

Social engagement and mine closure: lessons from mining transition in Itabira

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Abstract

Purpose – This research aims to investigate the main components of an engagement and participation process in the context of mine closure and how they contribute to a sustainable territorial transition in the post-mining period in Itabira, Brazil.

Design/methodology/approach – Based on literature reviews, interviews and a focus group, this study identifies five analytical categories: information flow, engagement context, scope of engagement, type of engagement and social acceptance. Although consultation and communication initiatives exist, practices remain largely unilateral and weakly deliberative, generating uncertainty about socioeconomic impacts as ore reserves are depleted.

Findings – The authors argue that enduring participatory forums and strengthened local capacities are essential for anticipating impacts, reducing asymmetries, and stimulating alternative productive activities. These contributions are particularly relevant in the Global South to ensure a legacy in mining territories that promotes inequality reduction, social inclusion and local development, as envisaged in Sustainable Development Goal (SDG) 10 of the United Nations 2030 Agenda.

Research limitations/implications – Single case evidence and absence of Vale interviews limit broader analytical generalization.

Practical implications – Permanent multi-stakeholder forums can reduce asymmetries and guide mine closure decisions.

Social implications – Inclusive closure governance can reduce vulnerability and support equitable local development.

Originality/value – Integrates stakeholder engagement, social license to close, and transition governance debates.

Keywords Mining, Social impacts, Engagement, Mine closure, Vulnerability

Paper type Research paper



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Introduction

Mining is a strategic sector for generating foreign exchange, developing productive chains, and creating jobs (Beckett & Keeling, 2019; Vivoda et al., 2019). Conversely, economic development linked to natural-resource extraction usually entails significant socio-environmental challenges that become even more pronounced at the end of a mine's life (Bainton & Holcombe, 2018; Xavier, 2013). Consequently, mine closure must go beyond decommissioning facilities and rehabilitating land to include social concerns arising from unemployment, declining local revenues, and investment (Ndaguba & Marais, 2024; Xavier et al., 2015).

Earlier approaches to mine closure primarily focused on technical and environmental studies to ensure geochemical stability at the site and the safe decommissioning of structures (Unger et al., 2020). However, recent research indicates that addressing the social dimension is essential for a sustainable post-mining transition. This can be achieved through community consultations, worker retraining programs and public-private collaboration (Bowles et al., 2019; Zhao et al., 2020). From this standpoint, stakeholder theory posits that companies should not base their decisions solely on shareholder interests, but also consider the needs of other affected groups, such as local populations, government entities and civil society organizations (Freeman, 1984; Freeman et al., 2004; Kujala et al., 2022).

Public hearings, deliberative forums and collaborative projects help build trust, legitimize initiatives and minimize tensions (Dare et al., 2014; Pimenta et al., 2021). Understanding how stakeholders can effectively influence decisions from planning through closure is vital, including efforts to foster alternative income sources and stimulate local economies (Marais et al., 2017). Nevertheless, the outcomes of this process are shaped by the level and form of community participation in decision-making, as stakeholder engagement can either facilitate or hinder the emergence of new development trajectories once economic and social decline set in. In this context, a gap in the literature justifies this study: although scholars acknowledge the importance of social dimensions throughout the mining life cycle, there remains a lack of in-depth analyses of stakeholder-engagement practices and outcomes in closure contexts (Marais et al., 2017; Xavier et al., 2015). Accordingly, this study asks:

- What are the main components of engagement and participation in mine closure? and
- How do these components contribute to a sustainable post-mining transition?

We assess stakeholder engagement and participation in Itabira to inform closure planning in mining-dependent territories.

In Brazil, the municipality of Itabira in Minas Gerais exemplifies the challenges of the gradual phase-out of mining, largely due to its historical dependency on this industry (Xavier, 2013). Itabira is home to Brazil's first large-scale mining project. While initial projections indicated that its iron-ore reserves would be depleted by 2029 (Vale S.A., 2020), more recent estimates have extended this timeline to 2041 (Vale S.A., 2022). With ~1,254 km² and ~118,000 inhabitants, municipal income and employment remain closely tied to mineral extraction (Fontoura et al., 2019). The extended mine life provides an opportunity to develop closure strategies that mitigate social risks, making Itabira a benchmark for large-scale post-mining transitions.

