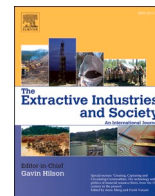


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Original article

The role of institutional mining investors in driving responsible tailings management

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ABSTRACT

Recent devastating tailings dam failures have led many investors to view mining projects as increasingly risky investments compared with other industrial projects. In 2019, institutional investors worth US\$14 trillion in assets called for the development of an independent classification system for quantifying the safety risks associated with tailings storage facilities (TSF), and played a central role in the Global Tailings Dam Portal Project disclosure request which called for a significant increase in transparency of TSF data. This paper draws upon an extensive literature review to explore the role and motivations of institutional mining investors in mitigating TSF failure risks. Results from qualitative interviews with institutional mining investors are presented to triangulate findings. It is concluded that the financial materiality of TSF failures cannot be argued to be the sole motivating factor for increased investor interest in this topic. Increasingly, the risk of TSF failure is being recognized as a critical environmental, social and governance (ESG) issue. Despite growing interest by investors to directly influence TSF management at mining sites, challenges arise due to the lack of a global tailings standard, technical training and differing regulations across jurisdictions. However, it is found that investors can also play an important role through pressuring company boards, and in improving the overall transparency of data associated with TSF risks. An outstanding research challenge lies in developing tools and frameworks to support investors to meaningfully incorporate TSF risks into investment decisions.

1. Introduction

Institutional investors have a growing interest in knowing a company's degree of transparency in disclosing Environmental, Social and Governance (ESG) performance and policies (Eccles et al., 2011). Given the mining industry's association with large-scale environmental damage and social conflict, the sector is ranked as being the most exposed to ESG risks (S&P Global, 2019). One of the most devastating effects of a mining operation on the surrounding environment and communities is from the failure of a mine's tailings storage facility (TSF). Recent TSF failures have focussed investor attention on the consequences of continued lack of initiative to invest in safer TSF design and management.

There are many examples where TSF failures have caused disastrous environmental and social consequences. The most recent example being the January 2019 collapse of the Córrego do Feijão iron ore mine TSF in the town of Brumadinho, Brazil. The collapse (referred hereafter to as Brumadinho) left more than 270 people dead, caused irreversible

environmental damage and resulted in a 16 billion dollar hit to investor portfolios (Freyman and Lall, 2019; Silva Rotta et al., 2020). In November 2015, in the same mining region of Brazil, a TSF at the Samarco Mining Complex collapsed resulting in 19 deaths and the largest environmental disaster in Brazil's history (Hatje et al., 2017; Vick et al., 2016). Both the Samarco Mining Complex and the Córrego do Feijão iron ore mine were jointly or fully owned by the mining company, Vale. Another example of a highly publicized TSF failure outside of Brazil is the 2014 facility collapsed at Imperial Metal's Mount Polley mine in British Columbia, Canada. The collapse released 7.3 Mm³ of tailings, significantly impacting the surrounding waterbodies (Nikl et al., 2016; Petticrew et al., 2015) and raising concern among Indigenous communities (BC First Nations Energy and Mining Council, 2015). Investor interest in TSF safety, management and governance peaked following Brumadinho. Following the failure, a group of institutional investors worth US\$14 trillion in assets under management called for the development of an independent classification system for quantifying the safety risks associated with TSFs and the public disclosure of TSF

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information. Institutional investors are being recognized as a key stakeholder for driving a new level of accountability and transparency within the mining sector (Franks et al., 2020; The Church of England, 2019).

The significant financial impacts of these failures have incentivized investors to enforce mitigation measures by companies in their portfolios (Concha Larrauri and Lall, 2017). Through initiatives such as the Investor Mining and Tailings Safety Initiative, Global Tailings Dam Portal Project (GTD) and the Global Tailings Review (Global Tailings Review, 2019; GRID-Arenal, 2020; “The Church of England,” 2019), investors have prompted the creation of the first Global Industry Standard on Tailings Management and encouraged mining companies to self-disclose various information on TSFs, hazard ratings, failure history and management processes. The Investor Mining and Tailings Safety Initiative also resulted in the first publicly available and most comprehensive global tailings database through the GTD (Franks et al., 2020). As of August 2020, 1743 TSFs from 107 mining companies are listed within the GTD, representing the significant influence that investors have over companies in their portfolios. To complement the GTD and the Global Industry Standard on Tailings Management (Global Tailings Standard), a compendium of papers was written, primarily, by the expert committees tasked with the creation of the Standard (Oberle et al., 2020).

