Field Trip to Minas Gerais

May 23-24, 2023

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Disclaimer

“This presentation may include statements that present Vale's expectations about future events or results, including without limitation our Health and Safety commitments on slide 31, our GISTM commitment on slides 32 and 42, our dams’ emergency level removal plan on slide 45, our decharacterization program on slide 50, and plans related to the Brick Factory on slide 67. These risks and uncertainties include factors relating to our ability to obtain financing and to obtain applicable environmental licenses for our projects . It include risks and uncertainties relating to the following: (a) the countries where we operate, especially Brazil and Canada; (b) the global economy; (c) the capital markets; (d) the mining and metals prices and their dependence on global industrial production, which is cyclical by nature; (e) global competition in the markets in which Vale operates; and (f) the estimation of mineral resources and reserves, the exploration of mineral reserves and resources and the development of mining facilities, our ability to obtain or renew licenses, the depletion and exhaustion of mines and mineral reserves and resources. To obtain further information on factors that may lead to results different from those forecast by Vale, please consult the reports Vale files with the U.S. Securities and Exchange Commission (SEC), the Brazilian Comissão de Valores Mobiliários (CVM) and in particular the factors discussed under “Forward-Looking Statements” and “Risk Factors” in Vale’s annual report on Form 20-F.”

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Field Trip to Minas Gerais

Brumadinho Reparation

Gleuza Jesué, Reparation Director

May 23-24, 2023

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We will never forget Brumadinho.

We will never forget the **victims, their families and the social and environmental impacts** of the tragedy at Brumadinho.

We have been working to repair the damage caused by the collapse **with respect and a high level of commitment to people** since 2019.

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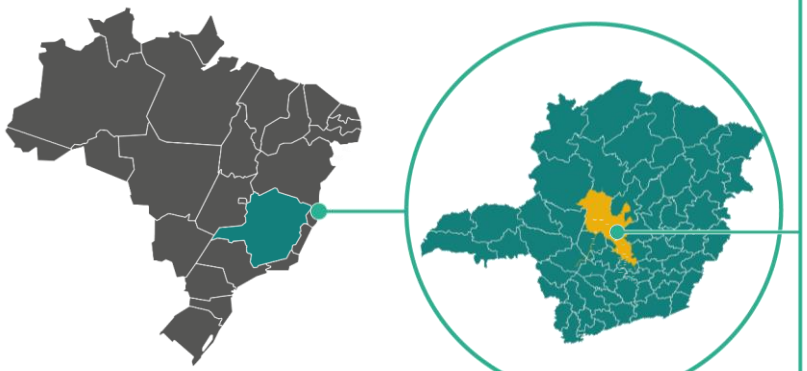
Efforts to locate and identify victims

8th search strategy:

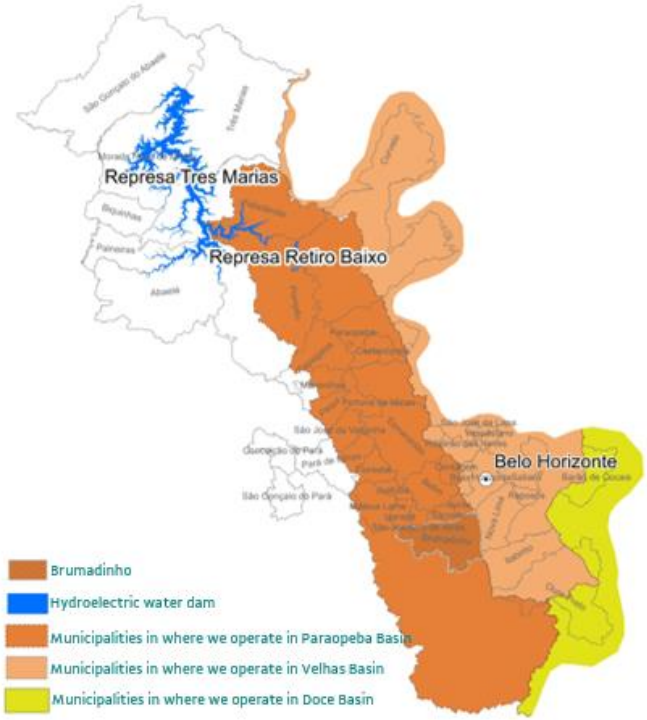
- **Search facility operated by the Military Firefighter Corps of the state of Minas Gerais**
- **Financial resources were provided, with donations of state-of-the-art equipment and improved infrastructure**

Since the collapse, we have been implementing initiatives in 26 different municipalities and 131 communities



Minas Gerais state

Paraopeba Basin

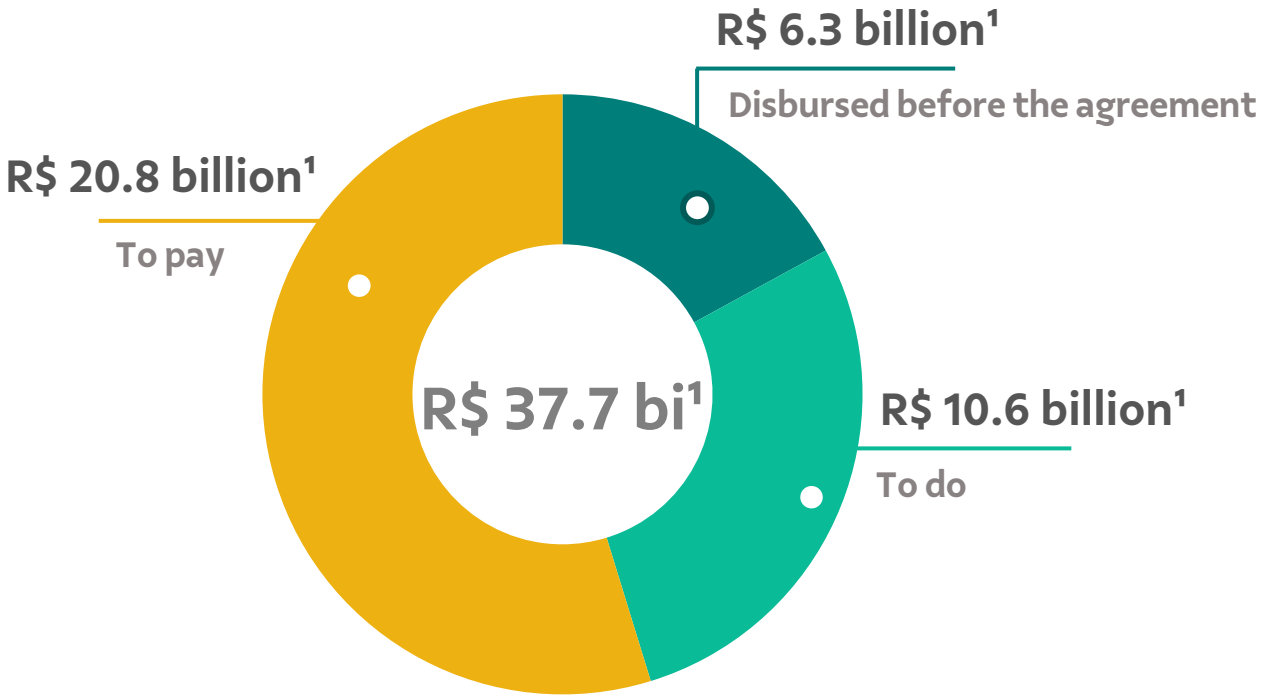


Hydrographic Basins

Our efforts to provide economic reparation extend beyond the Paraopeba Basin, covering an area of 27,600 km²

Global Settlement for Integral Reparation

Agreement Amount (US$ billion[1])

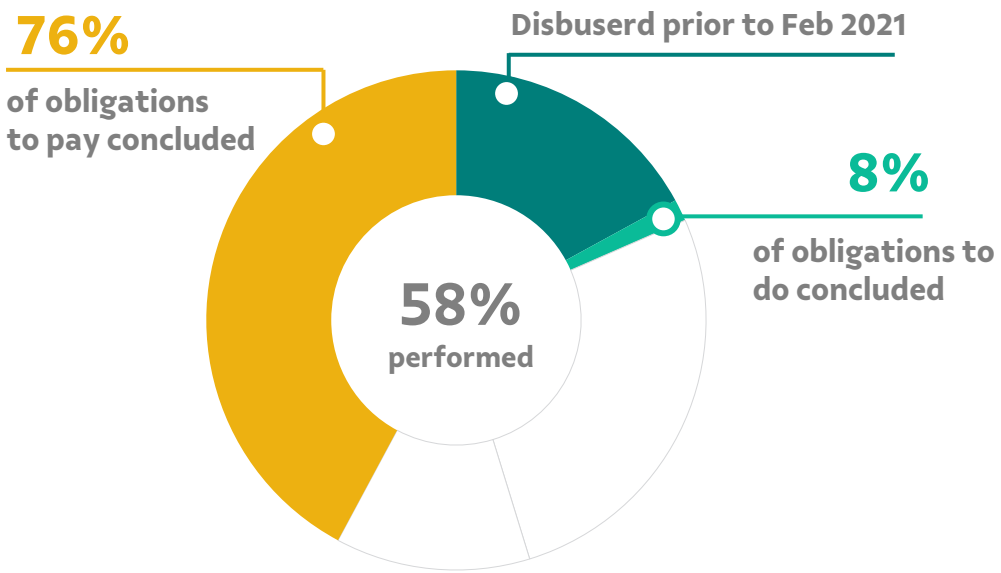


The **Settlement**, signed with the Minas Gerais state government, the State and Federal Public Prosecutors' Offices, and the Public Defender's Office for the state of Minas Gerais, represented the legal formalization Vale's obligations to act and provide payments within the scope of socioeconomic and socio-environmental reparation.

[1] Economic value of the agreement signed as of February 2021. Not adjusted for inflation.

58% of the agreement is perfomed

Global Settlement for Integral Reparation status[1]



The **Settlement**, signed with the Minas Gerais state government, the State and Federal Public Prosecutors' Offices, and the Public Defender's Office for the state of Minas Gerais, represented the legal formalization Vale's obligations to act and provide payments within the scope of socioeconomic and socio-environmental reparation.

[1] Obligations to pay correspond to 47% and obligations to do represents 25% of the total economic value set in the Agreement. [2] Individuals covered by indemnification agreements entered into with Vale until February 2023.

Emergency and short-term initiatives

Since 2019, emergency initiatives have been implemented in order to guarantee basic rights and necessities such as access to water, temporary housing, and food package.

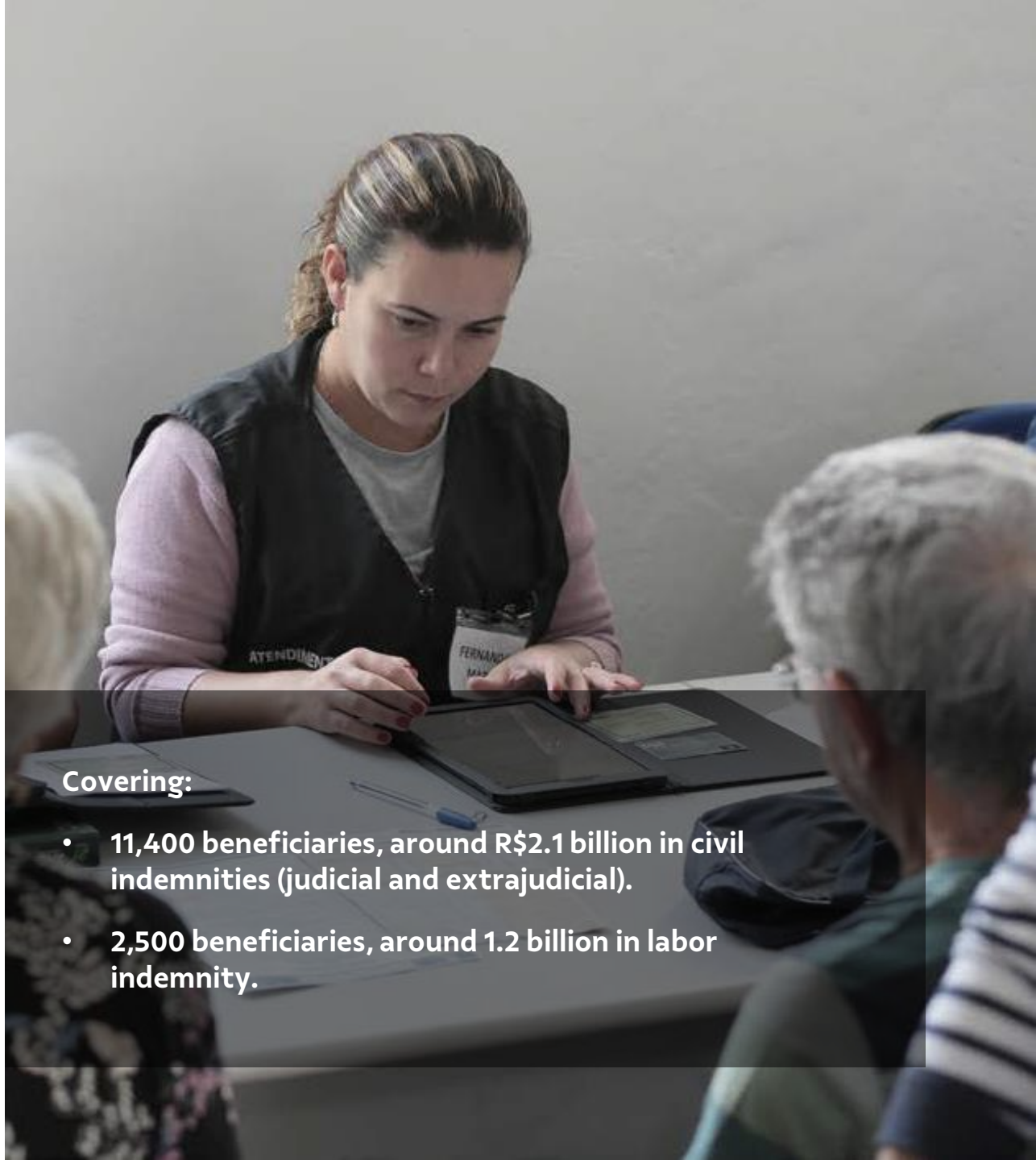
Several initiatives remain in place today and will continue as long as they are needed.