Social dimension and community engagement in mine-closure processes

For many years, discussions on mine closure have centered on technical and environmental issues, such as the safe decommissioning of structures and the rehabilitation of degraded areas (Beckett & Keeling, 2019; Keeling et al., 2024; Monosky & Keeling, 2021; Unger et al.,

2020). From the 1990s onward, increasing attention has been paid to the social dimension, with growing recognition that a mine closure can trigger long-lasting territorial effects – unemployment, the dismantling of local supply chains, and a decline in government revenues (Bainton & Holcombe, 2018; Xavier, 2013). Moreover, recent analyses of closure documents indicate that socioeconomic impacts and social, cultural, and historical challenges are still frequently insufficiently addressed (or even omitted) in these plans, and that community-engagement strategies and outcomes are often poorly documented, thereby constraining assessments of the quality of social planning for closure (Monosky & Keeling, 2021).

As illustrated in Figures 1 and 2, which respectively show the overall rise in publications on mine closure and the co-occurrence of the term “social” with that topic, academic interest in the socioeconomic impacts of ending mineral extraction has advanced substantially.

Between 1968 and 2022, over 2,000 studies addressed mine closure, but only around 200 explicitly examined social aspects, indicating that the social dimension remains an evolving field (Vivoda et al., 2019; Xavier et al., 2015).

Although progress in the social dimension is relatively recent, the issue of engagement and participation in mine-closure processes has gained prominence. Recent work highlights the need to give communities a voice, since residents are the first to experience the consequences of declining activities (Bainton & Holcombe, 2018; Bowles et al., 2019). Consultation and participation help identify context-specific demands and foster more transparent, collaborative relationships, thereby informing policies and plans that mitigate social problems in the post-mining period (Alonzo et al., 2024; Measham et al., 2024; Ndaguba & Marais, 2024; Zhao et al., 2020). Nevertheless, the literature indicates that engagement outcomes vary widely, partly due to challenges in conceptualization, design and implementation, as well as to initiatives driven primarily by compliance objectives rather than by an explicit commitment to leaving a positive social legacy (Alonzo et al., 2024).

Stakeholder theory holds that value is created when the interests of different parties are acknowledged and addressed (Mitchell et al., 1997). This can be achieved through stakeholder engagement that supports a realistic and transparent sustainability

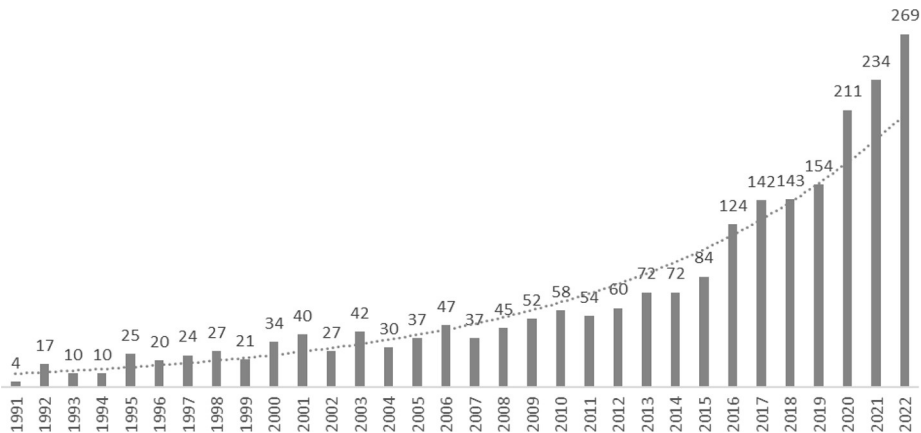


Figure 1. Evolution of publications on mine closure
Source: Compiled by the authors from Web of Science data