The need for improved TSF management is increasing synchronously with the global demand for mining and metals. Exacerbated by gradual declines in average ore grades of many mineral commodities resulting in an increase in waste rock and tailings production per tonne of ore mined (Prior et al., 2012), there is evidence to suggest that increased costs of accessing lower grade ore and elevated prices of mineral resources are contributing to an increase in large-scale tailings failures (Bowker and Chambers, 2017). Targeted, collaborative stakeholder action to improve TSF management is therefore imperative to mitigate future TSF failures, and investors are increasingly an important actor.

In this article, we begin by addressing the question of what motivates investors to become more active players in TSF management. We present an overview of recent literature pertaining to institutional investor engagement on ESG in the mining industry and investor motivations. Although research at the intersection of TSF management and institutional investment is limited, we found evidence that investor engagement can enhance disclosure of TSF data and improve alignment of company practices with international standards. It was found that investors play an important role to hold the mining industry to account for TSF failures through engagement with company boards. Qualitative interviews with institutional investors reinforce findings from our analysis of academic and gray literature. We also use the interviews to assess the challenges investors face to integrate TSF data into the investment decision process. We conclude with a critical discussion of the extent to which the newly available TSF database (or GTD) is likely to address investor challenges, and identify outstanding research needs for the development of new tools and frameworks that could better support investors to meaningfully incorporate TSF risks into investment decisions.

2. Why do TSFs fail?

There has long been recognition that companies have the technical capabilities to drastically reduce the number of annual tailings failures (Peck, 1980). Academia and industry are aligned on the technical causes of tailings containment wall failures causes being (Austrian Government, 2016; Baker et al., 2020; Clarkson and Williams, 2020; Kossoff et al., 2014; Rico et al., 2008):

- Slope instability;
- Earthquake loading;
- Overtopping;
- Inadequate foundations; and

- Seepage.

However, TSF failures rarely occur due to an isolated technical cause. Recent articles suggest that TSF failures are more likely to occur due to a disregard of proper engineering practices, management or poor governance frameworks, rather than lack of technical knowledge on TSF risks (Armstrong et al., 2019b; Oberle et al., 2020; Rico et al., 2008). The management of TSFs and a robust governance framework are therefore now considered the most critical aspect of reducing failures (Baker et al., 2020; Lyra, 2019; Morgenstern, 2018; Schoenberger, 2016). Governance, as defined within the Global Tailings Review (2019), refers to the responsibilities of the owner or operator as well as the competencies and capabilities of the facility designer, independent reviews and jurisdictional regulatory processes. A failure or inadequacy of one or multiple of these governance aspects has been identified at each of the documented TSF failures over the last 100 years (Oberle et al., 2020).

The prioritization of profit over safety at the board level has been explored by researchers following the 2015 Samarco failure. Armstrong et al. (2019a) and Bowker and Chambers (2015) argue that a doubling in TSF failures in the last two decades can be explained by cost cutting measures concurrent with production increases and decreasing ore grades resulting in poor management choices. The proceedings from the class action lawsuit following the Samarco TSF failure in Brazil reveal that cost-cutting measures seriously impacted the stability of the Samarco TSF (Banco v. Samarco, 2018). Despite acknowledgement by the Samarco board that the TSF was a matter of concern, the board approved TSF designs that contradicted the original design, and cost-cutting measures were implemented, such as a decision to expand the TSF to meet an increase in production rather than to build a new facility. Bowker & Chambers (2017) argue that the economics behind financing mining projects is inherently dysfunctional, encouraging risky decision-making and unsafe TSF design and management. Armstrong et al. (2019b) and Hopkins (2020) extends this research by arguing that incentive packages linked to equity stock prices promote cost cutting measures and thereby drive risk-taking with potentially catastrophic consequences. Regulatory bodies are also recognized as paramount. Morgenstern (2018), Schoenberger (2016) and Squillace (2020) underline the necessity of strict regulatory bodies in the management of TSFs. Schoenberger's (2016) analysis of recent tailings disasters concluded that the successful integration of TSFs within a mine's design required that there are strict regulatory standards in place.

