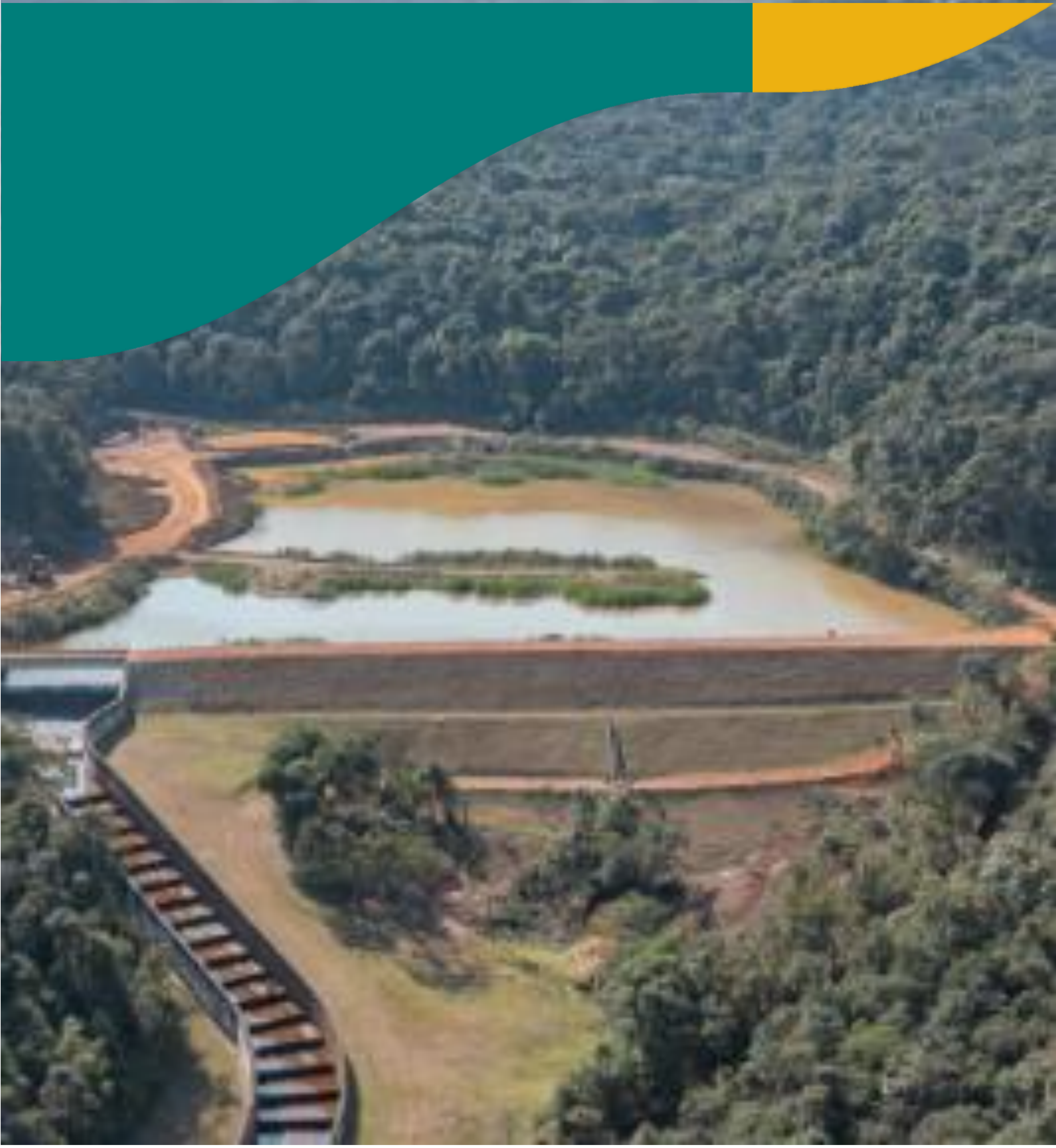

Vale's Dams and Tailings Storage Facilities Manual

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1. Scope

This manual was created to provide additional details to content in the Dams section of Vale Canada Ltd. (Vale)'s Portal. This manual focuses on technical concepts and legal aspects in Brazil, and thus seeks to improve understanding and clarity for the reader.

The reference date for the information contained in this document is December 31, 2023.

