – Petrópolis (Rio de Janeiro Brazil) - 363 mm in 8h and 547.4 mm in 24h
- 20/07/2022 – Zhengzhou - (China) – 644.6 mm in 24 h
- 19/02/2023 – Bertioga (São Paulo, Brazil) - 478,52 mm in 8h and 683.0 mm in 24 h
- 21/04/2023 – Santa Cruz de Cabralia (Bahia, Brazil) - 417mm in 12 h;
- 09/06/2023 – Beihai (China) – 614.7 mm in 24 h
- 14/06/2023 – Bartolome Maso - (Cuba) 360 mm in 24 h
- 15/06/2023 – Maquine (Rio Grande do Sul, Brazil) - 262 mm in 24 h
- 17/06/2023 – Escambia - (Florida - USA) - 406 mm in 12 h
- 10/09/2023 – Derna (Libia) - 400 mm in 24 h, 20,000 dead
- And others

None of the front and side slopes of tailings dams in Brazil have been calculated to withstand the erosivity of extreme rain events. In other words, no tailings dam in Brazil can withstand an extreme rain event.

None of the more than 700 existing filtered tailings and waste rock facilities has been calculated to withstand ten-thousand-year rains or PMP. None of the filtered tailings facilities have been calculated to take into consideration the Maximum Credible Earthquake (MCE), which is the largest earthquake that is theoretically possible in a given place.

8. Ban new tailings facilities where inhabited areas are in the path of a tailings dam failure

Brazilian legislation calls for the preparation of flood studies and maps where Self-Rescue Zones and Secondary Safety Zones must be defined. Federal Law nº 12.334 , ANM Resolution 95 and Minas Gerais State Dam Safety Policy - Minas Gerais State Law nº 23.291 ban the installation of new dams where there are populations in Self-Rescue Zones (areas of the valley downstream from the dam where there is not sufficient time for the competent emergency authorities to intervene to save lives). However, this does not apply to Secondary Safety Zones (areas identified as impacted in the flood studies, that aren't deemed Self-Rescue Zones), even though these too represent extensive affected areas subject to significant impacts, as experienced in Mariana with the failure of the Samaco-Vale-BHP Fundao dam.

In 2015, the Mariana tailings dam failure affected more than 600 km along the Rio Doce River, impacting all the way to the coast in the state of Espirito Santo. When Vale's B1

Dam broke in Brumadinho in 2019, the failure reached more than 300 km downstream in the Paraopeba River. Many towns were left without power and water usage was compromised, significantly affecting the economy and livelihood along the river.

At the federal level, the National Dam Safety Policy (PNSB) and the ANM Resolution 95 only prohibit the implementation of new dams where there is population in the self-rescue zones, leaving a loophole that makes it possible to further raise and expand existing dams. On the other hand, the State Dam Safety Policy in the state of Minas Gerais (PESB – law nº 23.291/2019) is more restrictive, prohibiting "the granting of an environmental licence for building, installing, expanding or raising a dam if its failure scenario studies indicate the existence of a community in the self-rescue zone."

Recently, the mining company Anglo American has been trying to obtain an environmental licence to raise its tailings dam in the municipality of Conceicao do Mato Dentro (Minas Gerais), which has three communities within the self-rescue zone. The mining company alleges that the initial project, licensed in 2008, before the State Dam Safety Policy was instituted, foresaw that the dam would have additional raises. The company is in the final stages of negotiations for the removal of residents in the self-rescue zone, which includes buying their land with the intent of relocating them to other places. However, community members have expressed opposition to the resettlement plans in public hearings. Residents, politicians and local organizations filed for precautionary measures, and the licensing process was suspended in August 2025.

On a federal level, Resolution ANM/95 of 2022 stipulates that only workers strictly required for activities pertaining to the operation, maintenance, dam raising, de-characterization and structure reinforcement, or equipment associated with these activities, are permitted to be present in self-rescue zones. Discussions pertaining to mining worker risks were intensified after the Vale failure in 2019, which killed 272 people, among which were 250 workers having lunch at the time failure in a restaurant situated below the dam, in a self-rescue zone.