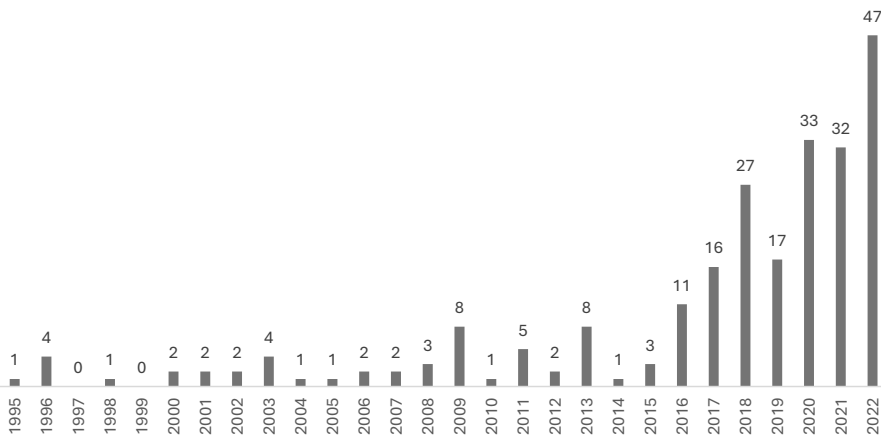


Figure 2. Evolution of the social dimension in publications on mine closure

Source: Compiled by the authors from Web of Science data

assessment within the decision-making process (Perdeli Demirkan et al., 2022). Growing concern about the post-mining period and the crucial role of participation in this process has fueled debate around the Social License to Close (SLC) (Cole & Broadhurst, 2020; Kivinen et al., 2018; Zvarivadza, 2018). The SLC entails maintaining strong stakeholder relationships, demonstrating how preparation for closure can influence environmental sustainability and the locality's long-term economy and social cohesion (Marais et al., 2017). By incorporating transparent engagement and governance practices (Xavier et al., 2015), companies and public authorities are better positioned to develop more inclusive transition plans, prevent socioeconomic collapse, and strengthen initiatives for productive diversification (Bainton & Holcombe, 2018; Bowles et al., 2019). However, inclusive transition is constrained by a limited shared vocabulary, unclear responsibilities, and weak regulation of social aspects, which can blur the lines between closure planning and regional planning. Closure and transition thus become governance challenges requiring formal and semi-formal mechanisms – such as regional planning initiatives and, where feasible, co-governance – to manage impacts and legacies. Hence, anticipatory planning and early, authentic stakeholder engagement remain central (Keeling et al., 2024; Measham et al., 2024).

Analytical components of engagement and participation in mine closure

The literature on mine closure underscores the need to analyze the factors that shape the effectiveness of stakeholder engagement and participation as mining activities draw to a close. In brief, five components are commonly used to explain how interaction among companies, communities and public authorities unfolds in this process: Information Flow, Engagement Context, Scope of Engagement, Type of Engagement and Critical Elements of Social Acceptance.

Information Flow concerns how communications are established and comprises four main formats. In the unilateral format, communication flows from the company

to the community, whereas in the consultation format, the community moves in the opposite direction, providing opinions or concerns to the mining company or public officials (Rowe & Frewer, 2005). In the bidirectional format – participation sensu Rowe & Frewer (2005) – there is an effective exchange of data and perspectives; the transactional format (Mercer-Mapstone et al., 2017) is marked by the possibility of ongoing negotiation, with greater influence exerted by the groups involved. This interpretation is consistent with practices that go beyond informing and consulting, constituting an effective partnership in which empowerment and the delegation of part of decision-making authority to the community are emphasized (Alonzo et al., 2024).