3. Shareholder engagement in ESG in the mining industry

A desktop review of research articles containing mine waste related terms (“mine waste”, “tailings”, “tailings dam”, “tailings storage facility”, “tailings failure”) and investment related terms (“institutional investor”, “investment”, “investor”) across multiple scholarly databases (e.g. ScienceDirect, Web of Science, Google Scholar) revealed that there is limited research at the intersection of TSF management and investment or institutional investor decision-making. Only a handful of relevant articles were identified, all of which were published within the last two years (Armstrong et al., 2019a; Torinelli et al., 2020). Consequently, and recognizing that TSFs present significant, long-lasting risks that impact the overall ESG performance at mining companies and investment firms (Gagnon, 2019), the literature review was expanded to include research pertaining to shareholder engagement and ESG in the mining industry.

Given the environmental footprint, social impact and potential for opposition, the mining industry is particularly prone to reputational risks in its operations (Allen et al., 2012; Valenta et al., 2019). These reputational risks are often related to environmental, social and governance (ESG) factors, and the breakdown of ESG standards associated with operational mines. ESG integration is one of the fastest-growing investment approaches despite the debate on whether or not high ESG performance correlates with long-term financial performance

advantages (Escrig-Olmedo et al., 2017). The rise of responsible investing has contributed to increased disclosure of ESG related risks, which in turn has resulted in ESG affecting the value of a resource (Valenta et al., 2019). Major themes from research around investor motivation in considering ESG information in investment decisions reveal that investors are motivated due to financial materiality and risk management (Amel-Zadeh and Serafeim, 2018; Przychodzen et al., 2016).

The mining sector represents one of the lowest-performing industries in several ESG report rating providers including the S&P Global Risk Atlas and the Thomson Reuters ASSET4 ESG database (Dyck et al., 2019; S&P Global, 2019). These ESG rating databases are increasingly used by institutional investors to assess and measure company ESG performance over time (Huber et al., 2017). Despite the recognition of sector-wide poor ESG performance, there has been limited research that considers how investors can create change specific within the mining industry (Dyck et al., 2019). This observation is not unique to the mining sector. Despite the surge in 'responsible investment' that has occurred following the creation of the UN Principle of Responsible Investing, there remains a significant lack of understanding of how investors actually incorporate ESG issues into investment decisions (Sullivan, 2017). This does not necessarily mean that investors are not playing an important role in driving company practice. Both Sullivan (2017) and Sullivan and Mackenzie (2006) discuss that although there is a disconnect between company ESG reporting requirements and investor decisions-making, the simple engagement of institutional investors in responsible investment strategies such as the UNPRI encourages companies to establish and maintain ESG management systems.

In terms of the extractive industry, shareholder engagement has focused on disclosure, standards and improved ESG performance on targeted issues (Allen et al., 2012). Institutional investors are increasingly becoming important actors in non-state, market driven governance systems where traditional laws and regulations lack stringency or are non-existent (Cashore, 2002; MacLeod, 2009). As discussed in the introduction, following the Brumadinho TSF failure, a coalition of investors and investor stakeholders with over USD 14 trillion in assets under management called for new independent, publicly accessible international standards for TSFs along with greater disclosure of the facilities resulting in the Investor Mining & Tailings Safety Initiative and GTD (Barrie et al., 2020; Lane and Black, 2020). Investor engagement with the mining industry has also contributed to the adoption of a number of initiatives including the Valdez Principles, the International Cyanide Management Code (CPPIB, 2011), the Extractive Industry Transparency Initiative and standards relating to FPIC for indigenous people, among others (Allen et al., 2012). Despite investors becoming a more prominent voice in the drive for ESG related initiatives, many of the codes and standards remain voluntary, therefore regulation and legal frameworks remain essential for the development of enforceable ESG standards.

Empirical evidence of a positive relationship between ESG performance and returns to the average investor remain a contentious issue with conflicting evidence (Allen et al., 2012; Dyck et al., 2019; Torinelli et al., 2020). Regardless of this relationship, many institutional investors consider ESG investments to provide risk insurance and market differentiation (Amel-Zadeh and Serafeim, 2018). Given these interests from ESG minded portfolios, an additional area of research has explored if pressure from institutional investors leads to improved ESG performance through acting as a driving force to motivate organizational change towards more responsible practices (Dyck et al., 2019; Allen et al., 2012). Dyck et al. (2019) found that greater institutional ownership of companies resulted in a significant increase in ESG performance. Similarly, Allen et al. (2012) who focussed on the impacts of shareholder engagement in the extractive sector, found that investors have some impacts on ESG issues primarily through corporate engagement with open and constructive dialog between the investor and companies. While successful engagements may be constrained by inadequate

government regulations, most often, investor engagement results in improved disclosure, alignment with international standards and improved ESG performance on specific issues. Allen et al.'s work also underlined factors that contribute towards successful engagement between investors and companies, namely that it requires investors to have a high degree of knowledge about the targeted ESG issue and situation of the company, and the need for strong international codes and standards to provide investors with a prescriptive course of action.