Once the collapse occurred, we acted quickly to assist the victims, their families, and communities

- Community service posts and 0800 number made available to serve the public.
- Medical and psychosocial care.
- Emergency aid payments provided to approximately 100,000 residents.
- Accommodation and assistance for temporary housing and hotels for 732 families.
- R$360 million transferred to the city of Brumadinho and government agencies within Minas Gerais state.
- Financial resources to environmental services, health care materials, reinforcement for public policy, transportation and other logistical costs.

Emergency aid and compensation were provided to offer financial support to those impacted

- According to agreements signed with legal institutions and government agencies
- +100,000 individuals received emergency aid, totaling R$2.4 billion.
- Approximately +13,900 people were compensated, totaling R$3.3 billion.
- R$ 36 million in donations to approximately 1,000 individuals, a Vale initiative.



Covering:

- 11,400 beneficiaries, around R$2.1 billion in civil indemnities (judicial and extrajudicial).
- 2,500 beneficiaries, around 1.2 billion in labor indemnity.

We have implemented emergency works in order to contain tailings and monitor water quality

Three large containment structures were built, and 25 chute stabilization barriers were used to retain sediment carrying

Hydraulic Filter Barrier BH0

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Reparation and Development Initiatives

Once emergency actions had been carried out, we began implementing reparation and development initiatives throughout the Paraopeba River Basin and Evacuated Regions.

Key pillars

- Compensation Plan (Evacuated Regions)
- Environmental reparation
- Water monitoring
- Basic sanitation
- Social projects and support for those affected
- Social and economic development
- Social and urban infrastructure works

Central Square at the Park Territory Project located in Córrego do Feijão, Brumadinho

We have adopted more conservative standards for assessing our dams and are carrying out preventive relocations or emergency evacuations when recommended.

Barão de Cocais: Vila do Gongo, Piteira, Tabuleiro, Socorro

Nova Lima: Macacos, Vila Anglo, Condomínio Solar da Lagoa housing complex

Ouro Preto: District of Antônio Pereira

Itabirito: Rural Zone

In addition to assisting families that were evacuated and relocated, we are implementing compensation and social development initiatives that are planned together with residents and the government

The compensation plan centers upon four key axes:

- Education, Sport and Culture
- Infrastructure, Urbanism and Environment
- Health Care and Social Assistance
- Economic Development and Tourism

On the environmental front, we are continuing to work to restore the Paraopeba River and impacted areas, evolving with the removal of tailings and environmental recovery efforts

Currently, **64% of the 12.4 million m³** of tailings in the Ferro-Carvão stream system and the Paraopeba River, which require management, **have been removed.**

The black-collared swallow, an endangered species, is now found in large numbers and in new areas along the Paraopeba River.

"This is an important environmental indicator and suggests that the dam collapse did not interfere with these bird's quality of life."

Cristiane Cäsar, Vale environmental analyst.

We consistently monitor the water quality, sediment, and terrestrial and aquatic biodiversity in the Paraopeba River

Recognized methodologies implemented and sampling plan validated by responsible government bodies and Coppe-UFRJ.

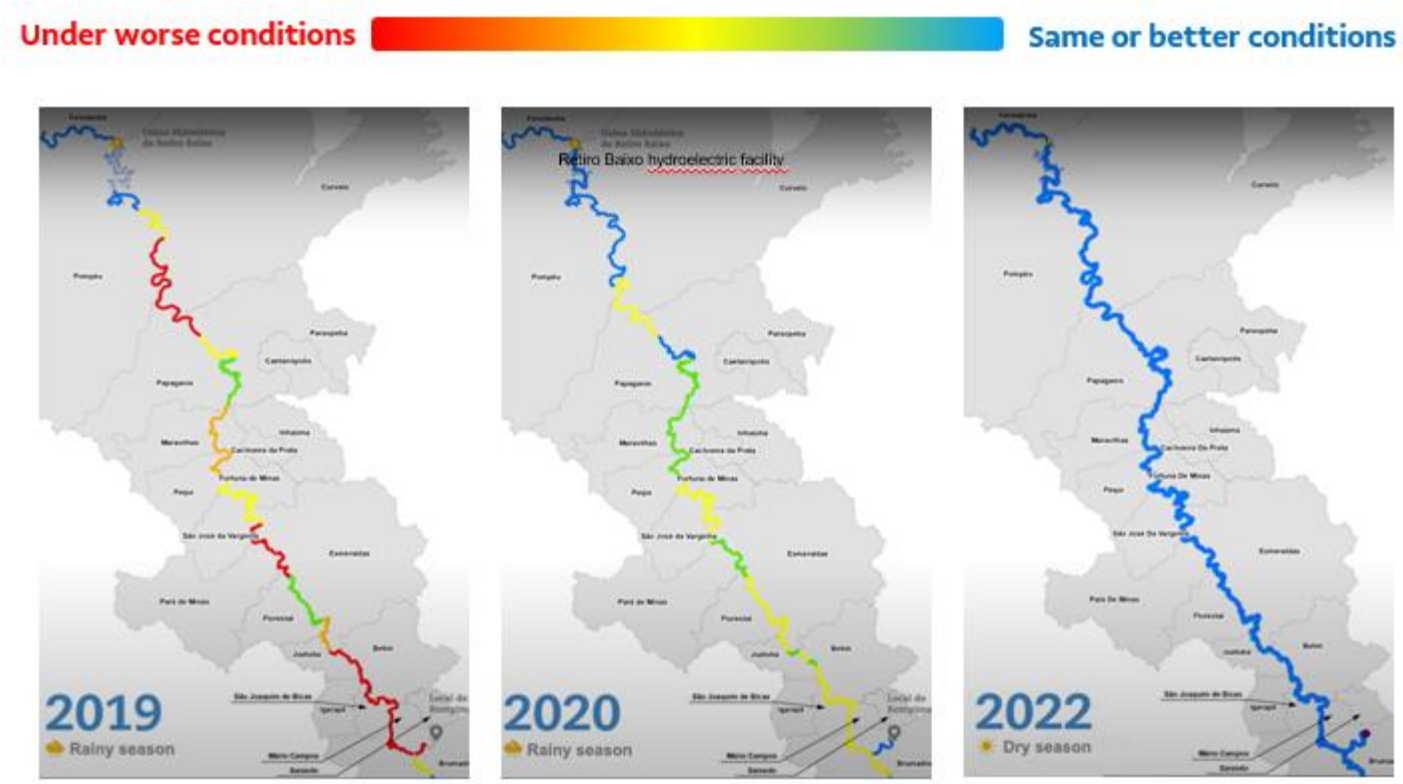
Telemetry stations automatically analyze data such as temperature, turbidity, pH, and dissolved oxygen in the river's water

- Approximately **80 monitoring** points.
- **+6 million** results generated through means of analyses.
- **+67,000** samples collected.
- Approximately **250 professionals** involved in processes.
- **157 monitoring points** for aquatic biodiversity.

This process is supervised by Government Inspection Agencies and the State Public Prosecutor's Office Independent Technical Auditor

These analyses suggest that progressive improvement has been made in terms of water quality, presenting results that are similar to or better than those recorded prior to the collapse during the dry season

Concentration of manganese in the Paraopeba River's water compared to conditions prior to collapse:



Data are corroborated through monitoring carried out by the Minas Gerais Water Management Institute (Igam).

We are restoring biodiversity by rescuing species of fauna and flora, recovering degraded areas, monitoring aquatic and terrestrial species, and offering support for animal health and sheltering

Planting of forests

Reuse of fertile soils

Protection of waterways

Production of forest seedlings

Tree planting on slopes

Research & Development

From 658 hectares that will be recovered until 2029, 155 hectares (23.6%) are already in the process of environmental recovery (around 61,000 seedlings of native species of the Brumadinho region have been planted).

We actively seek to ensure that all impacted residents are able to access their right to high-quality water in the required quantity

+1,500 points for monitoring of water quality

+2,500 water supply points

Drilled and reactivated wells

Individual water treatment system for the rural community

New upstream water catchment in the Paraopeba river

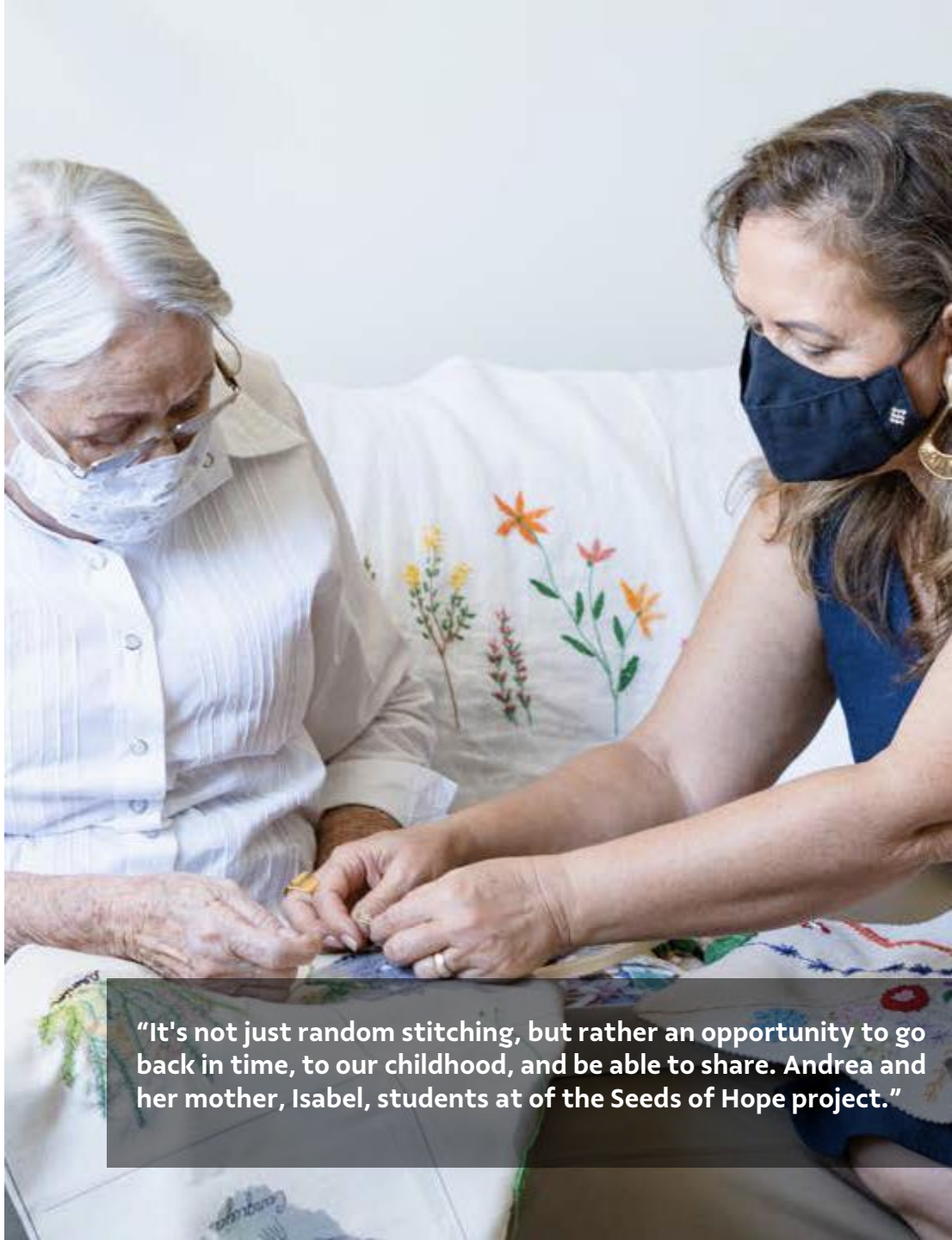
New water catchment in Pará de Minas

+4 million people have been served through water supply initiatives[1]

[1] Equivalent population based on the total flow made available under water supply initiatives implemented by Vale (14,500 L/s).