Engagement context refers to the conditions under which interactions occur and can be categorized as mandatory, voluntary or compensatory (Cesare & Maxwell, 2003; Holley & Mitcham, 2016; Keeling et al., 2024). In mandatory dialogue, companies or public authorities only meet the legal requirements, such as formal hearings or consultations. In compensatory dialogue, discussions focus on implementing previously agreed compensatory measures, typically linked to specific benefits or improvements. Voluntary dialogue goes beyond legal obligations, establishing ongoing communication channels that enable broader participation by diverse social groups throughout the closure process.

The Scope of Engagement focuses on who is effectively included in decision-making. Factors such as group representativeness, inclusion of minorities, and openness to actors historically given little voice are decisive for the legitimacy of adopted practices (Hurst et al., 2020; Raman & Mohr, 2014). A narrow scope risks deepening inequalities and provoking resistance to closure, whereas a plurality of voices tends to yield proposals with greater buy-in and acceptance. Recent research underscores that this scope carries specific implications when it involves Indigenous Peoples and other rightsholders, for whom closure governance is closely intertwined with self-determination, territorial governance and socio-environmental justice (Holcombe et al., 2025; Keeling et al., 2024; Monosky & Keeling, 2021).

The Type of Engagement distinguishes information-based from dialogue-based processes (Alonzo et al., 2024; Edgett, 2002; Hurst et al., 2020; Johnston, 2018; Monosky & Keeling, 2021). The company employs persuasion and advocacy strategies in information-based engagement, presenting selected data and crafting messages to legitimize its closure plans (Edgett, 2002). Dialogue-based engagement seeks joint solution-building through shared knowledge, reflexive interaction and mutual benefits, fostering enduring relationships and more effective community participation (Hurst et al., 2020; Johnston, 2018).

Finally, the Critical Elements of Social Acceptance comprise four main subcategories (Cesare & Maxwell, 2003; Everingham et al., 2018; Mercer-Mapstone et al., 2018; Prno & Slocombe, 2012):

- (1) procedural justice;
- (2) strong company–community relationship;
- (3) governance; and
- (4) trust.

Procedural justice ensures the community has a legitimate voice in decision-making processes. A strong company–community relationship is rooted in proximity and direct contact, encouraging face-to-face interaction that facilitates lasting agreements.

Governance values the participation of public and private entities and civil society in models that entail negotiation, cooperation and alliances. Trust relates to the company's track record and to perceptions of coherence and integrity in how proposals are presented and carried out during closure.

These five components and their subcategories provide an analytical framework for assessing inclusive, transparent and consistent engagement during the mine-closure phase. [Table 1](#) below organizes each dimension, illustrating its practical manifestation and how it can be observed during mine closure and the transition to the post-mining period.

Building on the discussion, the multidimensional nature of engagement processes becomes evident. Deepening this debate within the Brazilian context is essential, given the sector's economic significance and the challenges of social oversight of mining activities throughout the various stages of a project.

Methodological procedures

Nature of research and case-study strategy

This study adopted a qualitative, exploratory approach and employed a single-case design to gain an in-depth understanding of the mine-closure phenomenon in Itabira, as this strategy enables the analysis of complex phenomena ([Yin, 2015](#)). According to [Yin \(2015\)](#), several motivations justify a single-case approach:

- the case may be critical, with results that corroborate or challenge existing theory;
- it may be extreme or rare; or
- it may be typical and representative of a relevant phenomenon.

In the present research, Itabira possesses features that make it an emblematic reference in the extractive industry, combining a long history of economic dependence on mining with the challenges posed by the impending closure of its mines, thereby serving as a valuable example for analyzing post-mining planning.

Data-collection techniques

This design enabled an in-depth understanding of mine closure, emphasizing social effects and stakeholder engagement in post-mining transitions. By combining document analysis, interviews, and a focus group and applying triangulation, the study produced a more robust view of the phenomenon, strengthening the relevance of the conclusions and recommendations discussed in subsequent sections ([Bardin, 2020](#); [Godoy, 2010](#); [Yin, 2015](#)).