Both Allen et al.'s and Dyck et al.'s research opens the possibility for institutional investors to play a substantial role in transforming the ESG practices within the mining industry and the responsible management of TSFs. However, as highlighted by Sullivan (2017), there remains a requirement for mining companies to know how and if investors take into account ESG and TSF issues during decision-making before changes in the industry will be seen.

4. Investor motivations for improved TSF management

Land conversion requirements, potential for contamination, rehabilitation challenges, legacy issues and human rights violations represent only a small number of the collective threats presented by a TSF (Kemp et al., 2010; UNEPFI, 2010). Such threats are magnified in the event of a significant tailings release. TSFs represent long-tail environmental and social risks if not managed responsibly, making them a primary component of ESG management across the industry. As stated by Valenta et al., 2019, unresolved risks can become deep liabilities. Despite the rising number of known tailings failures over the past 20 years, research on the financial, legal and reputational ramifications for both mining companies and their investors is limited (Armstrong et al., 2019a).

Following the Brumadinho and Samarco failures, Torinelli et al. (2020) researched the financial market behavior towards Vale following both disasters. Their work focused on a comparative analysis of share price to see how the Brumadinho and Samarco failures impacted the involved mining companies (Vale in the case of Brumadinho; Vale and BHP in the case of Samarco) market value and financials. Despite Vale share prices on the NYSE dropping by 51% following Samarco, Vale share prices had fully recovered five months after the disaster. Similar to Brumadinho, Vale NYSE share prices dropped 24%; however, within two weeks, recovery had begun, and stock prices were 94% recovered to pre-failure value in just under six months. Concurrently, the total financial impact of Brumadinho and Samarco cost Vale between R\$8.1 - 9.1 billion and R\$7.5 billion (US\$ 1.4 - 1.5 billion and US\$1.3 billion), respectively. Torinelli et al. (2020) concluded that the risk related to TSF failure may not have been material to Vale due to the size and future perspectives of Vale's operations; moreover, the financial market is not adequately pricing environmental risk. It is important to note that Torinelli's study is focused only on Vale and BHP, two prominent global mining and extractive sector companies with multi-billion-dollar market caps and diversified operations. The same financial impacts of TSF failures may not necessarily apply to other companies, particularly small to mid-sized producers such as Imperial Metals, the owner and operator of Mount Polley mine (see Table 1).

A high-level analysis of financial data from Imperial Metals reveals that the company's annual income and stock price has suffered a more difficult recovery period as compared to the financial analysis of Vale and BHP completed by Torinelli (Fig. 1). This highlights that the financial and reputational impacts of TSF failures arise differently for mining companies of differing sizes and operational jurisdictions.

Outside of stock market responses to failures and financial impact, provisions related to legal defense following TSF failures can persist for decades after the failure (Armstrong et al., 2019a). Cumulative legal fees and costs related to reputational damage are not adequately quantified. Several papers argue that fines following TSF failures and clean-up costs are underestimated, letting mining companies 'off-the-hook' and leaving additional costs to regional taxpayers (Couto Garcia et al., 2017; Woody

Table 1

Market cap, share price and number of producing operations for BHP, Vale and Imperial Metals one month prior to and post TSF failures (Source Y Charts, 2020a-c; BHP, 2019; Imperial Metals, 2020; Vale 2019).