2. Concepts

Mining is the set of processes and activities for obtaining minerals, which involves the following stages:

- mining: process of removing ore from the deposit;
- beneficiation: treatment to granulometrically prepare, concentrate, or purify ores, aiming to extract minerals of economic interest, which is the product of mining activity;

As a result of mining production process, waste is generated. Mining waste differs from that produced in other sectors since it produces both solid waste from extraction (waste rock) and processing waste (tailings), which have different destinations.

Waste generated by mine extraction activities (not sent to the processing stage) results from materials excavated and removed to reach the ore veins. This mine waste has no economic value and is generally arranged in piles.

Waste results from ore processing is generally composed of particles from rock, water, and other substances added during processing.

At Vale, tailings remain after ore processing in wet processing plants. Composed of ore, sand, and water, tailings are not toxic, corrosive, or flammable.

Waste disposal can occur in bulk (transported using trucks or conveyor belts) or in the form of a pulp mixture of water and solids (transported through pipes using pumping systems or gravity).

Waste can generally by disposed of in:

- underground mines
- exhausted mine pits
- piles
- dry stacking (dry stacking method)
- folder arrangement
- tailings containment dams

Globally, most mine waste disposal is implemented through tailings dams, which mainly contain tailings to avoid damaging the surrounding environment while serving as a water reserve for reuse in the mine and/or in processing.

2.1 Types of Geotechnical Structures

Geotechnical structure: broad term that refers to engineering works in general such as dams, dikes, tailings storage facilities (TSFs), landfills, mine pits, piles, dry stacking, foundations, tunnels, and buildings.

Dam: barrier for the purpose of containment or accumulation of liquid substances or a mixture of liquids and solids, forming a reservoir. The reservoir consists of at least a main dam (starting dam), and internal dikes (if present) and saddle dikes (accessory dikes), which is known as a dam system. Its main purpose can be used to store water, sediments, mining waste or generate energy. Dams that store tailings and sediments are generically called mining dams. At Vale, the term dams can be treated generically as structures or geotechnical structures, always having an identifying name.

Dike: starting or accessory structures used to assist in the formation of a dam reservoir. Without considering the starting dike (main dam), a dam may have none, one, or more accessory dikes. Some dams have saddle dikes built on topographic saddles, with the aim of assisting in the formation of the reservoir. There may also be internal dikes (structures built inside the reservoir) with the aim of increasing dam storage capacity. At Vale, dikes are treated generically as structures or geotechnical structures, always having an identifying name.

Tailings storage facility: refers to dams, drained stacks or dry stacks that store solid waste, other mine waste managed with tailings (e.g., waste rock, water treatment waste) and any waters managed in tailings facilities. For dams, it encompasses the entire system including the main dam and, if applicable, the saddle dikes and internal dikes. In this case, the identification name of the TSF is the same as the dam, drained stacking, or dry stacking.

2.2 Construction Methods

When a dam is created, a main dam or starting dam is built to contain water, sediment, or tailings. As the reservoir fills, new layers are built over the original dam (process of "raising").

The most common types of elevation used by Vale are:

i) upstream: construction method for dams were raising masses rest on tailings or sediment previously released and deposited, including masses formed on tailings from already established reservoirs;

ii) downstream: raising downstream from the starting dike, where the raising blocks are built with borrowed material or with the waste itself;

iii) centreline: method of heightening where the dam axis remains aligned with the axis of the starting dike due to the arrangement of the construction material (partly downstream and partly upstream) in relation to the crest of the previous stage; and

iv) single stage: no heightening, the dam is built on compacted soil or rockfill (stone blocks) without subsequent construction of heightening to increase capacity.

3. Vale Tailings and Dam Management System

After the dam collapse in Brumadinho, Brazil, Vale evolved towards a more robust management model based on multi-layer reviews and continuous monitoring, supported by a remodeled management system based on international best practices presented in the Vale Tailings and Dam Management System (TDMS).

3.1 Introduction

TDMS is the application of the elements of our business management model called Vale Production System (VPS) to the management of dams and TSFs. Its application is mandatory and must be adopted globally by all operational and administrative areas involved in performance and safety management. This governance model reinforces the organizational culture through the development of people, standardization of best practices, operational discipline, and compliance with established routines as required by the VPS.

Vale's TDMS was developed to ensure compliance with the International Council on Mining and Metals (ICMM) *Global Industry Standard on Tailings Management* (GISTM; ICMM 2020) and the *Guide for the Management of Tailings Facilities* (MAC 2021), and to meet or exceed global guidelines for dam safety management (ICOLD 2020; CDA 2014; ANCOLD 2019).

