

Tailings Management to Enhance Safety, Sustainability and Transparency

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Abstract

Management of major risks for tailings facilities has become a key financial driver for investors. This is necessitating cultural change, and robust steps forward to be taken in tailings governance. Major tailing asset owners and members of Industry Council of Mining & Metals (ICMM) are committed to implement the Global Industry Standard for Tailings Management (GISTM) for critical operations by August 2023 and remaining operations, not in a state of safe closure, by August 2025. The intended higher level of safety and security provided by more transparent and ethical management systems is focused on benefiting communities located nearby to impoundments. In practicality, implementation of the GISTM program is not simple or immediate. Understanding the cultural challenges and transitioning to the new norm requires careful work across organizational levels. An industrial complex in Brazil, which includes a Port, Alumina Refinery, Aluminum Smelter, and specific areas for wet disposal of alkaline Bayer process bauxite residue, have developed and are rolling out an innovative, inclusive, and integrated GISTM Implementation Program in close partnership with Hatch. The concept is based on 04 pillars: i) to engage local and corporate teams; ii) to build and internalize knowledge, iii) to embed new requirements in existing processes and tools, iv) to add value and enhance business mindset in a sustainable manner across the journey. The program is ongoing and key factors to achieving the successful implementation of change include building communicative and cooperative relationships between internal teams and taking a structured project management driven approach in relation to guidance, continuous analysis, managing change and risk. Through strong governance by top operations and corporate leadership, and with Hatch support in the implementation, this approach is enabling change and consideration of new tailings management technologies and innovations as they arise, providing the environment for strides to be made in maintaining sustainability of operation in the face of significant legacy issues for this core global industry.

Keywords: GISTM, Alumina; Bauxite; Tailing management; Risk management; ICMM.

1. Introduction

In 2019, the Church of England Pensions Board [1] and the Swedish Council, led the foundation of *The Investor Mining and Tailings Initiative* (IMTSI) - a coalition of over than 100 investors. In 2020, immediately following the Global Mining and Tailings Safety Summit, 45 of the top-50 companies, representing 83 % of the mining industry market capitalization, joined the initiative and voluntarily disclosed information on their geotechnical assets.

The Initiative performed a broad review of issues related to recent ruptures with the intention of developing a stricter industry standard, calling operators to action, and keeping records on a common database [2]. These steps have influenced and are driving overall global industry commitment to a greater level of safety, ethics, and transparency in the mining sector.

GISTM, the product of efforts to improve, was developed by ICMM, United Nations Environment Programme (UNEP), Principles for Responsible Investment (PRI). All ICMM members have

agreed to adopt the GISTM and accordingly, critical operations from all industry will have to comply by August 2023 and remaining operations, not in a state of safe closure, by August 2025.

A global aluminium company, leading a joint venture with other members of ICMM, partnered with Hatch to develop and proceed with their GISTM Implementation Program, which runs concomitantly to all structures' lifecycle, including Project, Construction, Operation and Closure.

The shared vision is to implement GISTM by robust planning and management through building knowledge, promoting communication and cooperation between internal teams. The main objective is to embed sustainable processes at an organizational level, adapting and improving existing corporate systems and procedures to the fullest reasonable extent possible in a timely manner across business.

2. Approach

GISTM integrates 06 Topic areas, which encompass 15 Principles and 77 auditable requirements as shown in Figure 1. The benefit to nearby communities is intended to be greater safety and security from the more transparent and ethical management systems.