Company	Failure (Y Charts, 2020a; 2020b, 2020c)	1 month Pre-failure		1 month Post-failure		% Change in Market Cap	Operations (2019)
		Market Cap	Share Price	Market Cap	Share Price		
Vale	Brumadinho (2020)	USD 67 Billion	USD 13.14	USD 54 Billion	USD 10.56	-19.6%	33
Vale	Samarco (2015)	USD 21 Billion	USD 4.04	USD 15 Billion	USD 2.92	-27.70%	33
BHP	Samarco (2015)	USD 71 Billion	USD 26.61	USD 56 Billion	USD 20.91	-21.4%	18
Imperial Metals	Mount Polley (2014)	CAD 1.25 Billion	CAD 16.65	CAD 708 Million	CAD 9.45	-43.4%	2

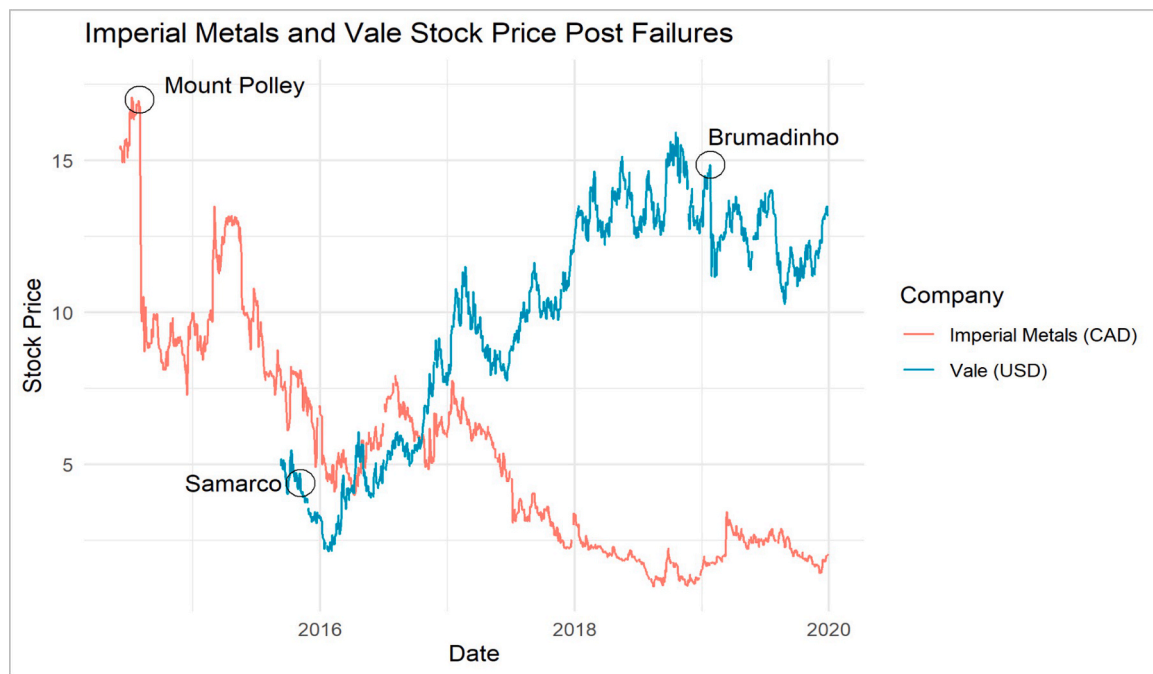


Fig. 1. Imperial Metals and Vale stock prices from two months prior to Mount Polley and Samarco failures, respectively, until January 31st, 2019. Please note Imperial Metals is traded on the TSX in CAD, whereas Vale is traded on the NYSE in USD (Figure created based on data from Yahoo Finance 2020a-b).

et al., 2010).

Until financial markets are accurately pricing social and environmental risks, and mining companies are equally and materially financially impacted following the failure of TSFs due to mismanagement practices, motivations for institutional investors to drive for more responsible tailings management cannot rely on financial materiality alone. Further research is required to interrogate the cumulative financial impact of TSF failure and the costs of reputational damage, to not only the mining company but their investors as well. Risk management is crucial to investment decision making. The increased transparency and disclosure of TSFs following the GTD is a step to risk awareness for investors. TSFs represent “tail risks” (i.e. losses occurring due to a rare event) lasting beyond the profitable period of a mine within a company’s portfolio. Investors may then be motivated by risk reduction associated with improved TSF management. The academic and gray literature has revealed that there is a unique and powerful opportunity for investors to positively influence the governance of TSFs, a major contributing factor to TSF failures. Investors are motivated to influence governance structures, improve ESG ratings and encourage the integration of standards. The following section uses interviews with institutional mining investors to corroborate these findings and further assess the challenges that investors face when integrating TSF information into investment decision making. Orienting TSF data and tools towards institutional investors may encourage continued engagement and aid the improvement of board management.