The TDMS reflects the cultural transformation focused on Transparency, Leadership and Performance initiated by Vale (Figure 1).

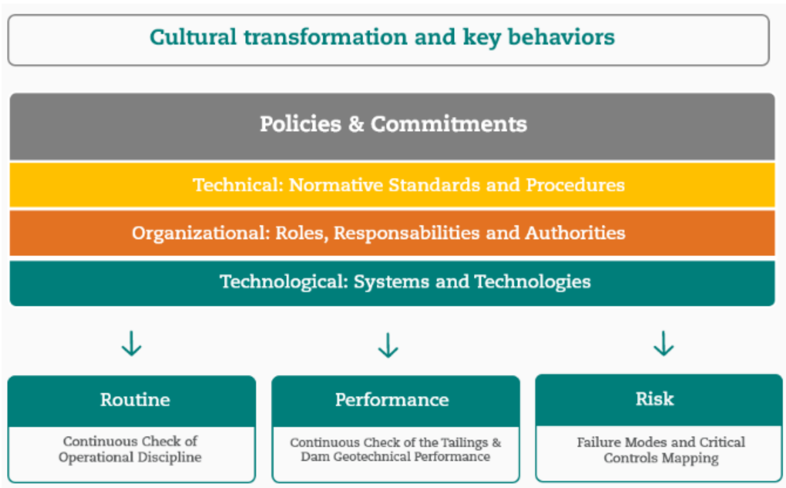

Figure 1: Cultural Transformation and Key Behaviors

Additionally, executive compensation was also revised to reflect cultural transformation, so that:

- 35% to 60% of short-term variable remuneration linked to Health and Safety, Operational Risk and VPS goals;
- technical area does not have a goal linked to production or financial metrics.

3.2 Organization

The VPS management model contains three main dimensions: Leadership, Technical and Management. The TDMS reinforces the VPS by using these dimensions as a guide for implementing its relevant elements (Figure 2).

Figure 2: Vale Production System Dimensions

VPS = Vale Production System.

• **Leadership:** As stated in the VPS, elements of the leadership dimension include expected behaviors and commitments of leadership, people management and organizational structure. The TDMS meets VPS requirements by defining functions of lines of defense, organizational structure, guiding assignment of responsibilities and discussing changes in key behaviors.

• **Technical:** The technical dimension addresses risk perception and management; engineering and planning of projects and construction, operations, maintenance, change management, systems, and technologies; and Emergency Preparedness and Response Plans. The TDMS addresses technical aspects through Normative Standards that aim to guide Vale's teams in technical aspects such as technology selection, risk classification and analysis, water management, closure planning, change management, and technical requirements for external professionals and between others.

• **Management:** As indicated in the VPS, elements of the management dimension consist of routine management, processes and standardization, problem solving and continuous improvement, in addition to evaluating the management system and results. In this dimension, the TDMS indicates how the VPS management requirements (basic guidelines, key performance indicators, FMDS – Floor Management Development System) should be applied to geotechnical assets through regulatory and management standards.

To cover all aspects of dam safety, the TDMS was built on four pillars that cover organizational and people practices, routine, structure performance and risk management. These pillars support VPS dimensions and detail how the VPS must be operationalized in dams and TSFs (Figure 3).

Figure 3: Pillars Supporting Vale Production System Dimensions

TSF = tailings storage facility; VPS = Vale Production System; TDMS = Tailings and Dam Management System.

• **People:** The TDMS focuses on establishing a robust organization and governance structure, as well as roles and responsibilities and job descriptions for functions to ensure empowerment and accountability.

• **Risk:** The 2nd pillar is risk management, defined through hazard identification and risk analysis. In this pillar, it is possible to identify, design and implement Critical Controls, as well as define actions with determined and feasible deadlines, for identified vulnerabilities, opportunities for improvement, studies to improve the understanding of a risk, treatments and reduction of risk priority, among others. This pillar also includes recording, monitoring, and communicating risks using Vale's risk management system (Bwise).

• **Performance:** The 3rd pillar emphasizes continuous evaluation of the performance of all dams and TSFs. Monitoring, inspection, analysis of deviations, and implementation of corrective actions serve to address performance deficiencies and restore the structure or facility to a safe and reliable state consistent with design objectives. For geotechnical assets, this pillar is enabled by the Engineer of Record (EoR), which is a contracted engineering company responsible for ensuring the performance of structures is in accordance with the proposed design, operation, expansion or modification, and closure of the structure. The EoR also monitors the Geotechnical Monitoring Centers.