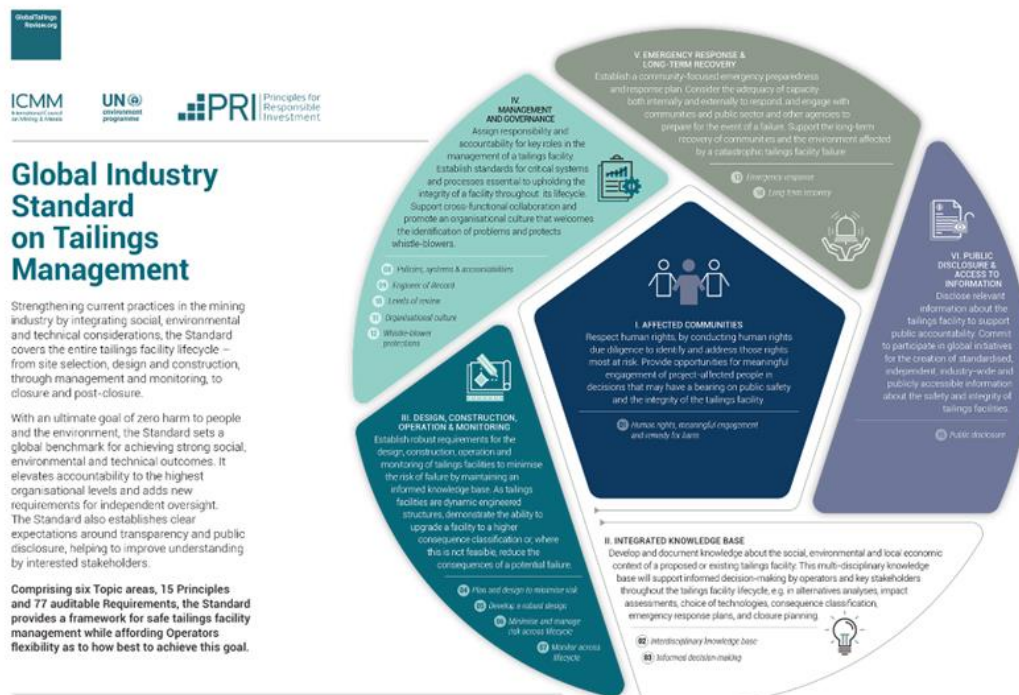


Figure 1. GISTM Topics and Principles.

2.1 GISTM Implementation Project Concept

The arrival of the new standard flagged the need for significant improvement of tailings management. The company, as operator of an industrial complex that includes Port, Alumina Refinery, Aluminum Smelter, and Residue Storage Areas (RSAs) of alkaline Bayer process bauxite residue, embarked upon upgradation of their global tailing Management System centered on GISTM requirements. Connecting several other business aspects to enhance management and governance of impoundment assets, their own corporate Self-Assessment Tool, used for decades in company's Risk-Based Audits, was revised to concentrate all GISTM Conformance Protocols requirements and criteria and was released in December 2021.

Understanding that cultural challenges to implement GISTM would have to be carefully worked across organizational levels, this client developed in close partnership with Hatch an innovative, inclusive, and integrated program. Considering GISTM extension, a special concern in maximizing effectiveness to business while balancing workloads for all stakeholders, led the Project Concept to anchor on 04 pillars:

- i) Engage local and corporate teams - to work culturally, so internal teams embrace a new work mindset.
- ii) Build and internalize knowledge – to develop expertise inside company and make it immediately available.
- iii) Embed new requirements to existing processes and tools - to work across existing processes to embody new requirements.
- iv) Add value and enhance business mindset sustainably - through either developing internal expertise and awareness and disciplined execution supported by Project Management Office (PMO) methods and tools to facilitate and provide reliability across the journey, making updated processes sustainable and auditable.

Both Strategy and Execution Planning, as detailed following, stand on these pillars.

2.2 Planning

Appointing a Project Manager (PM) right for the program was the critical first step to developing knowledge on the standard, concept, and execution strategy draft. Core skills for the role selection were leadership, communication, long-term vision, and influencing ability.

The execution strategy consisted of three key steps:

- Division of the responsibility for the 15 Principles to operational teams within Functional Business Areas of: Impoundments; Environmental Health & Safety (EHS) and Institutional Affairs. Criteria for work distribution were affinity, knowledge, and area accountability.
- Developing tailored methodology using business process mapping.
- Staging efforts throughout the more conservative implementation timeline of August 2023 to all structures.