5. Investor perspectives

5.1. Methodology

To investigate the perspective of investors about their role in improved tailings management, semi-structured interviews were completed with mining investors and investor stakeholders. Research interviews allow for fine-tuning pre-conceived notions and lend to a more robust perspective on interviewees thought processes behind decisions and ideas (Jamshed, 2014). Moreover, interviews presented a unique opportunity to assess the challenges investors face when evaluating the portfolio risks of potential TSF failures.

Throughout this research, over 40 institutional mining investors or investor stakeholders were approached to participate in an interview. Responses to this invitation revealed that institutional mining investors are interested in understanding the risks TSFs present to their portfolios. However, several investors, especially those from firms with smaller assets under management, felt that they had too little knowledge on TSFs or do not factor TSF risks into their analysis to feel adequately qualified to participate in this study. In total, eight institutional mining investors or investor stakeholders were interviewed, all of whom had between nine and 35 years of experience in the industry. The mining investors interviewed all were aware of the GTD and seven of the eight participants were involved with the disclosure. Interview questions are summarized in Table 2. All interviews were completed in compliance

Table 2

Summary of interview questions with mining investors and investor stakeholders.

Interview Questions
To the best of your knowledge, have any of the mines in your portfolio, current or past, been involved with a tailings incident?
Are you seeing any evidence of increased shareholder activism in the extractive sector?
What role do investors play in improving tailings management?
How do you track risks related to tailings storage facilities of design stage mines?
Does your firm have plans to assess the data from the GTD ^a tailings disclosure? If so, how?
Will the GTD tailings disclosure request cause any changes in your investment strategy? If so, how?

^a During investor interviews, the GTD was referred to the “Church of England tailings disclosure”. For the purposes of this article, the terminology of GTD is used consistently throughout.

with the requirements of the UBC Research Ethics Board [Certificate of Minimal Risk: *H19-01,217*].

5.2. Investor role in tailings management

Interviews revealed that there is a promising community within institutional mining investment that strongly believes in their role to improve the state of TSF failures, globally. However, investors are not likely to actively track tailings risks within their portfolios; tracking is rather completed through outsourced data from ESG research and rating companies such as Sustainalytics and MSCI. Interviewees that self-identified as impact-oriented investors¹ were attuned to taking into account ESG and TSF issues. A logical conclusion supported by interviews is that impact-oriented investors prompt changes within their investment firm’s policies and procedures for their current and future mining investments after tailings failures occur, regardless of whether these events arise within their portfolios. Conversely, non-impact oriented larger scale mining investors did not suggest they would change investment practices or policies when investing in mines. Moreover, an interviewee from a firm with significant shares in both Vale and BHP stated that the tailings failures over the last five years within both companies did not affect their investment strategies. The Investor Mining and Tailings Safety Initiative promotes positive engagement with the mining industry encouraging engagement with the Board and company directly and recognition of good safety practices. Despite this, following Brumadinho, exclusionary investment was undertaken by several significant institutional investors involved in the Investor Mining and Tailings Safety Initiative including the Church of England investing bodies, the Swedish AP Funds and Germany’s Union Investments (Barrie et al., 2020). The same interviewee raised a number of questions which extended the research by Dyck et al. (2019) and Bowker and Chambers (2017) by challenging the use of negative or exclusionary screening² for addressing ESG issues across major industries. As the interviewee discussed:

“Exclusionary screening...is like throwing in the towel, practically giving up on that particular company. It may help your portfolio, your portfolio will be cleaner as a result of that, but it may not change anything for the better on the ground. And that’s what ultimately we should strive for.”

Dyck et al. (2019) found that exclusionary investing screening

¹ Impact-oriented investors are those that target specific social or environmental objectives along with a financial return and measure the achievement of both (Findlay and Moran, 2019)

² Negative or exclusionary screening is defined as avoiding (i.e. not investing in) companies on the basis of specified criteria, such as underperforming in certain ESG issues.

practices were unable to explain broad changes in firm’s ESG performances. Applying negative investment screening within the mining investment community may not necessarily improve overall TSF management but could potentially have unintended consequences. The cash flow pressures from decreased investments could contribute to mismanagement of TSFs, which Bowker and Chambers (2015) underline as an important contributor to the rise in failures. There is a need for further research to better understand these potential flow-on effects from divestment strategies, and to consider potential measures for mitigation as part of an overall transition plan.