• **Routine:** The last pillar refers to management processes, tools and routines established by the Key Roles to achieve operational discipline.

3.3 Governance

Vale has an integrated risk management governance system based on the concept of lines of defense (Figure 4):

1. **First Line of Defense:** formed by risk owners and executors of the business processes, project, and administrative and support areas of the company. They are directly responsible for identifying, evaluating, monitoring, and managing risk events in an integrated manner.

2. **Second Line of Defense:** corresponds to the areas of occupational safety, risk management, internal controls, standardization, legal compliance, and specialized areas (such as operational excellence and asset management) supervising and supporting the work of the first line of defense.

3. **Third Line of Defense:** comprises areas with complete independence from the administration: Internal Audit and the Ombudsman unit. Both carry out assessments and inspections, considering their respective areas of operation. The result of this process is an impartial assessment that includes effectiveness of risk management, internal controls, and compliance.

Figure 4: Vale's Lines of Defense

The responsibilities of these layers are defined in the Risk Management Policy, which are available at Vale's [Portal](#).

In addition to the three conventional lines of defense, Vale's new Risk Management System for dams and TSFs incorporates other layers such as external sentinels (Figure 5).

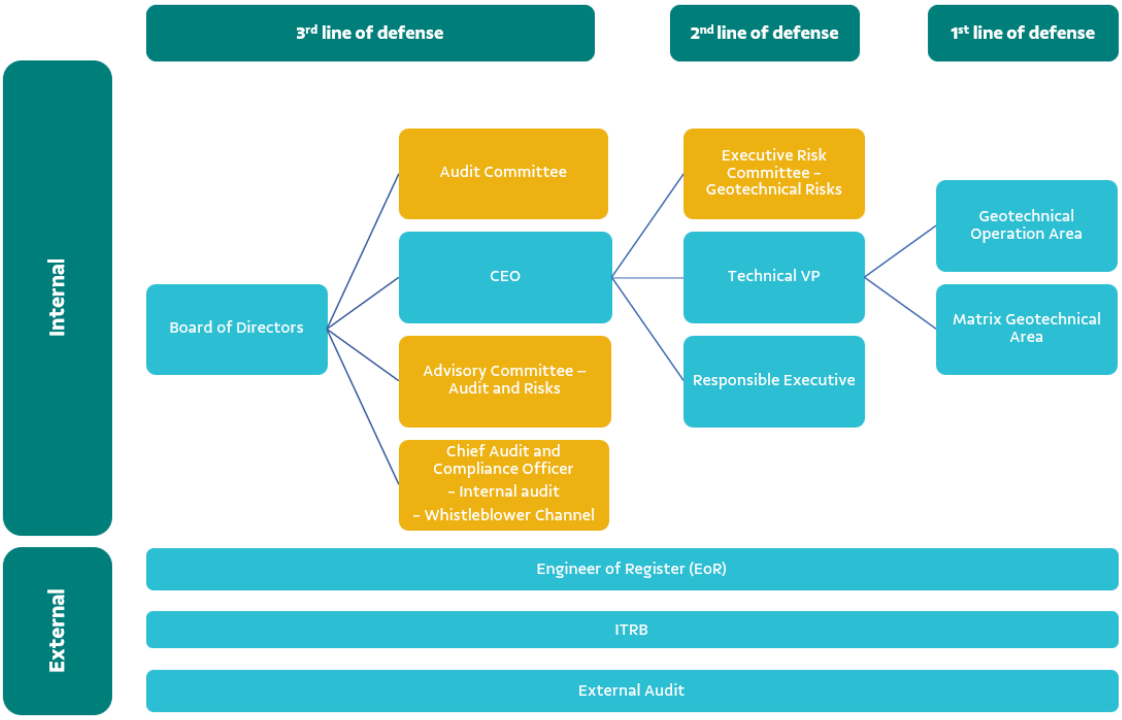

Figure 5: Vale's New Risk Management System for Dams and Tailings Storage Facilities

ITRB = Independent Tailings Review Board.

3.4 External Sentinels

Given the structure and governance established for the TDMS, each layer involves separate roles and responsibilities in the management and monitoring of Vale's dams and TSFs, described as:

- **Engineers of Record**

In January 2020, Vale established the EoR role to strengthen the governance of the TDMS, as an additional review step. The presence of this professional is a good practice recommended by the Mining Association of Canada, the Canadian Dam Association, the GISTM of the ICMM and by the Independent Extraordinary Dam Safety Advisory Committee established by the company itself in 2019, and today transformed into the Independent Tailings Review Board (ITRB) following the Global Standard.