Offering comprehensive reparation in affected communities means taking action together with the community

- The Family Reference Program provided more than 166 thousand psychosocial services.
- The Semeando Esperança ('Seeds of Hope') project: art therapy experiences translated into embroidery.
- 143 community leaders received training under the Program for Strengthening Public Services.
- Creation of the Community Center: Integrative Practices for the family members victims, co-managed by AVABRUM[1]
- Health Cycle Program: donation of 5,754 pieces of equipment and 2,541 trained professionals.
- Comprehensive Assistance Program for Affected People: activities in financial education, productive recovery, assisted purchasing and psychosocial support (10,000 consultations).
- Temporary housing and hotels: social support to 732 families



"It's not just random stitching, but rather an opportunity to go back in time, to our childhood, and be able to share. Andrea and her mother, Isabel, students at of the Seeds of Hope project."

[1] AVABRUM – Association of the Family's Victims and People Affected by the rupture of Córrego do Feijão's dam.

We are working attentively with traditional, Indigenous and quilombola communities

Indigenous People:

- Emergency aid provided to 222 Pataxó and Pataxó Hã-Hã-Hãe Indigenous group that lived on the banks of the Paraopeba River.
- Agreement for Individual Compensation and Comprehensive Collective Reparation approved for both groups.

Quilombola communities:

- Studies were finalized and filed in order to verify impacts and damages.
- We are currently in the final stages of defining reparation measures, with participation from communities.

"These efforts have been implemented with the full participation of Indigenous peoples and quilombola communities in accordance with the precepts set forth in Convention 169 and in compliance with the Community Consultation Protocol."

Thais Pereira, Manager for Relationships with Indigenous Peoples and Traditional Communities, Vale.

We have implemented projects aimed at transforming experiences, economic development, community entrepreneurship and training, promoting improvements in quality of life within communities

- Sustainable tourism in Brumadinho;
- Transforming the community of Córrego do Feijão
- Program to Support the Collectors of Recyclable Materials;
- Professional training;
- Valorizar (“Value”) Program;
- Cultivar (“Cultivate’) Project.

“Prior to this, I would spend the whole day at home, lying around. In our working group, sometimes you show up sad and start talking, you’re able to keep your mind occupied and soon enough we become so busy that we don’t have time to do everything we need to. We wanted to be there every day. ”

Josefa Josenilda Coelho, artisan in Córrego do Feijão.

Nowadays, people can count on preschools, basic health units, public squares and paved roads

Meridional School – Lafaiete

Health Care Unit and Preschool (Parque da Cachoeira)

"I have been living in Parque da Cachoeira for 10 years. My biggest concern here is health. (...) We didn't think that this would happen so quickly, but it did."
Ademir Geraldo Caricati, Member of Parque da Cachoeira's Community Association

There are also several social and infrastructure works currently underway.

Key lessons learned during more than four years of Reparation

Assuming responsibility for events and their consequences is the first indication of our commitment to providing reparation.

Humility is a central element to managing such a sensitive scenario.

Empathy and compassion gain new meaning in the face of the losses experienced by those affected by the tragedy.

Strong management practices (VPS) and operational discipline are key to efficiency in providing reparation.

Active listening and a presence in the field are central to fully understanding and legitimizing demands.

Accountability with regards to reparation cannot take on the tone of propaganda. Communication must include the perspective of those affected by these events.

Discussions that center on technical bases and KPIs remove and alleviate any ideological clashes.

We do not expect recognition or praise. Our purpose is what sustains us.

And today, what do we still need to do?

- **Find** the three remaining “gems” (victims)
- **Finalize** pending compensation
- **Comply with all the commitments made and agreements signed**, contributing to improving the quality of life in the affected municipalities.
- **Continue to recover** the Paraopeba River.
- **Carry out** the complete management and disposal of the tailings.
- **Restore confidence** among all stakeholders.
- **... And dialogue, dialogue, dialogue!**

Field Trip to Minas Gerais

Tailings Management

Rafael Bittar, Executive Vice President and Chief Technical Officer – CTO

May 23-24, 2023

VALE

Brumadinho triggered significant changes at Vale

Our Purpose

We exist to improve life and transform the future. **Together**.

Why do we exist?

Values

- **Life** matters most.
- Act with **integrity**.
- Value **the people who build our company**.
- Make it **happen**.
- Respect our **planet and communities**.

What do we believe **in**?

Key Behaviours

- **Obsession with safety and risk management.**
- **Open and Transparent dialogue.**
- **Empowerment with accountability.**
- **Sense of Ownership.**
- **Active listening and engagement with society.**

How do we act?

Levers

- **Safety**
- **VPS**
- **People**
- **Innovation**
- **Sustainability**

Ambitions

A great company recognized by society for being:

- Benchmark in **safety.**
- Best in class **reliable** operator.
- **Talent** driven organization.
- Leader in **sustainable** mining.
- A reference in **creating and sharing value.**

What do we look for?

All sites are already covered by HIRA[1] first cycle

Risk

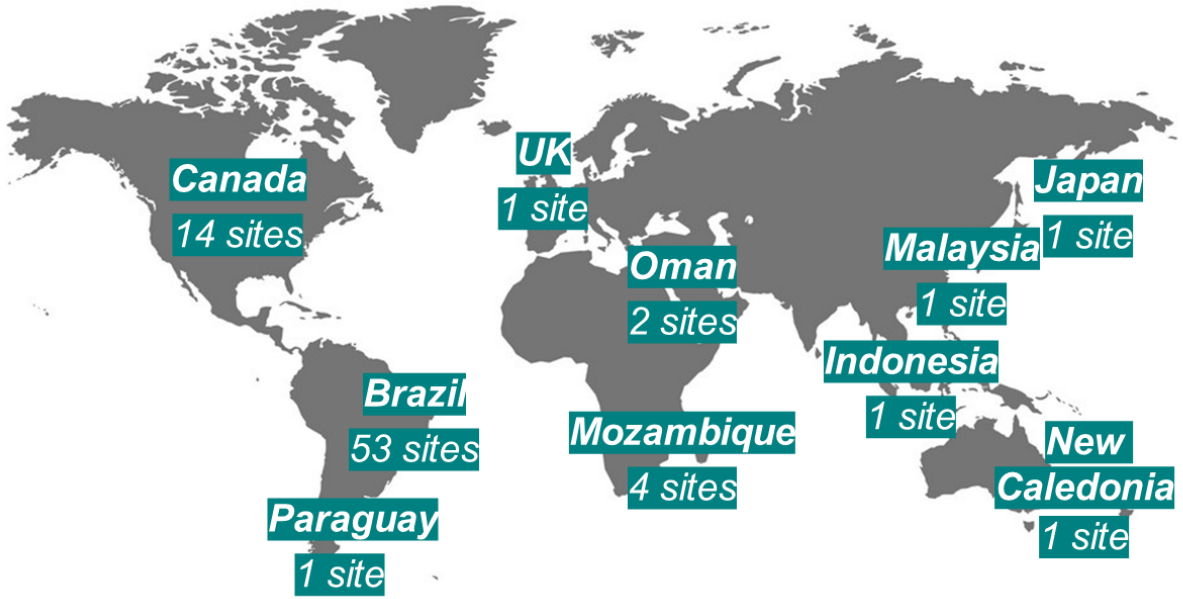
Identification — **79 sites[2]** assessed since 2019

Assessment — **824 material unwanted events** mapped

Treatment — **2,039 immediate actions** implemented

Control & Monitoring — **7,250 critical controls** identified

Reassessments every 3 years (critical sites) or 5 years (non-critical sites)



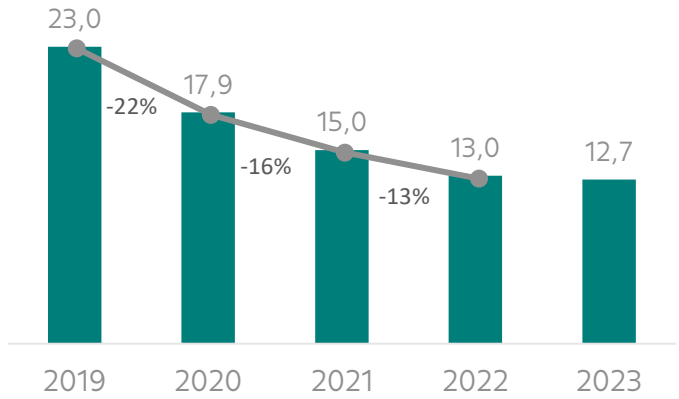
[1]Hazard Identification and Risk Assessment. [2]Includes New Caledonia, as the assessment was performed before Vale's exit from the business.

We are building a sustainable performance in Health & Safety

Commitments by 2025

- Zero high-potential recordable injuries (N2)[1]
- Reduce by 50% employee exposure to key health risks[2]
- Eliminate very high-risk scenarios[3]

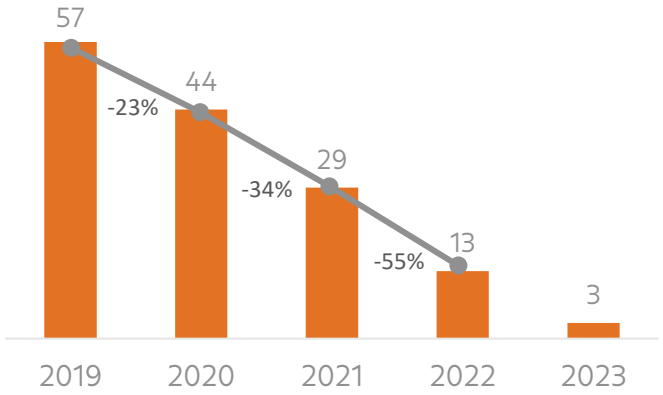
Reducing the number of exposures above the Occupational Exposure Limit (OEL) *(In thousands of exposures)*



Note: The number of exposures is calculated as the sum of the number of exposures above the Occupational Exposure Limit (OEL) that occurred at Vale Global during the year.

2023 YTD up to April

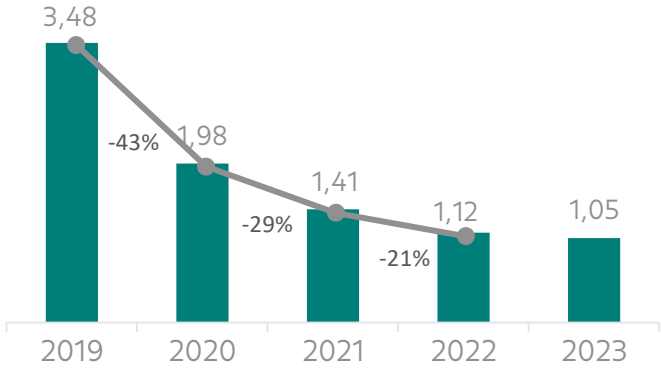
Reducing recordable high-potential injuries (N2)



Note: These numbers show that Vale has continuously reduced the number of high potential injuries. Such events could have had a serious adverse impact on safety and health and are generally considered to be indicators of precursors to fatalities.

2023 YTD up to April

Total accident rate (TRIFR) employees and contractors *(Per million hours worked))*



Note: These numbers show that in recent years, Vale has significantly reduced the accident rate.

2023 YTD up to April

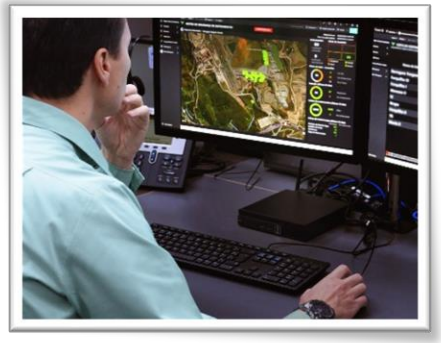
[1] Injuries which are considered a precursor to fatal accidents. [2] Physical, chemical or biological risks. [3] According to Vale's risk matrix, based on 2019.