An Implementation Roadmap connected corporate standards and practices to Project Set-up, where the main activities were:

- Corporate Self-Assessment Tool pre-review by Hatch: focused on inclusion of additional parameters, such as evidence examples, budget, preliminary actions, milestones, accountable people, and Subject Matter Expert (SME) from regional and global teams.
- Work team assignment: full team comprises around 30 people from local, corporate internal levels and Hatch.
- Roles and responsibilities well defined and clear governance process between operational teams, PMO team and top leadership.
- Operational teams Self-Assessment Tool review for their own actions, deadlines, and budget.
- Monthly progress leadership reviews with specific Steering Committee.

A first engagement at top leadership level was carried out in December 2021 to approve the Implementation Roadmap and confirm stakeholders. It was critical to assure their focus was on establishing accountable and engaged cross-functional teams. The necessity of these being led by a Principle whose individual performance targets reflected the importance of the program to the business was recognized as a critical success factor.

2.3 Set-up and Project Phases 1-2-3

Kick-off took place in January 2022. This focused on officially engaging and provide primary GISTM guidance to cross-functional operational teams, clearly assigning roles and responsibilities, and establishing the project schedule.

The focus of set-up efforts was on the inclusion of relevant information into the Self-Assessment Tool. Extensive communication by the Hatch PMO team during data gathering and deadlines definition by operational areas, reinforced through consistent review enabled challenges to be overcome through teamwork, commitment, and adoption of leadership drivers.

After all input were gathered and critical analysis undertaken, the PMO team delivered schedules and reported models by Principle and Functional Area and provided a Self-Assessment Tool full version to be loaded at into the clients' global compliance database. For quality assurance purposes, additional small workshops were conducted by PMO team with each Principle accountable person to undertake consistency checks on database full version.

The Project Phases 1-2-3 were set by the 03 milestones.

- Phase 1: short-term actions and gaps to be closed by May 2022 (completed)
- Phase 2: mid-term actions and gaps to be closed by December 2022 (in progress)
- Phase 3: long-term actions and gaps to be closed by June 2023

Establishing and maintaining momentum is a core requirement of achieving the milestone objectives. To facilitate this, an agenda for periodic follow-up meetings was agreed between PMO and operational teams to advance Phase 1. Weekly or bi-weekly meeting routines were initiated to discuss progress, eventual constraints, and arising risks, related to each action assigned to the Principle and team. These discussions fostered ongoing knowledge development, with hurdles, internal resources and drivers being openly discussed as a team and escalated monthly to top leadership through specific governance meetings. This process continues to be in place during Phase 2 and improved as required to meet the phase requirement and timelines.

2.4 Risk Management and Reporting

As with other projects, the ability to manage arising risks often comes down to awareness of them as they become increasingly imminent and establishing mitigation actions in reasonable time to reduce likelihood.

Phase 1 included 7 sessions to assess risks related to execution of the actions. Organized by PMO, the sessions were attended by Regional Impoundments team members and most operational teams. Each requirement was discussed in terms of action effectiveness to achieve full compliance by June 2023. For every medium/high risk that came up, the action and deadline were revised to become more reliable and mitigate the risk. High risk gaps were immediately prioritized to reduce score. Residual risks are managed through the Self-Assessment Tool, where progress of their completion is tracked. In addition, lessons learned associated with the risk process sharpened the approach during follow-up discussions.

Transparency of progress towards completion of this prioritized business program was required by top leadership on a monthly basis. The report provided by the PMO team, encompassing performance against all Key Performance Indicators (KPIs) and overviewing red flags, grounded discussions with top leadership team and enabled informative and guidance-based discussions, while providing an additional layer of risk management and valuable escalation support.

2.5 Governance

Governance is a fundamental aspect of any effective management system. The aspirations for implementation and sustainable adoption of the GISTM enhanced tailings management program increased the imperative for governance as a mechanism to reinforce the criticality of culture change at all levels. Facilitating communication in relation to the importance of the new mindset, engaging people in the drive for necessary improvements and ownership of identified actions, the governance process ensures quality output, truth-in-reporting and support to execution is provided through enhanced cooperation.