Document analysis entailed examining official reports, mining legislation and materials produced by organizations active in the field. These records were used to track the evolution of mining activity in the region and to identify regulatory guidelines on mine closure ([Marconi & Lakatos, 2003](#); [Sá-Silva et al., 2009](#)). The goal was to map historical, socioeconomic and environmental information related to Itabira and national and international directives for decommissioning mining operations ([GTR, 2020](#); [ICMM, 2019](#); [International Organization for Standardization, 2021](#)).

To deepen the understanding of local dynamics, 29 semi-structured interviews were conducted with key stakeholders: representatives of public authorities, the community, trade associations, business owners and academia. Interviewees were selected through purposeful sampling, reinforced by the snowball technique ([Atkinson & Flint, 2001](#)), to

Table 1. Categories and subcategories of engagement in a mining context

Category	Sub-category	Description	Theoretical foundation
Information flow	Unilateral	Communication originates with the proponent (company) and is directed to the public	Mercer-Mapstone et al. (2017); Rowe & Frewer (2005)
	Consultation	Information flows from the public to the proponent, conveying opinions or concerns	Mercer-Mapstone et al. (2017); Rowe & Frewer (2005)
	Bidirectional	<i>Participation</i> –interactive dialogue between the proponent and stakeholders	Mercer-Mapstone et al. (2017); Rowe & Frewer (2005)
Engagement context	Transactional	Ongoing negotiation that seeks to build relationships with multiple stakeholder groups	Mercer-Mapstone et al. (2017)
	Mandatory dialogue	Does not amount to effective engagement; it merely fulfils legal requirements	Cesare & Maxwell (2003); Holley & Mitcham (2016)
	Compensatory dialogue	In light of negative externalities, the proponent seeks to demonstrate its contribution to social, environmental, and economic development	Cesare & Maxwell (2003)
Scope of engagement	Voluntary dialogue	Engagement is motivated not by regulation but by the pursuit and maintenance of the social license to operate/close (SLO/SLC)	Holley & Mitcham (2016)
	Community	Aims for public or community acceptance when objectives have been defined prior to engagement with specific community segments	Hurst et al. (2020); Raman & Mohr (2014)
	Stakeholder diversity	Articulates diverse perspectives – including marginalized or vulnerable groups – across local communities and other interested parties	Hurst et al. (2020); Raman & Mohr (2014)
Type of engagement	Information-based	Emphasizes persuasion through advocacy and selective stakeholder participation to foster acceptance of a viewpoint or favorable representation of the organization	Edgett (2002); Hurst et al. (2020); Johnston (2018)
	Dialogue-based	Collective action, shared knowledge, or reflexive/experiential interaction with a broad array of stakeholders in search of mutual benefits and continuous relationships	Edgett (2002); Hurst et al. (2020); Johnston (2018)
	Procedural justice	Having a legitimate “voice” in decision-making is central to community perceptions of social justice	Cesare & Maxwell (2003); Everingham et al. (2018); Mercer-Mapstone et al. (2018); Pmo & Slocombe (2012)
Critical elements of social acceptance	Trust	Trust drives social acceptance and can be captured through integrity, benevolence, and credibility	Everingham et al. (2018); Mercer-Mapstone et al. (2018)
	Strong company–community relationship	Frequent face-to-face communication underpins interpersonal bonds; positive dialogue experiences strengthen perceptions of mutually beneficial relationships	Cesare & Maxwell (2003); Everingham et al. (2018)
	Governance	Involves private, public, and civil–society actors in negotiation, cooperation, and alliance-building, giving stakeholders greater representation in decision-making	Pmo & Slocombe (2012); Mercer-Mapstone et al. (2018)

Source(s): Elaborated by the authors

reach individuals with direct experience of, or engagement in, the Itabira context (Patton, 2015). Table 2 shows a range of profiles that capture multiple perspectives on mine closure, particularly on local participation and potential vulnerabilities. The interview guide featured open-ended questions on (i) perceptions of engagement with the mining company; (ii) expectations regarding the municipality's economic transition; and (iii) engagement in decision-making spaces related to mine closure. All interviews were recorded, transcribed and then coded.