Tailings & Dams Management Journey

Governance

2019

- Strengthen **3-line of defense** model
- **Geotechnical Risk Committee.**



Adoption of International Best Practices

- New **TDMS** (Tailings and Dams Management System)
- 3 Geotechnical **Monitoring Centers**
- **Engineer of Record**
- Improved technical **understanding** of Vale's dams ("As-is" project)
- **Adoption of GISTM (Aug/20)**

Lower Risk Solutions

- **Hazard Identification and Risk Analysis (HIRA)** for dams and tailings facilities
- Upstream **dam elimination program**
- **New way to operate** alternatives to tailings – **Filtered Tailings**
- Co-products

2023-2025

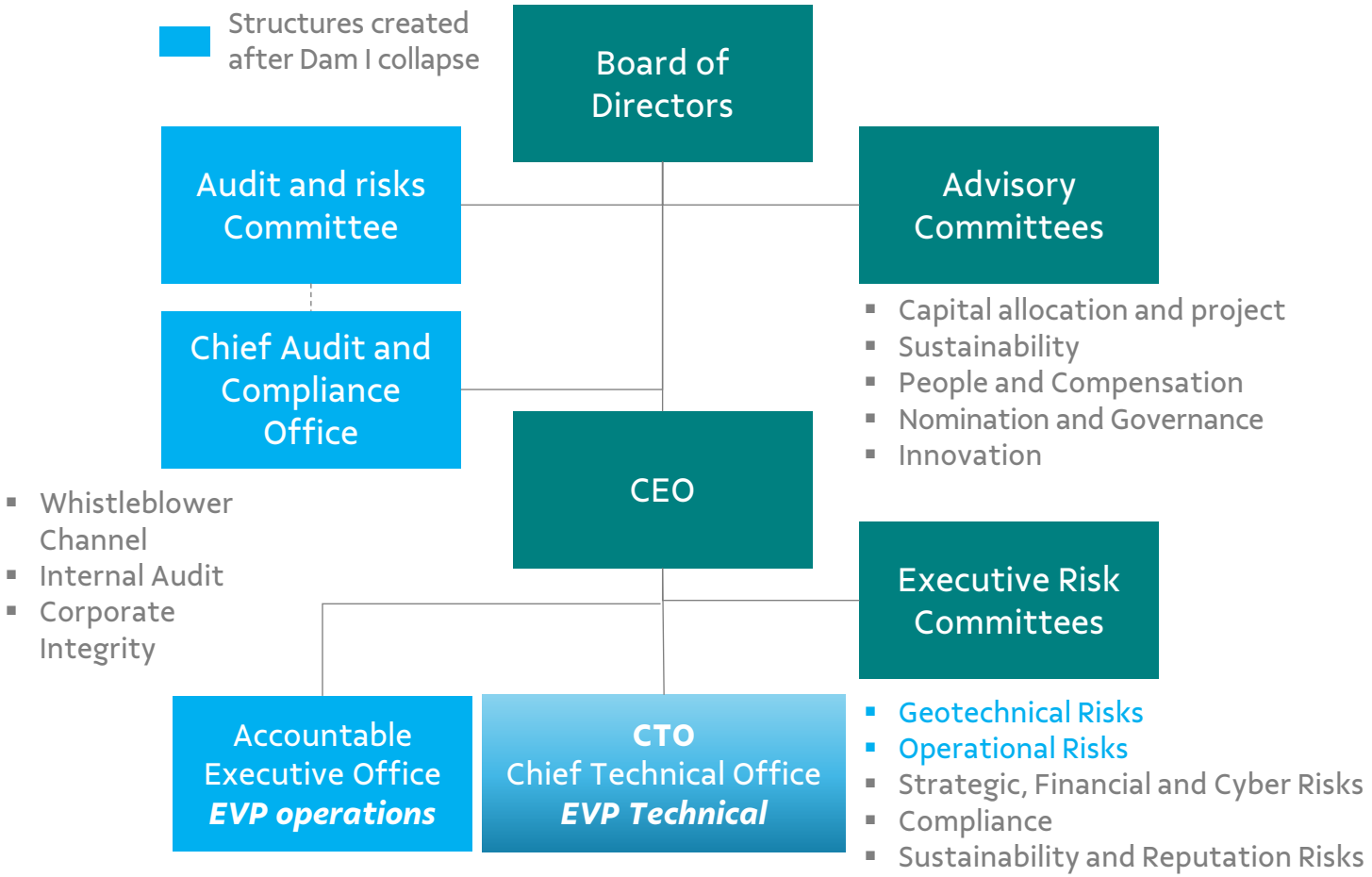
GISTM

(global industry standard tailings management)

World-class standards and processes

Cultural Transformation Journey

A strong governance and oversight for TSF[1] management, supported by tailored executive compensation



Executive compensation

30–70%

of short-term variable compensation tied to Safety, Operational Safety, Sustainability and DEI

*The Safety, Geotechnics and Compliance areas have **NO TARGET** tied to production or financial metrics*

[1]TSF stands for Tailings Storage Facility, with criteria agreed by the International Council on Mining and Metals' Tailings Advisory Group in response to the Church of England information request, which may differ from Brazilian National Mining Agency criteria. [2] A requirement by the Global Standard Industry on Tailings Management.

Our current tailings management approach is based in a multi layers of protection, improving our capacity to avoid accidents

Business units	Safety & Risk	Internal audit	External sentinels		
Geotechnical operations team **"risk owner" Accountable executive**	**Technical VP**	**Chief Compliance Officer** Internal audit and whistleblower channel	**Engineer of Record** Dam safety inspections and performance assessments	**Independent Auditors** Public Prosecutors technical reviews and Tailing Review Boards (ITRB)	**Dam Safety Reviews** Periodical technical reviews by external engineering company
1st line of defense	**2nd line of defense**	**3rd line of defense**			

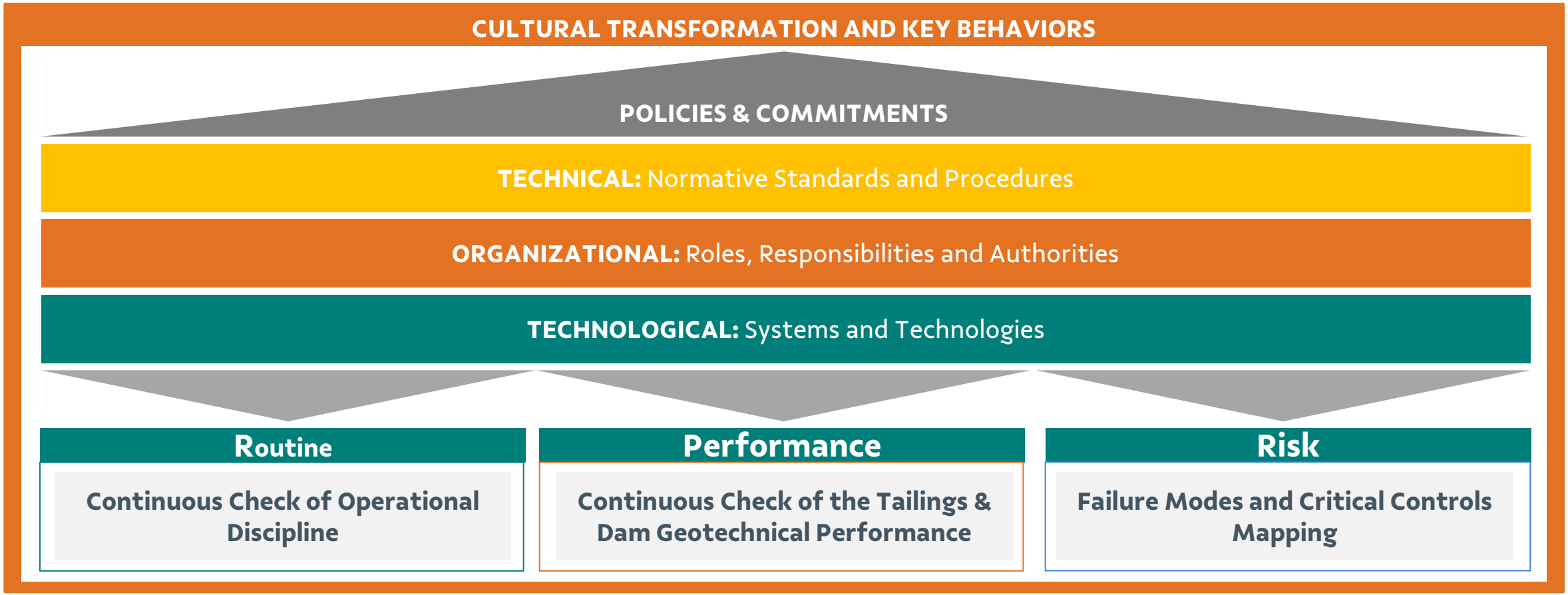
[1]TSF stands for Tailings Storage Facility, with criteria agreed by the International Council on Mining and Metals' Tailings Advisory Group in response to the Church of England information request, which may differ from Brazilian National Mining Agency criteria. [2] A requirement by the Global Standard Industry on Tailings Management.

Tailings Management Strategic Pillars

- Implementation of a new and transformed Tailings & Dams Management System (TDMS)
- Vale will comply with the Global Industry Standard for Tailings Management
- Eliminating Upstream TSFs – De-characterization Program
- New Way to Operate – New projects to reduce the reliance on TSFs
- Co-products: recycling dry tailings to sustainably increase production capacity

Understanding the TDMS[1]

Cultural transformation focused on Transparency, Leadership and Performance



[1]Tailings and Dam Management System.

Understanding the TDMS

POL-0037 establishes guidelines and commitments

Policy for Dam Safety and Geotechnical Mining Structures VALE

POL-0037-G | Rev.: 00-08/10/2020 | DCA 108/2020 | PUBLIC

Guidelines:

Given the existing Safety Management context for these critical assets and Vale's goals, the following directives were defined:

- Design and operate tailings storage facilities, water reservoirs and sediment dams, mine waste storage facilities, amongst other earth structures such as open pits, stacks and underground works, such that potential failures are prevented, monitored and mitigated, and that risks be always reported to the company's senior leadership. Vale's objective is for these assets to count with critical control actions in place so that risks are prevented and mitigated.
- Keep the facilities and structures physically stable throughout all the critical earth structure's life cycle, starting at its construction and during its operation, decommissioning, closure and post-closure.
- Implement the Safety Management System so that dams, earth structures and other mine waste storage facilities are built and/or raised following a detailed engineering design, under the supervision and with the acknowledgement of the Engineer of Record – EoR – and that these structures are operated following the mining dams' operation, maintenance and surveillance manuals, also called the OMS Manual.
- Handle and/or dispose of tailings solid particles as well as the process or impounded water only within the tailings storage or mine waste storage facility's designated areas, minimizing the formation of supernatant water. Proceeding with these actions outside the designated areas requires prior and clear approval from the Business Executive Board and the Safety and Operational Excellence Executive Board, as well as, where applicable, from public administration authorities.
- Fulfill the objectives of the Safety Management Systems for tailings storage facilities and geotechnical mining structures that aim to protect life, the communities, the integrity of infrastructure and processes, the availability and quality of water, and, generally, the environment protection, in order to ensure the inspection and monitoring of water reservoirs, tailings storage facilities and sediment dams in addition to open pits, stackings and underground mines, not only respecting the Company's internal procedures, but chiefly the applicable standards. Therefore, the assignation and contracting of engineering services, external review and consultancy services must prioritize quality, ethics and not the cost of such services.
- Maintain a Safety Management System that allows for an effective level of governance in routine activities and with a level of strict compliance regarding the critical assets' performance in agreement with the national and international technical standards hereby referenced; thus, this System will keep adequate and active communication, dialogue with society and engaging the surrounding communities in agreement with the AA 1000 Stakeholders Engagement Standard-2015, the IFC Stakeholder Engagement Handbook or following the industry's best practice standards similar to the aforementioned standards.
- Ensure that all components of the Safety Management System for dams and mine waste storage facilities are designed with continuous improvement elements, using and applying the best available technology and best practices according to international institutions (MAC and ICMM) and, at the same time, in the technical realm, the best practices of the Institutions (CDA, ANCOLD, ICOLD and LOP).
- Design and operate all Vale's earth structures with the adequate licenses, following the pertinent local legislation and engaging the communities.
- Maintain and disclose to the interested parties a preparedness and contingency plan for response to emergencies regarding the critical earth structures and geotechnical assets based on the best practices and best available expertise and in compliance with legislation in effect. The plans must be periodically tested through simulations and must be kept updated taking into account the communities and affected people.