All interviewees believe that they play some role in improved tailings management. Several investors and investor stakeholders highlighted that their role was limited to ensuring that the board of the invested company is competent and capable in overseeing management and that the company is compliant with regulations. The GTR compendium outlined the benefits of having a company board with one or more experts in major accident risk on addressing organization weaknesses (Hopkins, 2020). Boards hold the ultimate accountability for the management of major accident risk. Unlike other mining project stakeholders like communities, boards are both accountable and held to account by shareholders. As noted by Hopkins (2020), for effective shareholder involvement, shareholders need to hold boards to account for management of TSFs consistently, not only after a TSF failure.

Half of the investors interviewed underlined the limitations of their role due to the lack of a global tailings standard and government regulations. As one investor stakeholder noted:

“When investors have issues like TSFs that have different measurements and methodologies related to different regulations from jurisdiction to jurisdiction, it can be really challenging to find comparable metrics.”

A large-scale institutional investor confirmed that:

“One of the biggest issues I have is local regulations are wildly different by jurisdiction”

Given these responses, we believe the Global Tailings Standard will significantly improve the understanding and reach of investors on improving TSF management.

5.3. Challenges faced by investors

Given the industry wide response from the GTD, it is clear institutional mining investors can motivate companies to disclose tailings information. However, the role that investors involved in the GTD request will play post-disclosure remains unclear. Until a database is publicly disclosed where company sites are listed in a single, functional database, it is unlikely that investors or other stakeholders will devote time to acquiring data from the currently disclosed companies. Responses from investor interviews outlined that the disclosure may not effect changes in investment practices, as shown by a very direct response from an institutional mining investor:

“I’m not sure [how the GTD request will] help me in my investment process.”

The low response rate of investors (20%) to the request to participate in an interview for this study could be attributed to several factors, including the recruitment method. However, the reasoning for several investors’ decline to participate was that the investor had too little knowledge of TSFs or did not factor TSF risks into investment decision making. It may be of significance that the majority of the investors who agreed to be interviewed had a technical mining or mining related background. This contrasts with the majority of the other investors contacted whom had predominantly finance backgrounds. This correlation between technical experience with the mining industry and understanding of financial risk exposure of mining facilities is an area that

should continue to be explored in future mining investment-related research.

Unreliable and differing regulations and standards present challenges to investors. As discussed by an institutional investor with a technical background:

“For investors with a less technical background, in their questionnaire [on mine site visits]. All they can ask is are you managing your dam according to the regulations? Are you auditing it properly? The answer is always yes and yes.”

Misalignment of regulations, standards and industry ‘best-safety practices’ do not supply investors with the tools to properly compare and hold company boards accountable for unsafe or mismanaged TSFs. Company self-reporting and bias, as touched on in the above quote, presents a significant issue to investors. It is clear from interview responses that investors need global standards, such as the Global Tailings Standard, as well as, easily digested data on TSFs to inform investment decision-making.

6. Discussion: what is the utility of the GTD initiative to investors?

The TSF related information provided by companies through the GTD can be used by investors in several different ways. First, the fact of whether or not a company reports within the GTD can be used to screen companies in or out of an investment portfolio. However, as highlighted by investor interviews, exclusionary investment practices may have negative repercussions on TSF management. While the fact that a company reports on TSF information is not in and of itself, an indication of the quality of a company’s management, the lack of reporting suggests that TSFs may not be seen as a priority by management. Similar comments could be made about company responses to TSF risk management questions within the disclosure such as:

- When was the most recent Independent Expert Review of the TSF?
- Do you have full and complete relevant engineering records?
- Has a formal analysis of the downstream impact on communities, ecosystems and critical infrastructure been undertaken?, and
- Have you, or do you plan to assess your tailings facilities against the impact of climate change?