To delve further into issues raised during the interviews and to enable interaction among different actors, a focus group was organized in line with Carter et al. (2014). Participants included public-sector officials, community leaders, business owners and civil society representatives. The focus group sought to explore collective perceptions, points of convergence and possible divergences regarding governance practices for preparing for mine closure (Oliveira & Freitas, 2012).

Data treatment and analysis

Interpretation of the collected material was grounded in content analysis, a method that enables discourse categorization, coding and inference (Bardin, 2020). NVivo software organized, segmented and thematically filtered the corpus, facilitating pattern searches and data triangulation. The tool allowed us to manage coded excerpts and perform frequency and cooccurrence analyses of terms (Braun & Clarke, 2006).

In addition, data triangulation was applied (Carter et al., 2014; Nowell et al., 2017), comparing (i) official documents, (ii) interview narratives and (iii) focus-group discussions. This strategy enhanced the reliability of the findings by identifying points of convergence and divergence in the information obtained.

The subsequent stage integrated the results to capture the breadth of perceptions about mine closure and the degree of participation among the various interviewee groups (Yin, 2015). Coding reports were generated, enabling the construction of summary charts and tables. By triangulating qualitative data (participants' statements) with quantitative data (coding frequencies), priority themes for the community were identified – trust-building, strengthening governance and procedural justice. These elements underpinned discussions of the relational dynamics among the mining company, public authorities and other stakeholders.

Table 2. Categories and subcategories of interviewees

Category	Sub-category	Quantity
Community	Neighborhood residents	8
	Community leadership	5
	Business owners	2
	Press	2
	Academia	2
	Trade association	2
	Legislative branch	5
Public authorities	Others	3
<i>Total</i>		29

Source(s): Elaborated by the authors

Historical and socioeconomic context of Itabira (MG, Brazil)

Before the onset of its mining period, Itabira's economy was largely subsistence-based, with agriculture and livestock farming, food production and the textile industry standing out (Fundação João Pinheiro, 2022; IBGE, 2022). From 1909 onward, after British engineers identified the area's mineral potential and organized ore extraction ventures, the territory became increasingly integrated into mining activities, culminating in the creation of *Companhia Vale do Rio Doce* in 1942 and consolidating Itabira as a strategic complex for national development (Vale S.A., 2016). In this process, the company took on the role of a territorial development agent and contributed to urban infrastructure, helping forge the social identification of "Mother Vale" ("Mãe Vale"); nevertheless, perceptions of elitist treatment toward higher-ranking employees persisted, widening the distance between employees and nonemployees (Guimarães & Milanez, 2017). From the 1970s onward, operational and organizational changes – such as the shift from mechanization to automation and a greater focus on results – were accompanied by job losses, erosion of rights and benefits, and reduced social provisions, culminating in a general strike in 1989 (Guimarães & Milanez, 2017; Vale S.A., 2012, 2016). In the 1990s, the intensification and expansion of operations toward the city heightened urban-planning and social impacts, including health effects associated with pollution. In 1997, the company's privatization and a restructuring geared toward productivity and cost reduction – through outsourcing, layoffs and a voluntary separation program – were associated with reduced local investment and increased conflicts, prompting a reframing of company–community relations in which the company came to be known as "Stepmother Vale" ("Madrasta Vale") (Guimarães & Milanez, 2017).