Policy for Dam Safety and Geotechnical Mining Structures VALE

POL-0037-G | Rev.: 00-08/10/2020 | DCA 108/2020 | PUBLIC

Commitment to the Safe Management of Tailings and Water Dams and Geotechnical Mining Structures:

Vale's operations are mainly guided by the following commitments:

- Implementing diverse controls aimed at managing the water in tailings storage facilities, from the design phase to the operation of the project. This must be achieved using hydraulic works to convey surface water runoff out of the impoundment and avoiding the interference of tailings or sediments at the spillways' inverts.
- Tailings disposal must consider guidelines or operational parameters in the planning sequence that cause or favour displacing water ponding away from the tailings storage facility dam's upstream slope in agreement with the Detailed Engineering Design, Design Criteria, Normative Standard, Technical Specification or OMS Manual.
- Reclaim, in the most efficient way, the water used in the production processes with the use of thickening circuits to reduce the volume of water that would be transported together or separately with the tailings; thus, prioritizing water recirculation at the process plant itself before reaching the storage facility or similar installation, so that water flow and ponding is avoided wherever the Detailed Engineering Design or OMS Manual does not specify it.
- Follow the safety conditions and best practices hereby mentioned (ICOLD, CDA and/or ANCOLD) exclusive for water reservoirs' embankments and hydropower dams, whether these are planned either for mineral processing or for environmental control or for power generation.
- Improve, via the governance hereby established for dam safety and geotechnical mining structures as well as the independence and technical rigour of the Management Systems that support the quality of critical assets, a compulsory follow up to be carried out on a permanent and documented basis by the Engineer of Record (EoR) for the critical asset's every single stage of the life cycle, i.e. from design to closure.
- Develop staff members in a professional manner, so that they achieve the appropriate training for each key function in the activities for geotechnical, hydrotechnical, dewatering and mining processes, based on efficient communication and specific training, in order to ensure that employees with relevant experience understand their responsibilities and, so, ensure direct, transparent communication with an appropriate sense of urgency at all levels of the organizational structure. Therefore, personnel training and continuing education will be carried out to keep the level of knowledge up to date regarding the earth structures as well as the improvement of the practice linked to the most rigorous engineering techniques.
- Implement, at all stages of the asset's life cycle, geotechnical risk controls and activities tied with identified geotechnical monitoring based on the studied failure modes and their associated consequences. In the event of changes related to performance caused by internal or exogenous factors, a new engineering and risk assessment should take place as soon as possible. Risks must be periodically assessed in a specific way in order to measure the effectiveness of controls for each critical earth structure. These must count with an opinion in writing from the specialist in charge designated by Vale and the EoR in order to certify that such earth structures are operated in a disciplined manner, maintained and under surveillance, with updated and accessible information, and that the historical registry of the earth structure is properly stored and available in accordance with international quality standards.
- Implement the Safety Management System for tailings dams and mine waste storage facilities, amongst similar systems, for the critical control of geotechnical risks. The scope of this System is applicable to every single stage of the asset's life cycle, comprising the various design phases: from construction to operations, to closure and post-closure.

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Understanding the TDMS

Global Standards Operational Procedures

POL-0037: Policy for Dam Safety and Geotechnical and Mining Structures

PNR-000096: Vale Tailings and Dams Management System (TDMS)

PNR-000118: TDMS Implementation Guidelines

Performance

- PNR-000074: OMS Manual
- PNR-000075: Technical Quality Assurance (QA) and Quality Control (QC)
- PNR-000076: As-built Reports
- PNR-000097: Tailings and Water Management Facilities Guidelines for Performance Monitoring
- PNR-000102: Closure Planning for Tailings Storage Facilities
- PNR-000106: Terms of Reference for Engineer of Record
- PNR-000107: Terms of Reference for Independent Technical Review Boards
- PNR-000108: Standard Practice for Dam and TSF Safety Reviews
- PNR-000109: Safety Inspections of Dams and Tailings Storage Facilities
- PNR-000110: Standards for Site Wide Water Management Plans for Dams and TSFs
- PNR-000111: Standard Guidelines for the Design of Hydraulic Structures for Dams and TSFs

Risk

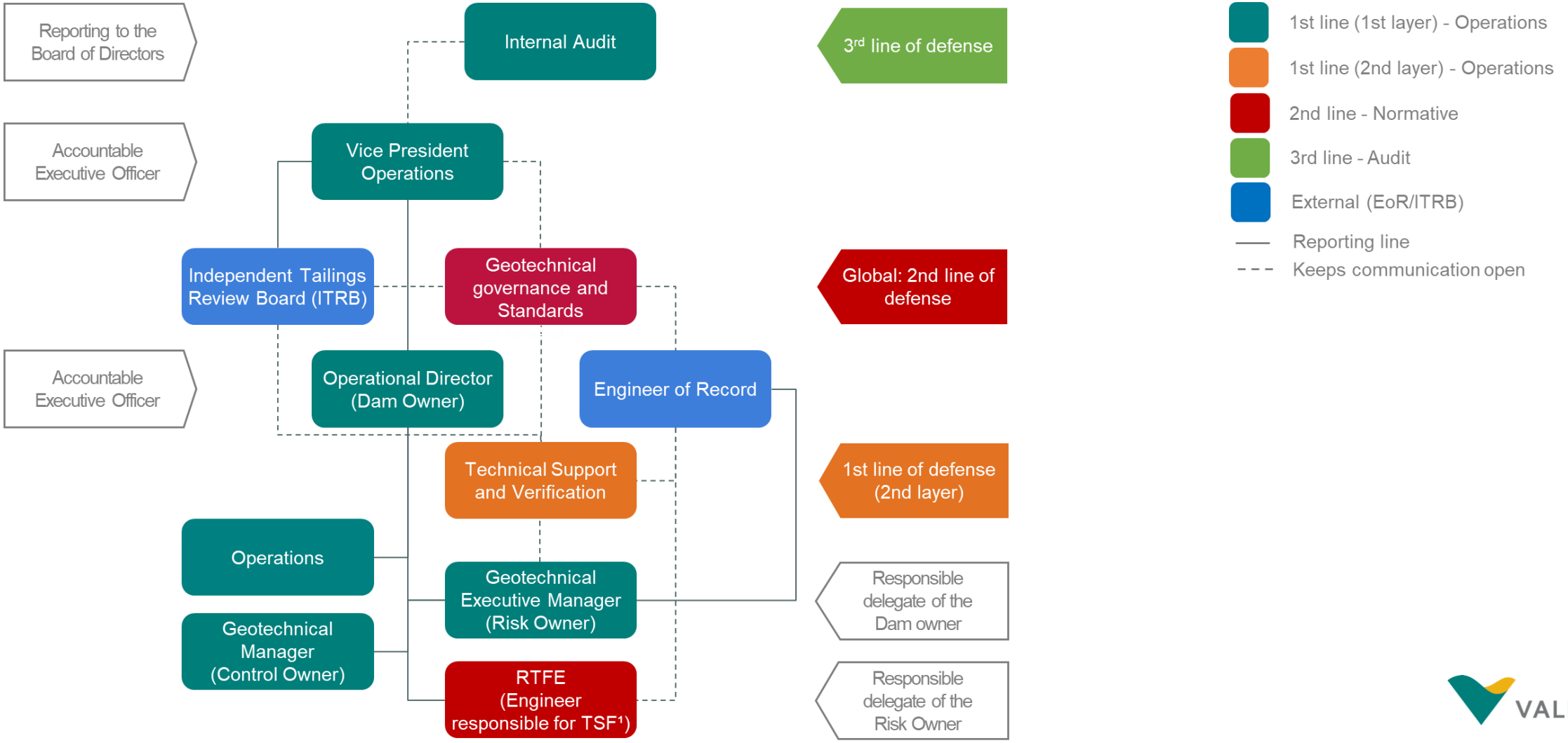
- PNR-000073: Consequence Classification for Dams and Tailings Storage Facilities
- PNR-000100: HIRA for Geotechnical Structures
- PNR-000129: Guidelines for Dam Breach Analysis
- PNR-000071: Dewatering Technology Selection
- PGS-004086: Guidelines for Emergency Response for Mining Dams
- PGS-004255: Management of Change for Tailings Storage Facilities

Routines

- PNR-000030: Basic Geotechnical Guidelines (BGG)
- PGS-004524: Roles and Responsibilities TDMS BMNA
- PGS-004525: Papéis e Responsabilidades TDMS BMSA
- PGS-004526: Roles and Responsibilities TMDS PTVI
- PGS-004527: Papéis e Responsabilidades TDMS Carvão
- PGS-004528: Roles and Responsibilities TMDS Energy Canada
- PGS-004529: Roles and Responsibilities TMDS Energy Indonesia

Understanding the TDMS

Organizational Structure and the Role of Senior Leadership



Understanding the TDMS

Monthly TSF Performance Assessed by the EoR[1]

Geotechnical Performance Condition Classification Table for TSFs

- Satisfactory With Possible Operational Improvements
- Satisfactory With Restriction
- Unsatisfactory With Possible Safety Issues
- Unsatisfactory With Possible Safety Issues

non-exhaustive

Country	Structure	Municipality	Mine	EoR Monthly Performance Assessment		DCE	Emergency Level
				Prev. Month	Cur. Month*		
Brazil	Barragem Norte/Laranjeiras	Barão de Cocais	Brucutu			Negative	Level 1
Brazil	Área IX	Ouro Preto	Fábrica			Negative	Level 2
Brazil	6 MAC	Nova Lima	Águas Claras			Negative	Level 1
Brazil	7A MAC	Nova Lima	Águas Claras			Negative	Level 1
Brazil	Barragem 5 - Mutuca	Nova Lima	Mutuca			Negative	Level 1
Brazil	Barragem 7B	Nova Lima	Águas Claras			Positive	Not applicable

www.vale.com/esg

All TSFs with extreme, very high, and high consequences need to have a designated EoR

The EoR is responsible for periodic TSF safety inspections

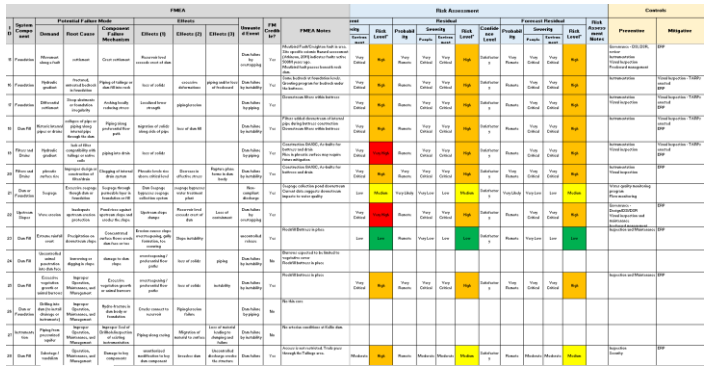
Monthly TSF Performance Assessment is publicly disclosed at Vale ESG portal since Q1 2021

[1] EoR stands for Engineer of Record.

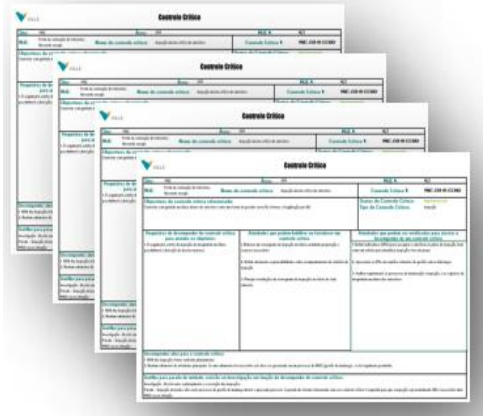
Understanding the TDMS

HIRA[1] deliverables

1 FMEA[2], MUE[3], Risk Assessment, Controls



2 Critical Controle One Pagers



3 Risk Matrix

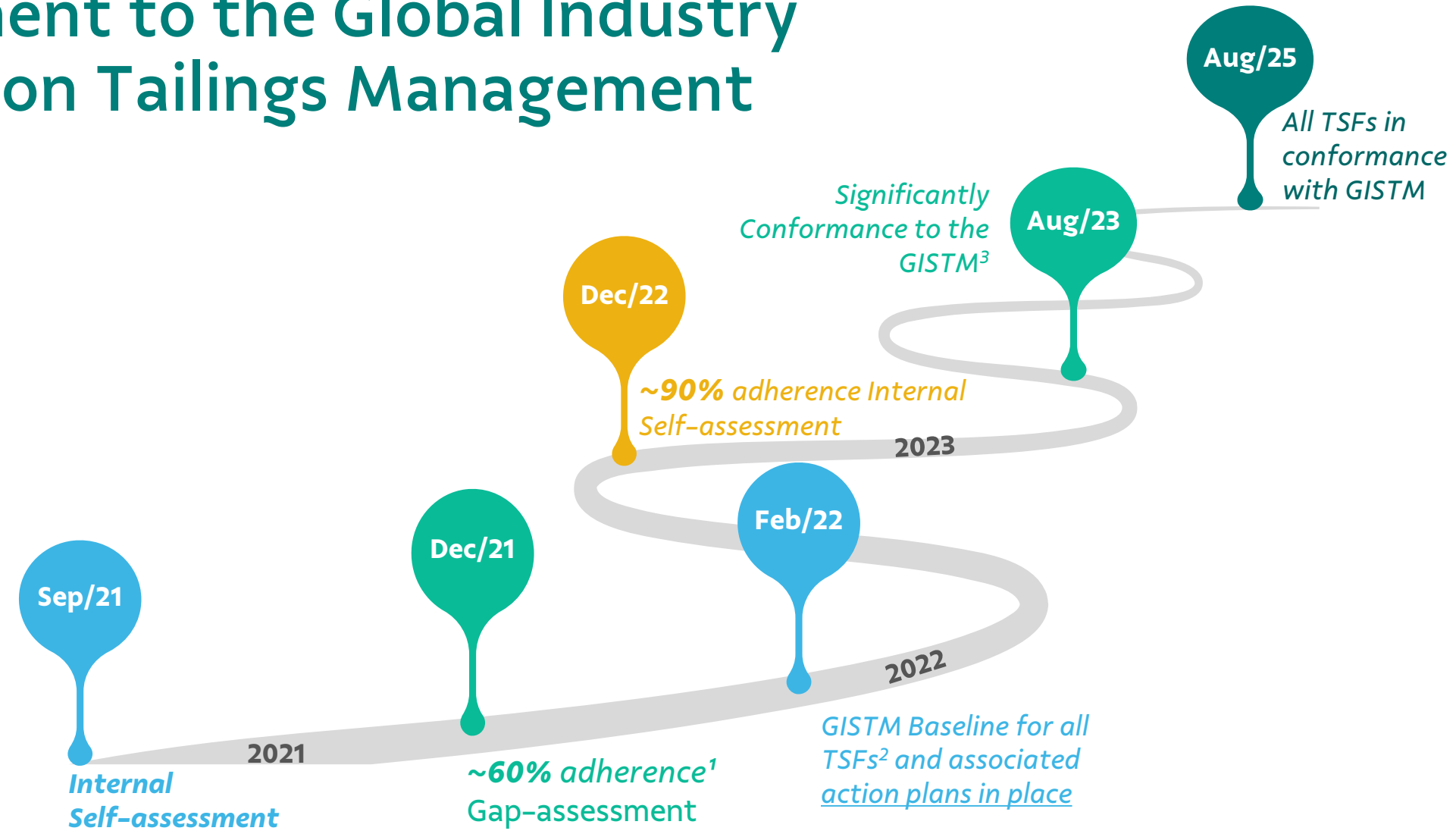
Severity	Very Remote	Remote	Unlikely	Likely	Very Likely	Total
Very Critical	12	18	17	1	0	49
Critical	5	13	6	1	0	26
Severe	3	4	1	1	0	9
Moderate	1	2	2	1	0	5
Low	1	2	2	0	0	5
Very Low	1	0	0	0	0	1
Total	23	40	28	4	0	95