A multi-faceted governance process has been implemented for effectiveness and consists of:

- Weekly and bi-weekly sessions led by PMO - operation teams to check progress, remarks, outcomes from SME discussions and eventual attention points or potential barriers to advancement.
- Weekly meetings led by PM with Impoundments Leadership to ensure local alignment and clarification of items required to proceed.
- Monthly Meetings led by PM with Regional Team to discuss specific actions under their responsibility and further technical clarification where required to advance the Project.
- Monthly Steering Committee Meetings led by PM with top leadership to report KPIs/red flags share major focus areas of operational teams' discussions, decision making or provide direction where needed and activate help chain, as necessary.
- Operational teams and Subject Matter Experts (SMEs) specific meetings to discuss technical subjects regarding specific requirements to guide local efforts under corporate guidelines, avoid misunderstanding and avoid rework. The PMO team facilitates these meetings if needed or alternatively, team members operate autonomously with an increase in independence witnessed as organization GISTM maturity increases.
- Discussions led by area leadership with global Team and consortium members on periodical meetings, to share experiences and make specific decisions.

3. Essential Success Factors

As the Project has unrolled, recognized key success factors are identified as utilization of a structured project management approach, internal teams' engagement, and communicating a clear sustainable management strategy.

3.1 Structured Project Management Approach

From early steps, PMO added value by developing a robust approach, rapidly endorsed by top leadership, and embraced by operational teams. Recruiting a Senior Hatch consultant with necessary client history, topic knowledge and management expertise as Project Manager to lead building concept phase and mindset, brought relevant business experience and traction to the Project and facilitated strong initial communication and engagement between stakeholders. As additional high energy professionals joined PMO team (Risk & Compliance, Planning Engineers), this key support was indispensable to project succeeding during extensive deliverable development effort and Phase 1.

Along the journey, the need for extra PMO dedication and resources was identified, resulting in restructure in May 2022. This reshaping aimed to increase focus on mid-term actions by closer tracking with internal stakeholders. A transition process was conducted during completion of short-term actions. Increasing ownership of the program is an important aspect of the pathway to adoption of the new mindset and program. As such, the client Risk & Compliance Engineer assumed the PM role, with the Hatch team transitioning from the lead to the support role and

assuming help chain roles including assistance with coaching the team, driving efforts strategically, and providing environmental social governance (ESG) consultation.

3.2 Internal Teams Engagement

Another key differentiator from early in the program was recognition of the necessity for, and full commitment to, GISTM implementation at all organizational levels.

To work culturally to embed knowledge, shift mindset to a new tailing operation approach, integrating it into day-to-day processes and activities is challenging and as with all aspects of culture remains an area of continual focus. At the very beginning tailing management was seen to be apart from plant operation, however, Operation Impoundments, EHS, Institutional Affairs teams understanding on GISTM is expanding quickly during Phase 2, which is creating interest and curiosity in the Project and enhancing motivation to accelerate across the journey.

Acknowledgement of the critical role that cultural alignment plays in the performance of the organization, remains difficult to measure, but is intrinsically a factor that contributes to success as it embodies the interconnected relationship between behaviors and values and their association with achieving desired outcomes on a consistent basis over the longer term.

3.3 Communication

The work team comprises at least 10 area superintendents, supervisors, and managers, complemented by Subject Matter Experts (SMEs) from regional and global levels, resulting in a team consisting of over 32 people, located in 3 different time zones.

Communication between teams has been a powerful factor and is improving significantly, strengthening partial outcomes to excellence levels. Remote or virtual communication tool advancement through Covid-19 assisted in enhancing communications across regions and time zones.

Additionally, joint venture partners inputs have been an enlarged communication path as Project advances, providing mutual beneficial experience sharing between teams. The PMO team dedication to intensify focus and other mutual contributions and guidelines are part of current communication, and progress is being monitored.

3.4 Sustainable Management Strategy

The initial strategy was carefully planned to manage GISTM implementation efforts through a PMO led project management approach and structure, and with a focus on open communication, mutual learning, revising existing processes and tools to embed new requirements where possible and developing new if required.