The EoR issues the Regular Safety Inspection Report accompanied by a Declaration of Stability Condition (required by National Mining Agency [ANM] Resolution 95/2022) and monthly technical reports, continuously interprets results of inspection and monitoring activities of structures, and other duties. The EoR is external to operations and integrated into Vale's lines of defense and senior management level to act with authorities required for the type of function.

In this model of continuous and rigorous monitoring by Vale, if a change is found in the safety condition of any structure, a new Declaration of Stability Condition may be issued at any time throughout the year.

- **Independent Tailings Review Board**

The ITRB is an independent contracted group composed of a multidisciplinary team of internationally recognized Subject Matter Experts who are not and were not directly involved with the design or operation of the dam or TSFs. ITRB members must have a minimum of 25 years of experience in design, construction, performance evaluation, and operation of dams or TSFs (whichever is applicable) and ideally have participated in at least two previous independent reviews as an expert on the subject.

The main contribution of an ITRB meeting is a report with opinions and recommendations presented to Vale for the TSFs and/or dams for which the board was formed to review.

The Accountable Executive is responsible for accepting or rejecting ITRB recommendations supported by the Risk Owner, Responsible Tailings Facilities Engineer or Responsible Dam Safety Engineer and the Corporate Geotechnical Manager. The Accountable Executive must consult the 2nd Line of Defense when rejecting ITRB recommendations.

The general role of the ITRB is based on the following:

- provide Vale with independent opinion(s) informing whether design, analysis, operation, maintenance, surveillance, and evaluation of dams or TSFs is consistent with standard industry practice;
- provide advice and guidance to Vale, as a consultant, on technical issues associated with planning, design, analysis, construction, operation, maintenance, surveillance, and closure of the dams or TSF; and
- make recommendations to help Vale identify, understand, and manage risks associated with dams or TSFs.

The ITRB does not have the authority to make decisions. Its main role is to advise the Risk Owner, the Dam Owner and the Accountable Executive on compliance or lack of compliance with industry practices and standards. Vale is responsible for the safe operation of its dams and TSFs, as well as achieving the objective of minimizing damage: zero catastrophic failures and no significant impact on human health and the environment.

At a minimum, the ITRB must be established for all Vale dams and TSFs that have a "High", "Very High" or "Extreme" Consequence Classification.[1]

ITRB meetings should be held at least once a year or more frequently, depending on the complexity of the TSF or dam, its historical performance, and whether there have been significant changes to the structure or its performance during operation.

- **Periodic Dam Safety Reviews**

The Periodic Dam Safety Review is applicable to all mining dams included in the National Dam Safety Policy and is regulated by ANM Resolution 95/2022.

Periodic Dam Safety Review reports are the responsibility of consulting companies specialized in geotechnics hired to be an additional and independent layer aimed at

[1]The concept of this classification of consequences is contained in Annex 1 of this Manual.

evaluating and improving the safety management of dams and associated structures through the application of continuous knowledge.

These reports are prepared considering the elements indicated in Volume IV of Annex II of ANM Resolution 95/2022, accompanied by a Declaration of Stability Condition and providing recommendations for Vale teams. The registration, management, and monitoring of these recommendations is carried out according to internally assigned roles and responsibilities.

The Periodic Dam Safety Review Declaration of Stability Condition cannot be issued by the EOR; it is signed by the entrepreneur and the technical person who prepared it, attached to the Dam Safety Plan (PSB) and inserted into the Integrated Mining Dam Safety Management System.

- **Independent Audit (Public Prosecutor's Office)**

For all dams in the State of Minas Gerais, Vale still has an independent external audit process through an agreement signed in 2019 with the Public Ministry of the State of Minas Gerais.

Audits are carried out by international companies that audit dam safety reports, reinforcement works, and emergency action plans, among other important documents and works related to the dam, providing recommendations to Vale and monthly reports to the public authorities. After completing the evaluation of the main documents and confirming the stability of the dam over the course of one year, the dam audit service is considered completed. Figure 6 provides a flowchart of independent audits.

Figure 6: Independent Audit Flowchart

ANM = National Mining Agency; FEAM = Feam Ordinance.