4 Action List

Action No.	Description	Reason/Origin	Timeline
1	**Conduct Hydrogeology Study:** Determine the cause of the high heads in the left abutment. The local hydrogeology is not well understood.	Elevated Risk due to adverse conditions	30-Aug-22
2	**Interim Risk Controls:** Implement the following interim risk controls until the hydrogeology study can be completed. A. Implement inverted filter downstream of the toe of the dam. B. Install pressure relief wells in the left abutment to reduce artesian heads. C. Beach tailings U/S of the dam to reduce the gradients from the reservoir. D. Reduce the normal operating water level in the reservoir. E. Update HIRA, critical controls, TARPs etc. as necessary.	Interim Risk Reduction	31-Dec-21
3	**Conduct the following Additional Slope Stability Analyses:** A. Effective stress analysis with cohesion intercept equal to 0, i.e. c' = 0 kPa. B. Undrained analysis using pseudostatic analysis C. Deformation study. D. Evaluate and update the critical sections (CC2), instrumentation (OMS) and TARPs (OMS) as appropriate.	Improve risk understanding	31-Dec-22
4	**Calculate Earthquake Induced Settlement of Colluvium Layer**	Improve risk understanding	31-Dec-21
5	**Install Additional Information:** Install vibrating wire piezometers in existing standpipe piezometers to obtain real-time piezometric data for dam.	Risk Reduction	30-Nov-22
6	**Downstream Slope Surface Drainage:** Evaluate the erosion damage that could occur during the 1:1,000 and 1:10,000 yr floods. Dedesign the drainage system if damage is unacceptable.	Improve risk understanding	30-Jun-21
7	**Active/Inactive Fault Verification:** Determine if the fault in the bottom of the valley where the dam is located is active or not.	Improve risk understanding	31-Dec-21

[1] HIRA stands for Hazard Identification and Risk Assessment. [2] FMEA stands for Failure Mode and Effect Analysis. [3] MUA stands for Material Unwanted Event.

Commitment to the Global Industry Standard on Tailings Management (GISTM)



1 - Based on the results of the self-assessment conducted in December 2021, which had the 77 auditable requirements as main source and encompassed 66 Tailings Storage Facilities (TSFs). | 2 - Tailings Storage Facility with criteria agreed by the International Council on Mining and Metals' Tailings Advisory Group in response to the Church of England information request, which may differ from Brazilian National Mining Agency criteria. | 3 – TSFs inventory revision to adapt to GISTM criteria resulting in 50 TSFs

Concrete steps towards GISTM implementation

Non-exhaustive examples

Affected communities[1]

- Grievance Global Standard released on October 30, 2020
- Human Rights Global Policy and Global Standard Procedure for engagement with Indigenous People and Traditional Communities
- Brazilian legislation requires FPIC
- All process that requires PAEBM review has an Indigenous and Quilombola component

Integrated knowledge base

- The PAEBM[1] registers the project-affected people (socio-economic and environmental)
- The most at-risk groups are also identified
- Probabilistic seismicity hazards and climate change assessments being performed
- TSF break studies under review, following best practices

Design, construction, operation & monitoring

- Consequence of failure classification being reviewed in accordance with GISTM
- Addressing brittle failure modes with conservative design criteria (implementation of backup dams for the critical upstream TSF)
- Design Basis Report prepared by EoR's
- HIRA to assess risks and critical controls, geotechnical monitoring centers with TARPS[3]

Management and governance

- Policies, systems and accountabilities completely reviewed
- ITRB and EoR appointed
- Multi levels of review implemented
- Geotechnical knowledge portal implemented
- Organizational culture with VPS enforcement
- Ombudsman channel with whistleblower protection

Emergency response and long-term recovery

- PAEBM[1] publicly disclosed[2]
- Engagement with public sector agencies in post-failure response strategies
- Brumadinho reparation enabling participation of the affected people in the restoration and recovery works and ongoing monitoring activities

Public disclosure and access to information

- GISTM implementation commitment disclosed at the ESG Portal
- ESG Portal under frequent review to accommodate all the TSF and information requested
- Monthly EoR reports publicly disclosed

[1] Emergency Action Plans for Mining Dams. https://vale.com/pt/paebm

Population close to risk areas removed and emergency drills performed

Emergency Action Plans for Mining Dams (PAEBM)[1] publicly disclosed[2] and fully aligned with of GISTM

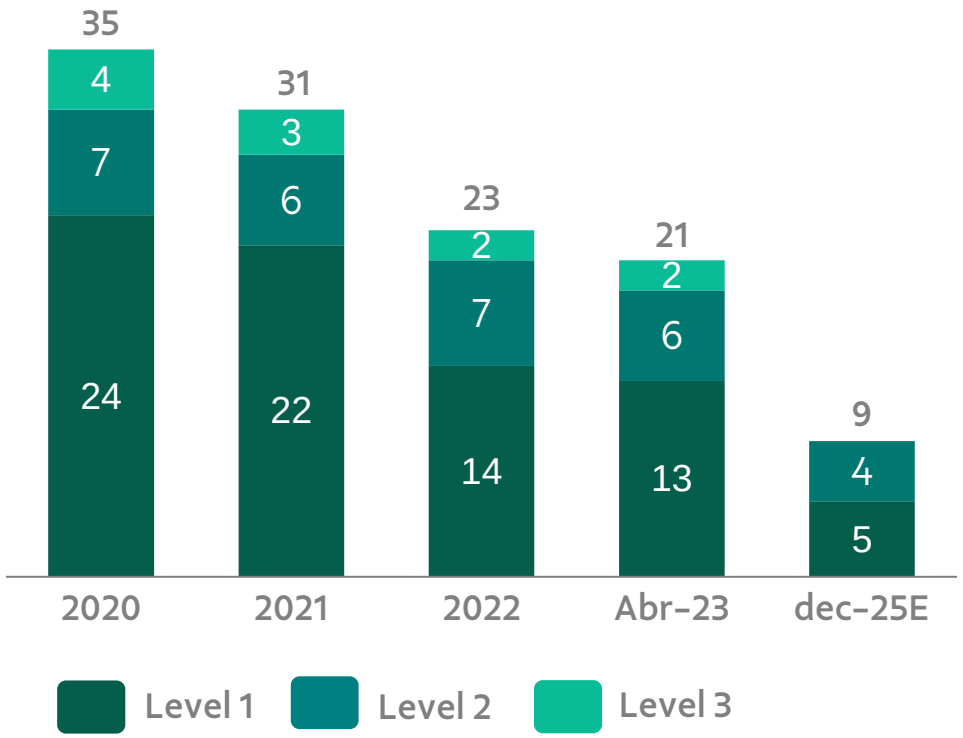
- **Emergency response training** with communities close to dams
- Partnership with the local Civil Defense Agency to **ensure appropriate conditions for simulations** and emergency protocols activations
- **Alarm sirens** placed in strategic areas to trigger emergency protocols
- **Teams and communication channels dedicated** to the dialogue with communities
- In case of mandatory removal, **full support to reestablish living and working conditions** to those affected

[1] Technical document required by the National Policy for Dam Safety – PNSB. [2] Available at: http://www.vale.com/brasil/PT/aboutvale/servicos-para-comunidade/minas-gerais/Paginas/Projetos.aspx

Making progress with dam safety

Structures at emergency level

No. of structures



NO DAM at critical safety condition by 2025

Geotechnical Monitoring Center

- **24/7 monitoring**
- **Video analytics with artificial intelligence**
- **Real-time piezometers monitoring**
- **Geophones to measure TSFs response to seismic**
- **Radars ensure fast response and precision**
- **Satellite, drone imagery and sound alarms**

Understanding the level 3 emergency upstream dams (2 structures)

Level 3 → No longer with access of people → Total Evacuation of all people downstream

2019 scenario:

- **Immediate response** to the B1 dam failure
- Dams with same **technical characteristics of B1**
- Change in the technical criteria to address liquefaction risks. **Adoption of minimum parameters.**
- **No change or degradation** in the dam conservation status.
- Adoption of **remote monitoring** and remote inspections

2023 scenario:

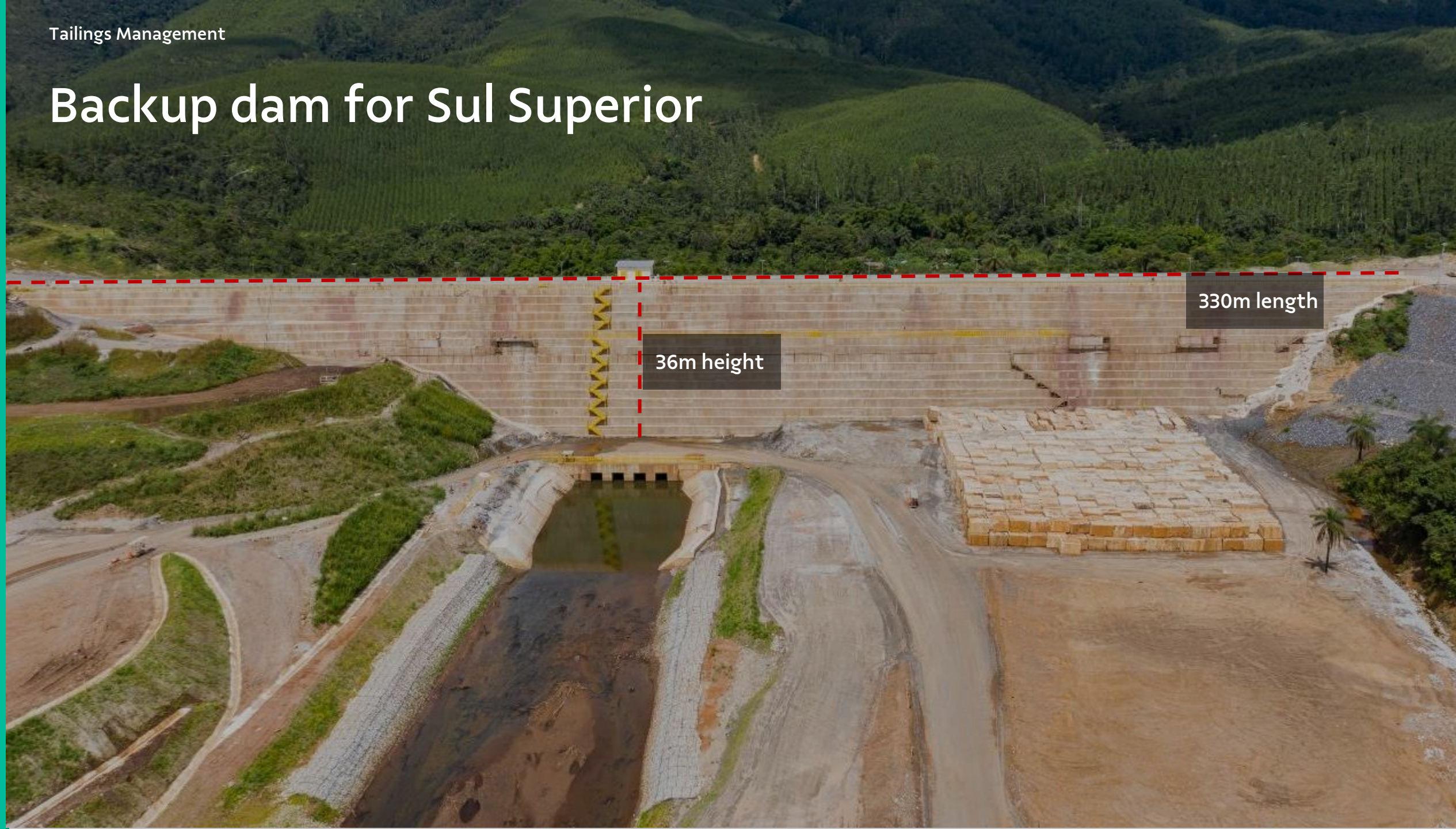
- **Back-up dams** downstream to reduce consequences
- Measures to **improve stability** and safety conditions.
- 3 years of **heavy rains** recorded
- 3 years of **good performance** measured
- Conclusion of the B1 **technical investigation** by different world´s top experts
- In-depth studies to **improve knowledge** on the them
- 1 dam reduced from Level 3 to Level 2 as a result of technical works