This combination of elements has been a decisive step in the journey to embed the GISTM mindset and innovations into operational routines and transition the culture smoothly and cooperatively when internalizing the requirements. Highlighting the need for sustainable change and expectations around achievements has been a constant message while actions and gaps are closed and is reinforced by internally and externally auditing forming part of the process.

Through strong governance by client top leadership, supported by Hatch, the Project is progressing incrementally towards becoming the foundation stone of the new tailings management process, technology review and evolution of innovation which delivers the intention

of making change across the metallurgic industry in relation to impoundments and management of these operational legacy areas.

4. Partial Achievements & Outcomes

4.1 Key Performance Indicators (KPIs)

The ultimate objective is to implement 100 % of the GISTM requirements for tailings facilities with Extreme and Very High ICMM classification structures by August 2023 by having capable people and effective systems in place, reliable information disclosure, and improved safety, transparency, and demonstrated ethics. The GISTM Implementation Program developed and in rollout, encompasses all aspects of the business required to meet this objective. Performance of planned activities is monitored weekly and prioritized in governance program to effectively manage risks and challenges timely. Phase 1 was completed in May 2022, and Phase 2 is ongoing, with completion with an estimated compliance level of 85% scheduled for December 2022. Phase 3 will correspond to full compliance to 100 % GISTM requirements and is forecast to have long-term actions closed by June 2023, in advance to the August deadline.

4.2 Stakeholders Engagement

Since early stages, effective stakeholders' engagement was recognized as necessary to successfully pivot the organization to adopt the requirements set down by the new GISTM. Interpretative and educational discussions on conformance protocols have remained a constant feature underpinning mindset maturity increase. Special care had been taken to include perspectives and experience of operational personnel as well as balance stakeholder's workload to encourage commitment.

To support this objective pre-filling efforts were done by Hatch consultants with suggestions from past discussions. On-boarding introduction sessions were held during February 2022, so people understood what was going on, what was expected of them and where to seek help. Populating the Self-Assessment Tool with evidence, defined actions related to gaps and to estimate potential additional budget required extensive communication among several organizational levels to gather local contributions and undertake final review and endorsement from action owners to avoid compromising the final objective.

Hatch provided experience-based guidance and understanding of the project, which enabled the project to be resourced appropriately. Phase 1 enhanced the current PMO and local team skill maturity and capability to discuss issues, identify and track actions to completion. Continuity of monitoring against milestone dates and timely decision making in view of float between milestones will remain necessary to minimize the risk to not completing the program within the target schedule.

Those core components combined were essential to obtain stakeholders' engagement, along with leadership commitment, who embraced accountability-philosophy from the beginning. As the work advances, project objectives are becoming area targets, roles become increasingly defined, and internal relations become independent.

5. Conclusions

Investors and society expressly required the Mining & Metals Industry to raise the bar on tailings operations safety and transparency.

A Hatch client in Brazil operating an alumina complex has embarked on a proactive and risk-based approach, which relies on effective management and communication to build or review their internal systems. Stepping forward on their tailings management approach to reflect and embed GISTM into the business existing requirements has been focused, co-operative, and undertaken at a continuous pace to succeed, essentially by pairing full operational team engagement and commitment to company values, with Hatch project management skills, subject matter understanding and team building in a long-term partnership.

Differentiators in achieving positive change have been working to adapt culture and mindset through leadership drive and support, effective planning with sufficient timeframe to adequately provide an environment for strong stakeholder engagement, ownership of accountability, disciplined governance. The magnitude of the program is significant and may be recognized and fully valued at the end of the implementation. Current openness to changes arising from GISTM is a positive indicator for achievement of program objectives which strongly seek to operate with excellence and empower systems, teams, to maximize their outcomes.

Hatch intends by publishing this Paper is to provide useful insights to Mining & Metals Industry, while the journey is still under development.

6. References

1. The Church of England, The Investor Mining and Tailings Safety Initiative, The Church of England.
2. Global Tailings Portal, Global Tailings Portal (grida.no).