In addition to this scope, the Public Ministry requires Vale to contract (or include in the original scope of independent audits) technical support to the Public Power in the analysis and monitoring of projects and schedules for the removal (de-characterization) of upstream dams and diagnosis of environmental impacts and measures of mitigation.

3.4 Advances in Monitoring

Vale has intensified the frequency of monitoring structures and assessing states of conservation to predict problems through preventive and corrective measures.

An example of these permanent efforts is the creation (since 2019) of three Geotechnical Monitoring Centers, which monitor dams 24/7 to ensure useful information for better decision making. Other examples are:

- 24-hour video monitoring
- water level monitoring at different points of the dam with specific instruments
- dam response measurements to seismic activity with specific instruments
- radar monitoring
- satellite image and drone monitoring of soil conservation and displacement status
- siren installation

4. Global Industry Standard on Tailings Management

During 2019 and 2020, Vale worked closely with the ICMM and actively participated in the GISTM, which has a main objective to improve safety at all stages of a TSF by establishing a global reference for tailings management involving the main areas of the entire TSF life cycle. The document contains six topics subdivided into 15 principles, which are further divided into 77 auditable requirements (Figure 7).

Affected Communities Principle 1: Respect the rights of project-affected people and meaningfully engage them at all phases of the TSF life cycle, including closure.	**Management and Governance** Principle 8: Establish policies, systems and accountabilities to support the safety and integrity of the TSF. Principle 9: Appoint and empower an Engineer of Record. Principle 10: Establish and implement levels of review as part of a strong quality and risk management system for all phases of the TSF life cycle, including closure. Principle 11: Develop an organizational culture that promotes learning, communication and early problem identification. Principle 12: Establish a process for reporting and addressing concerns, and implement whistleblower protections.
Integrated Knowledge Base Principle 2:	**Emergency Response and Long-Term Recovery** Principle 13: Prepare for emergency response to TSF failures.

Develop and maintain an interdisciplinary knowledge base to support safe tailings management throughout the TSF life cycle, including closure. Principle 3: Use all elements of the knowledge base (social, environmental, local economic and technical) to inform decisions throughout the TSF facility life cycle, including closure.	Principle 14: Prepare for long-term recovery in the event of catastrophic failure.
Design, Construction, Operation and Monitoring of TSF Principle 4: Develop plans and design criteria for the TSF to minimize risk for all phases of its life cycle, including closure and post-closure. Principle 5: Develop a robust design that integrates the knowledge base and minimizes the risk of failure to people and the environment for all phases of the TSF life cycle, including closure and post-closure. Principle 6: Plan, build and operate the TSF to manage risk at all phases of the TSF life cycle, including closure and post-closure. Principle 7: Design, implement and operate monitoring systems to manage risk at all phases of the facility life cycle, including closure.	**Public Disclosure and Access to Information** Principle 15: Publicly disclose and provide access to information about the TSF to support public accountability.

Figure 7: Global Industry Standard on Tailings Management Topics, Principles and Auditable Requirements

Note: Adapted from ICMM (2020).

TSF = tailings storage facility.

In October 2020, Vale's Board of Directors approved a new Dam Safety Policy and Geotechnical Mining Structure, with GISTM as one of its references. Among other guidelines, the policy determined that all components of its current TDMS were designed with elements of continuous improvement; using and applying the best technologies and practices available according to international institutions, including the ICMM.

According to a public commitment, Vale completed the implementation of GISTM in its TSFs (on August 5, 2023) regardless of the consequence classification of the TSFs. The commitment also emphasizes that all TSFs operated by Vale, not in a state of safe closure, will be in compliance with GISTM by August 5, 2025.

5. Emergency Level

5.1 Stability Condition Declarations (DCE)

Stability Condition Declarations are issued based on the Regular Safety Inspection Report and sent every six months (May and September) to the ANM. In addition, Stability Condition Declarations are issued based on Periodic Dam Safety Reviews with a frequency defined in accordance with ANM Resolution 95/2022.

The document is mandatory for all mining dams and TSFs included in the National Dam Safety Policy. It is signed by the entrepreneur and the technical person who prepared it, certifying the stability of the structures and only thus allowing their operation.

For mining dams and TSFs in the state of Minas Gerais included in the State Dam Safety Policy, there is also an obligation to issue another Declaration of Stability Condition every six months (March and September) as recommended by Feam Ordinance 699.

The Declaration of Stability Condition can have one of the following statuses: attested, not attested, and not sent.