Level 3 dam's status

Forquilhas 3 – Advanced stage of Engineering

Sul Superior – Beginning of tailings removal

Backup dam for Sul Superior

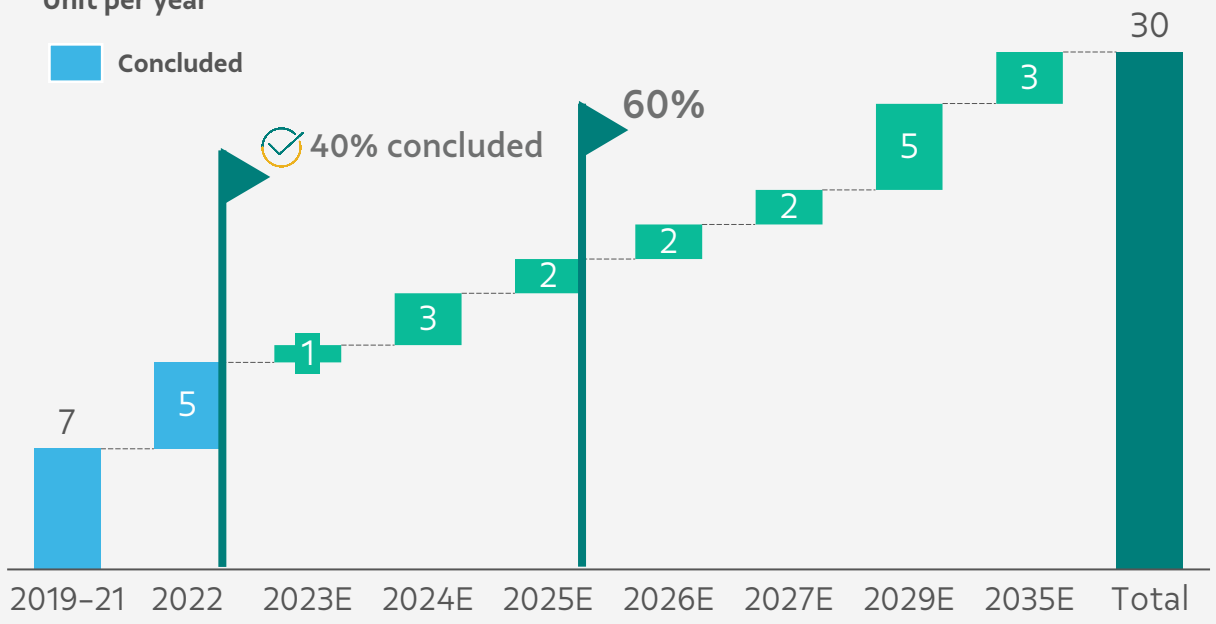


Backup dam for Forquilhas TSF´s

Progress with TDMS and the Decharacterization Program

Eliminated upstream structures in Brazil

Unit per year



B3/B4 removed from critical safety condition (level 3)

B3/B4 decharacterization conclusion anticipated to 2025

No dam at critical safety condition by 2025

Precautionary approach:

Use of remotely operated equipment to remove tailings in critical safety structures

8B Dam de-characterization concluded 2019

Fernandinho Dam de-characterization concluded 2021

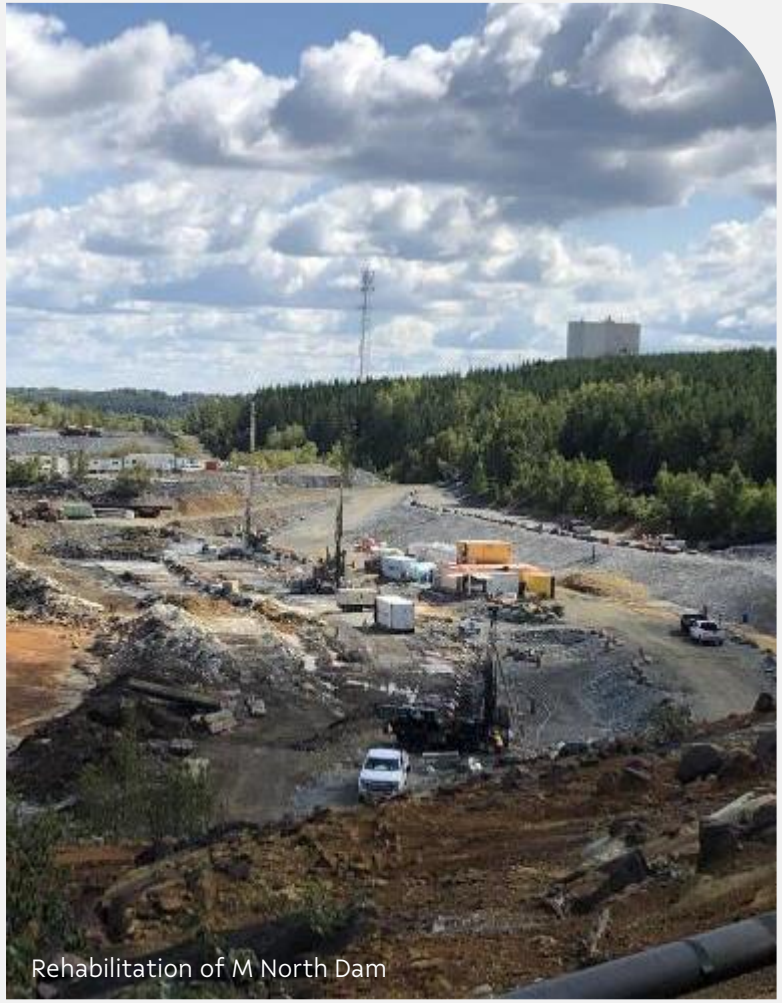
Vargem Grande Complex, Minas Gerais State, Brazil

Base Metals: buttressing is the strategy to meet acceptable level of risk

All the "upstream" dams outside Brazil are in Sudbury and the modified compacted outer shell is current practice.

- Canadian Dams Association (CDA) and the Mining Association of Canada (MAC) guidelines.
- Rehabilitation and reinforcement of upstream dams underway to meet Vale, CDA and ICMM Global Industry Standard on Tailings Management (GISTM) **to enable facility closure**
- 5 dams are already buttressed and the remaining 6 will be done over the next 6 Years.

Tailings Compaction – upstream TSF operation



Rehabilitation of M North Dam

New way to operate: *investment in alternative systems to reduce tailings and the use of dams*

- 4 filtration plants delivered
- US$ 2.5 bi invested
- Dry tailings used as co-products


Filtration Plant, Cauê


Sand stockpile , Brucutu site

- Sand as raw material for civil construction
- Dry tailings to promote infrastructure improvements in communities

Circular mining approach

On track for eliminating exposure to TSF failure risk

Upstream TSF De-characterization Program in progress

Optimized governance supporting risk management

Best practices to improve tailings and dam performance

Processing solutions to replace TSFs

Education and Training – People

We are building a safer and more reliable Vale

Geotechnical Monitoring Center

Parauapebas (PA)

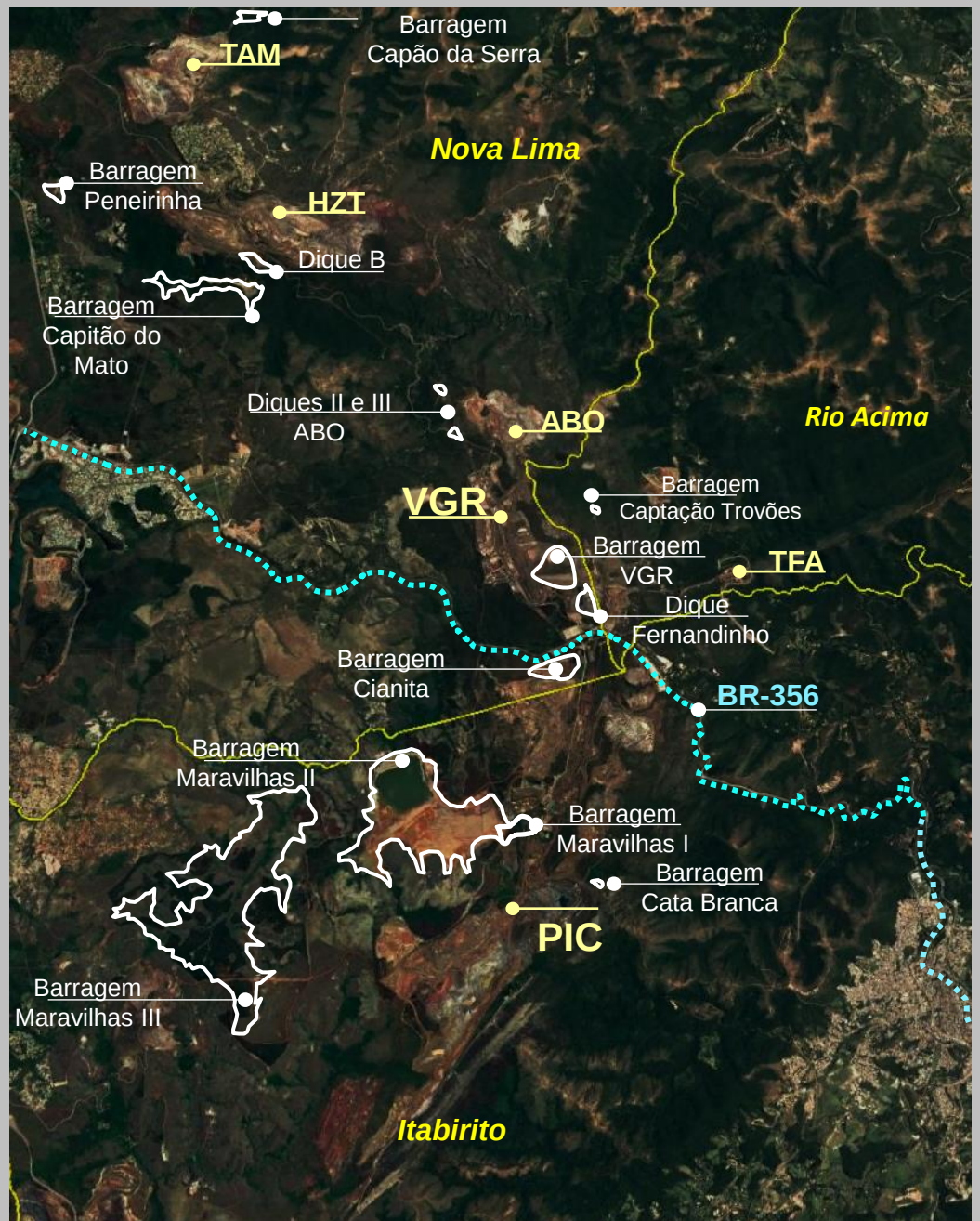
Field Trip to Minas Gerais

Vargem Grande Complex

May 23-24, 2023

VALE

2023



Vargem Grande Complex

6 **Open pit mines**
Tamanduá, Horizontes, Abóboras, Pico, Galinheiro and Sapecado

8 **Plants**
VGR2; ITM-D; ITM-A1
ABO1; ABO2; ITM-B; ITM-I; ITM-A2; VGR1

3 **Train loaders**
TFA1, TFA2 e TFA3

17 **Dikes and Dams**
1 in operation (Maravilhas III);
1 decommissioned; 15 in standby mode