The existence of the above analyses, expert reviews and records does not guarantee that a TSF will not fail. However, the converse may provide an indication that a given TSF is not being effectively managed by the responsible company. The GTD represents a significant step forward for transparency within the mining industry. However, there are notable limitations of the GTD and investor’s ability to assess TSF risks within investment portfolios. The limitations of the GTD are addressed in the Global Tailings Review Compendium of Papers Chapter Seven (Franks et al., 2020). As discussed in the investor interviews, self-reporting bias also represents one of the limitations of the GTD. As Franks et al. (2020) notes, there may be incentive for companies to under report certain key parameters such as past stability issues. Another limitation is the ability to compare performance between different companies. It is very difficult to make a robust comparison of TSF risk across mines located in different geographic location and jurisdictions. For example, as of August 2020, there were 62 different hazard rating classification systems listed within the GTD. While the Global Tailings Standard provides a global, transparent consequence-based TSF classification system (Oberle et al., 2020), the extent to which this standard will be adopted is unclear at this point. Additionally, limitations exist within the current Global Tailings Standard and GTD for legacy and closed facilities. Franks et al. (2020) acknowledges that the GTD is likely more representative of active facilities than inactive, closed and legacy sites. The standards are written to be applicable throughout the TSF lifecycle, however, many of the

requirements would be difficult to adopt at a closed facility and impossible to adopt at irresponsibly closed legacy sites.

A limitation of the GTD to investors is that while it may be possible to identify potential liabilities related to TSFs within their portfolios, it is not possible to assess the financial significance of potential TSF failures, nor can one evaluate how these associated risks may differ based on the ways in which TSFs are managed. The limitations of the GTD align almost directly with the challenges highlighted through investor interviews. Galvanizing investors to maintain interest in responsible TSF management will require data and questions to be accessible and useable by the investment community. Building off the findings from the literature review and interviews, the GTD request should consider including questions surrounding the makeup of corporate boards and management with regard to TSF or risk expertise as well as internal compensation practices. Further information about ESG and risk management practices would also allow investors to move to elect knowledgeable and competent corporate boards and improve risk reduction.

Tools and frameworks for investors to understand and manage ESG related risks within investment portfolios is not a novel idea. Non-profits including the World Resources Institute and Ceres have created specific tools for investors to understand important ESG related risks such as water scarcity (Ceres, 2017; WRI, 2019), however, risk tools for mining investors to assess TSF risks are lacking. The development of a tool to characterize risks related to TSF failures across portfolios may not only continue awareness around TSF management, but also allow investors to directly respond and mitigate risk through collaborative investor engagement. This research is a crucial first paper in a series of papers to build accessible and transparent tools for investors and stakeholders to better understand and act to mitigate future TSF failures.

7. Conclusion

TSF failures are preventable and present a unique opportunity for investors to engage with companies to manage safety and environmental risks. In this paper, we considered the role of institutional investors in improving TSF management following the devastating tailings disasters at Mount Polley, Samarco and Brumadinho. The review of literature focussed on the causes of tailings failures and investor influence and motivations to improve ESG and TSF issues. Although we cannot conclude that TSF failures are necessarily financially impactful to institutional investors, TSF are a crucial aspect of ESG management and play an important role in portfolio risk reduction. Despite limited research in the sphere of institutional mining investors and ESG, investors have played a role in improved ESG and continue to play a role through collaborative engagement. This conclusion is reflected by the GTD; at the very least, investor involvement in the request resulted in the most comprehensive dataset of TSF information ever made publicly available. The interviews with institutional mining investors reveal investors play a significant role in improved tailings management through actively managing board members and decisions. Responses also reveal that the GTD is unlikely to be used by investors until it is compiled into a single, practical database or tool. Investors are heavily limited and reliant on standards and regulations that reflect the ‘best safety practices’. The lack of information on mine management and TSFs available also presents a significant challenge to investors.

The GTD represents a significant advancement for transparency within the mining industry. However, the utility of the GTD initiative to investors remains unclear. The limitations of the GTD initiative align with responses from investors surrounding challenges of integrating TSF risk into investment decisions. These limitations include, the lack of consistent standards, data accessibility, self-reporting bias and the financial liabilities associated with TSFs. There are promising opportunities for continued research on investor influence on ESG and TSF issues in the mining sector. As highlighted by this paper, the findings surrounding the lack of financial impacts of TSF failure may only apply to the few, massive mining companies with multiple global operations. The

current demand for TSF transparency by investors and stakeholders highlights the importance of improved knowledge and access to data, particularly where the consequences of failure are devastating. Understanding the role of institutional mining investors in improving TSF management provides an opportunity to develop specific tools to help investors continue to be pivotal players in mitigating TSF failures.

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