For the dam to be part of the National Dam Safety Policy and consequently be required to declare its stability, it must present at least one of the following characteristics:

- height of massif greater than or equal to 15 m, measured from where the foot of the downstream slope meets the ground level up to the crest
- total reservoir capacity greater than or equal to 3 million m^3
- reservoir containing hazardous waste
- medium or high associated potential damage category in economic, social, environmental terms or loss of human life
- high risk category according to Resolution n. 95

For the dam to be part of the State Dam Safety Policy, it must present at least one of the following characteristics:

- height of massif greater than or equal to 10 m, measured from the lowest part of the function to the crest
- total reservoir capacity greater than or equal to 1 million m^3
- reservoir containing hazardous waste
- medium or high category associated with potential environmental damage, in economic, social, environmental terms or loss of human life

The status of the Declarations of Stability Condition of Vale dams included in the National Dam Safety Policy can be found here (only in Portuguese).

5.2 Dam Emergency Levels

Vale has intensified its preventive, corrective, and monitoring actions for its structures. For example, when an anomaly is detected that results in the maximum conservation status score, daily inspections begin, and the emergency level is activated. The emergency level is a convention used in Resolution ANM 95/2022 to classify potential risks that could compromise the safety of the dam.

Emergency situations are those arising from adverse events that affect dam safety and may cause damage to its structural and operational integrity; and preservation of life, health, property, and the environment. The emergency situation must be assessed and classified according to the levels in Table 1.

Table 1: Assessment and Classification Levels in an Emergency Situation

Emergency Level	Detailing	Communication	Immediate Actions
Level 1	When: an anomaly is detected that results in the maximum score in terms of conservation status; an anomaly in the state of conservation is detected without corrective action in 4 fortnightly inspections; dam is classified as a high-risk category (CRI); safety	ANM, environmental agencies, Civil Defense (national, state, and municipal)	signaling instability and intensifying monitoring

	factor is outside the limits established in art. 41 II and Res 95 or for any other situation with potential compromise of the structure		
Level 2	When: result of actions adopted in Level 1 anomaly is classified as "uncontrolled"; safety factor is outside the limits of art. 41 III b of Res 95	ANM, environmental bodies Civil Defense (national, state, and municipal), self-rescue and secondary security zones	from this level, people in the self-rescue zone are evacuated
Level 3	when: rupture situation is imminent or occurring; safety factor is below the limits of art. 41 IV b of Res 95	ANM, environmental bodies Civil Defense (national, state and municipal), self-rescue and secondary security zones	care is extended to people in the secondary security zone through additional educational measures

ANM = National Mining Agency; art. = article; Res = Resolution.

5.3 Emergency Action Plan for Mining Dams

All mining dams and TSFs covered by the National Dam Safety Policy and the State Dam Safety Policy of the state of Minas Gerais must have an Emergency Action Plan for Mining Dams (PAEBM).

The PAEBM is drafted, developed, implemented, and managed in accordance with the requirements of the law and filed with city halls and municipal and state Civil Defences. The PAEBM defines immediate actions in the event of an emergency and its main objective is to plan measures to minimize risks and damages, such as:

- flood zones in the event of dam breach
- meeting points and evacuation routes
- information on monthly tests and geolocation of sirens
- arrival time for each structure
- procedures in case the sirens sound
- important contact phone numbers in case of emergency

The main actions aimed at the community to prepare and respond to emergency situations are:

PAEBM publicly disclosed and fully aligned with Principle 13 of GISTM	– **Emergency response training** with communities near TSFs. – Partnership with local Civil Defense to **ensure suitable conditions** for simulations and emergency protocol activations. – **Alarm sirens** strategically placed to trigger emergency protocols. **– Dedicated teams and communication channels** for dialogue with communities. – In case of mandatory evacuation, **full support to restore living and working conditions** for those affected.

More information about PAEBMs is available here.

5.4 PAEBM Declaration of Conformity and Operationality

As recommended by ANM Resolution 95/2022, the PAEBM of dams and mining TSFs included in the National Dam Safety Policy must undergo a Conformity and Operationality Assessment. Conformity is the evaluation and proof of the minimum PAEBM items and, by operability, the proof of effectiveness of the PAEBM in a possible emergency situation.

The Conformity and Operationality Assessment is carried out annually by an external company and is composed of the PAEBM Conformity and Operationality Report and the PAEBM Declaration of Conformity and Operationality, which must be sent to ANM through Integrated Mining Dam Safety Management System in June each year.