7 **Waste stockpiles**

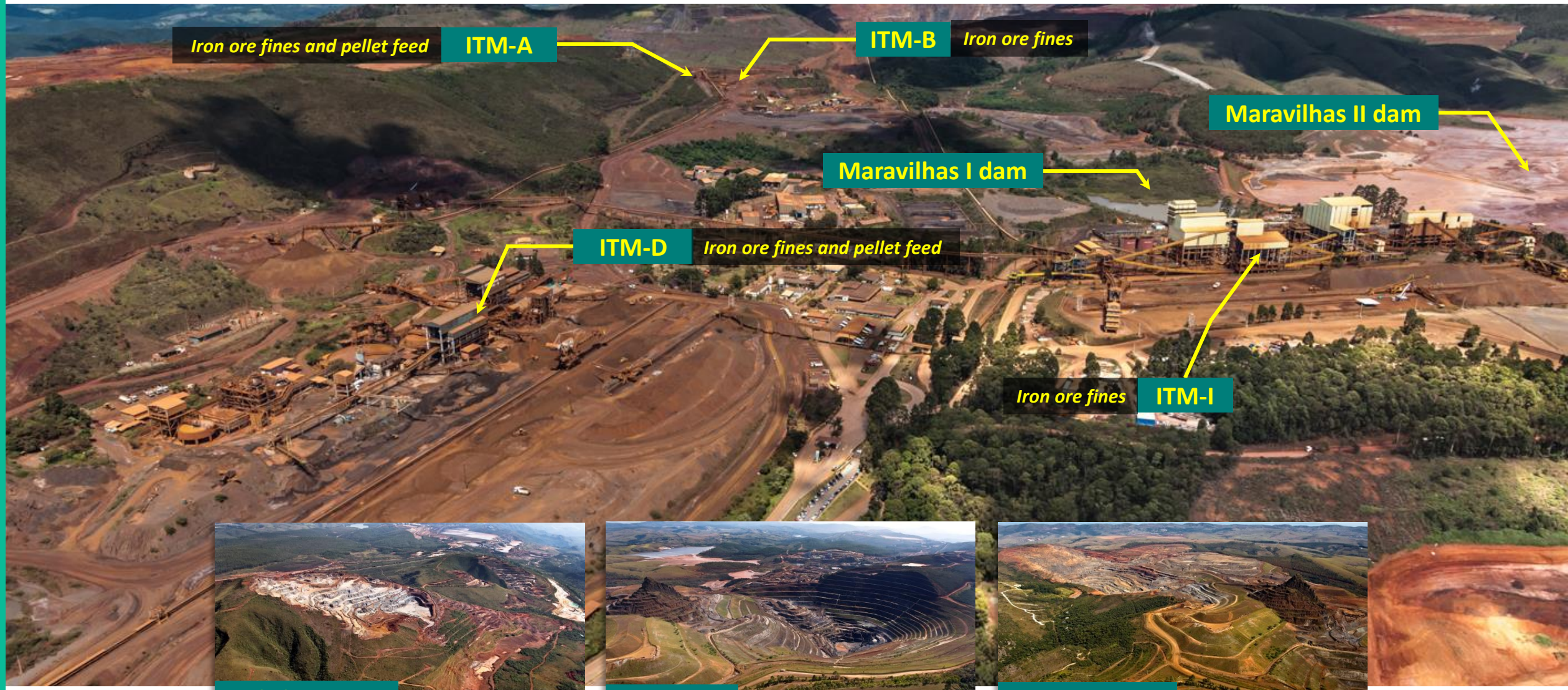
Vargem Grande Complex

- **Vale's 3rd largest iron ore complex**
  Capacity: ~55Mt
- **Largest iron ore reserves** in Minas Gerais (estimated exhaustion by 2120)
- **Longest conveyor belt** in Latin America (9.6 km)
- **Largest loading terminal** in Minas Gerais
- **Vale's 1st filtration plant**
  (Cianita Plant)
- **Vale's 1st brick factory** using iron ore tailings as raw material

Vargem Grande mine, Nova Lima (MG), Brazil

Vargem Grande

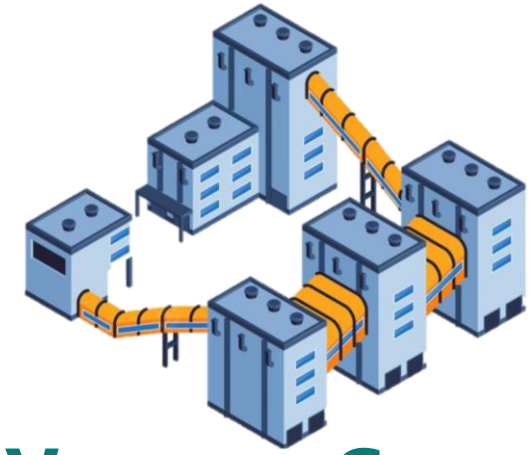
Pico


Iron ore fines and pellet feed
ITM-A
ITM-B
Iron ore fines
Maravilhas II dam
Maravilhas I dam
ITM-D
Iron ore fines and pellet feed
Iron ore fines
ITM-I
Galinheiro Mine
Pico Mine
Sapecado Mine

Andaime Railway Terminal

Vargem Grande 2

Process stages



01 MINE

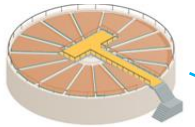
ROM is crushed and stockpiled for recovery, and then it is fed to the Grinding Plant

02 GRINDING

ROM material is ground to release the iron mineral. This stage is essential to separate the economically valuable mineral and the gangue in the following stage

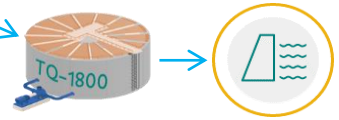
03 CLASSIFICATION AND DESLIMING

The particles are separated according to their size, with the coarse particles returning to the grinding process. The slimes are removed and directed to a dam for disposal



Slime thickener

The thickening process recovers a portion of the water for reuse and directs the slime to the Maravilhas III dam



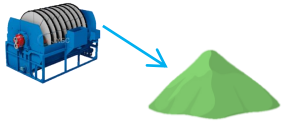
04 FLOTATION

It receives the underflow from the desliming process and is responsible for separating the iron mineral particles (pellet feed) from the sand waste. The sand waste is then directed to the Cianita filtering. Both have previously undergone pulp thickening processes

05 PELLETIZING

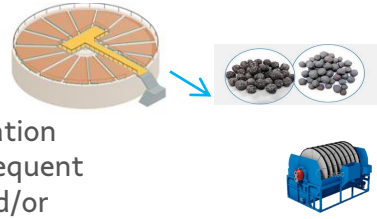
Iron ore fines are agglomerated into pellets and then hardened using a furnace to produce iron ore pellets. These are typically fed into a blast furnace or a direct reduction furnace as part of the steelmaking process.

Concentrate filtering



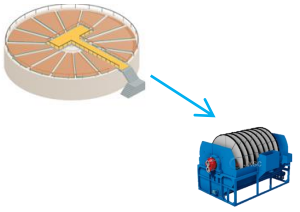
Alternative for filtering surplus pellet feed

Concentrate thickener



Sedimentation process of flotation concentrate particles for subsequent shipment to the Pelletizing and/or Filtering Plant

Tail thickener

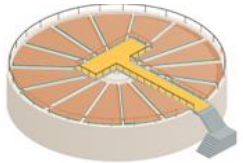


Sedimentation process of particles from flotation waste and subsequent sending to Cianita Filtration

Cianita Filtration Plant

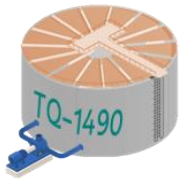
Process stages

01 RECEIVING



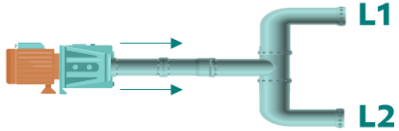
Tailings slurry from the Vargem Grande Complex Plants are collected and pumped to Pico mine

02 STOCK TANK



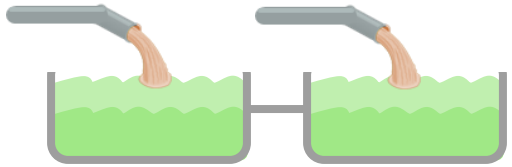
The pulp is stored in the tank that stirs the material, preventing sedimentation and ensuring the feed filtration

03 DISTRIBUITION

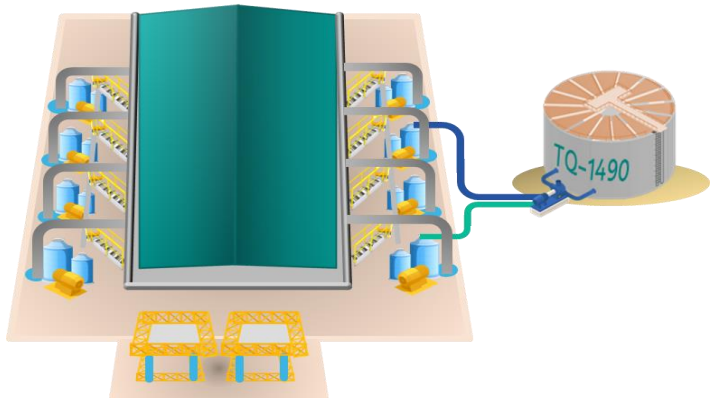


The TQ-1490 slurry is pumped and distributed in lines 1 and 2 to feed the filter basins

04 FEEDING



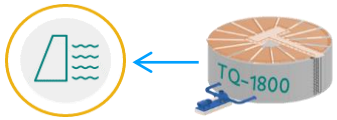
The basins are constantly fed with pulp, which is stirred at an adequate level



05 FILTRATION

Main stage of the process: at this moment the sectors are immersed in the pulp, and a vacuum effect separates the filtered tailings (solid) and the filtered water (liquid)

06 DESTINATION



Filtered water:
The liquid reaches the TQ-1800 by gravity and it is pumped to Maravilhas

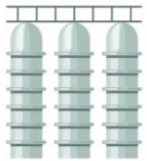
Filtered Tailings:
It is transported via a belt and stacked in piles. Later, it is distributed to PDER Cianita and Brick Factory

Vargem Grande Complex

Brick Factory

Process stages

01 RAW MATERIAL



Additives for the concrete;
Water;
Cement;
Commercial sand;

Fine Gravel;
Sand waste from others Vale operations, as a test;
Pico's sand waste

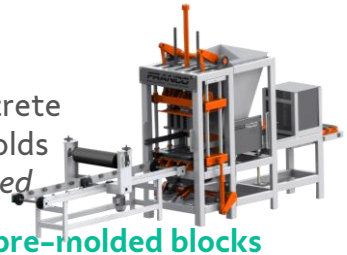
02 MASS PREPARATION

Depending on the desired concrete, different shares of inputs are combined in the mixer to make the **fresh concrete**

03 PRESSING

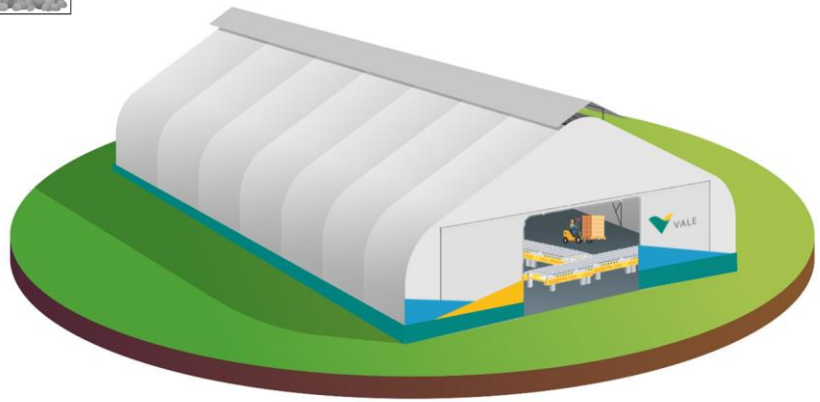
The fresh concrete is poured in molds and *vibropressed*

to ensure the **pre-molded blocks** formation



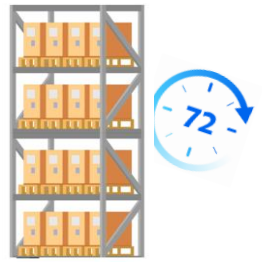
04 TRANSPORT

After the pressing, **sustainable pre-molded blocks** are produced and they will be transported to the cure area



05 CURE AREA

The pre-molded blocks are kept at least 72h inside the cure area to **reach the minimum specified resistance** required by norms



06 PALLETIZING

The pre-molded blocks are transported from the cure area to the handling bench, where they are sorted and stockpiled on pallets

07 PACKING

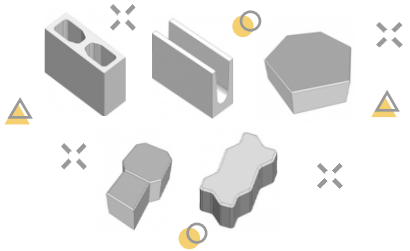
The pallets are wrapped with a "stretch" film as their final packaging for transportation and stocking

08 STOCKING

Packed pallets will be stored and await their final destination

09 APPLICATION

The new product is **donated and used in a clean and sustainable way**



Brick Factory

- **Pioneer initiative aims to foster sustainability in our operations by leveraging innovation.**

The main goal is to ensure **sustainable disposal of iron ore waste/tailings by applying technology to repurpose it as a raw material for new products**.
This approach aims to promote positive socio-environmental relationships with neighboring communities.

- **The initiative boosts a circular economy and champions diversity in mining by exclusively employing women in factory operations.**

VALE+ CEFET/MG

Pico Mine – Itabirito

Reutilization of ~10 ktpy of waste/shift

Production capacity: 3.8 MM artifacts unities/year/ shift

Potential: 90,000 m² of coating

Investment: R$ 28 million


VALE