References

- ANCOLD (Australian National Committee on Large Dams). 2019. Guidelines on tailings dams.
- CDA (Canadian Dam Association). 2014.
- ICMM (International Council on Mining and Metals). 2020. Global Industry Standard on Tailings Management.
- ICOLD (International Commission on Large Dams). 2020.
- MAC (Mining Association of Canada). 2021. Guide for the management of tailings facilities.

Attachment

Consequence Classification for Dams and Tailings Storage Facilities

Consequence Classification varies from low to extreme and constitutes an integral part of Vale's TDMS. Notably, it is used to establish the Standard of Care and minimum criteria that must be applied to the engineering and performance management of dams and TSFs. This table is based on the GISTM (2020).

Consequence Classification must be periodically reviewed and updated during the Periodic Safety Review of Dams or TSFs or whenever the dam or TSF undergoes a significant change, including but not limited to: the relevant behavior or performance of the dam or TSF, heightening or alteration of the installation, modification or change of the tailings process, changes in tailings deposition characteristics or increase in population and land use downstream of the installation.

Table 1 presents the consequence classification system to be applied to Vale's dams and TSFs.

Table 1 – Vale Consequence Classification System (Adopted from ICMM's Global Industry Standard on Tailings Management 2020)

Facility Classification	Incremental Losses				
	Population at Risk	Potential Loss of Life	Environment	Health, Social and Cultural	Infrastructure and Economic
Low	None(1)	None Expected	Minimal short-term loss or deterioration of habitat or rare and endangered species.	Minimal effects and disruption of business and livelihoods. No measurable effect on human health. No disruption of heritage, recreation, community, or cultural assets.	Low economic losses; area contains limited infrastructure or services. Less than US$1M in losses.
Significant	1-10	Unspecified(2)	No significant loss or deterioration of habitat. Potential contamination of livestock/fauna water supply with no health effects. Process water has low potential toxicity; Tailings are not potentially acid generating and have low to neutral leaching potential. Restoration possible within 1-5 yrs.	Significant disruption of business, services or social dislocation. Low likelihood of loss of regional heritage, recreation, community or cultural assets. Low likelihood of adverse health effects.	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes. Less than US$10M in losses.
High	11-100	Possible 1-10	Significant loss or deterioration of critical habitat or rare and endangered species. Potential contamination of livestock/fauna water supply with no health effects. Process water moderately toxic. Low potential for acid rock drainage or metal leaching effects of released tailings. Potential area of impact 10 – 20 km^2. Restoration possible but difficult and could take > 5 years.	500 to 1,000 people affected by disruption of business or services or social dislocation. Disruption of regional heritage, recreation, community, or cultural assets. Potential for short term adverse human health effects.	High economic losses affecting infrastructure, public transportation, and commercial facilities, or employment. Moderate relocation/compensation to communities< US$100M.
Very High	101-1,000	Likely 11-100	Major loss or deterioration of critical habitat or rare and endangered species. Process water highly toxic. High potential for acid rock drainage or metal leaching effects from released tailings. Potential area of impact > 20 km^2. Restoration or compensation possible but very difficult and requires a long time (5 years to 20 years).	More than 1,000 people affected by disruption of business or services or social dislocation for more than one year. Significant loss of national heritage, community, or cultural assets. Potential for significant longer-term adverse human health effects.	Very high economic losses affecting important infrastructure or services (e.g., highways, industrial facilities, storage facilities for dangerous substances), or employment. High relocation/compensation to communities. < US$1B.
Extreme	More than 1,000	Many, i.e. >100	Catastrophic loss of critical habitat or rare and endangered species. Process water is highly toxic; Very high potential for acid drainage or metal leaching from released tailings. Potential area of impact is > 20 km^2. Restoration or compensation in kind is impossible or requires a very long time (>20 years).	More than 5,000 people affected by disruption of business or services or social dislocation for several years. Significant national heritage or community facilities or cultural assets destroyed. Potential for severe and/or longer-term adverse human health effects.	Extreme economic losses affecting critical infrastructure or services, (e.g., hospitals, major industrial complexes, major storage facilities for dangerous substances) or employment. Very high relocation/ compensation to communities and very high social readjustment costs. Greater than >US$1B.

Notes:
1 - There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.
2 - People are only temporarily in the dam-breach inundation zone and the appropriate level of risk depends on the number of people, exposure time, the nature of their activity and other considerations.