Even amid this more conflictual trajectory, at the socioeconomic level, Itabira is widely recognized as Vale's place of origin and remains highly dependent on mining: the company extracts approximately 26.4 million tons per year, generates more than 11.5 thousand direct and indirect jobs, and operates a complex comprising seven mines and fifteen dams (Barifouse, 2019; Vale S.A., 2023). Estimates indicate that Vale accounts for 30% of municipal revenue and directly and indirectly drives 70% of the local economy. In 2022, the municipality received BRL 235 million in taxes (CFEM and ISS), the company reported BRL 3.6 million in purchases from local suppliers (within the state), and it declared BRL 18.5 million in external social expenditures, combining mandatory and voluntary spending (Barifouse, 2019; Vale S.A., 2023). At the same time, indicators point to persistent vulnerabilities: in 2019, 26.97% of the population was registered in CadÚnico and 11.97% was considered poor or extremely poor; the employed share of the population was 26.6%, and the average monthly wage was 2.1 minimum wages (Fundação João Pinheiro, 2022; IBGE, 2022). GDP per capita in 2019 totaled BRL 60,417.39, with the extractive industry as the main source of income and industrial value added (dominated by mining) reaching BRL 4.0 billion – higher than services (BRL 2.3 billion), the public sector (BRL 587.8 million) and agriculture (BRL 21.8 million) (Fundação João Pinheiro, 2022; IBGE, 2022). It is important to note that economic growth has led to only limited economic diversification, as activities such as hotels, restaurants and car rental services are closely tied to the large influx of Vale's outsourced workers who do not reside in the municipality. Taken together, these elements depict a context in which the company's historical centrality deepens Itabira's economic dependence and heightens municipal vulnerability in the post-mining period, underscoring the relevance of understanding community engagement and participation in the mine-closure process.

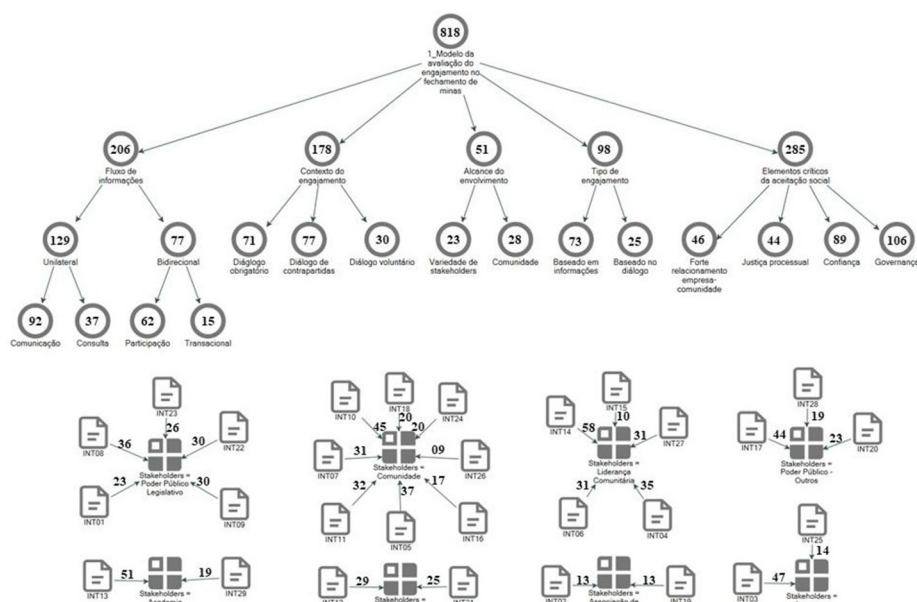


Figure 3. Coding by category and by stakeholder/interviewee group

Source: Elaborated by the authors

Results

This section presents the empirical findings from the case study of mine closure in Itabira (MG) and the outlook for the post-mining transition. Three elements were considered:

- (1) a quantitative overview;
- (2) a qualitative analysis organized by the main engagement categories; and
- (3) interview excerpts.

Quantitative overview

The NVivo coding analysis of the interviews provides a detailed view of Itabira community members' perceptions of Vale's engagement in the mine-closure process in Itabira. Figure 3 provides an overview of the distribution and frequency of codes for each group of interviewees.

The distribution of coded excerpts indicates that Information Flow (206) and Critical Elements of Social Acceptance (285) are highly salient categories, suggesting that effective communication and the building of trust and governance are crucial to engagement in mine closure. The predominance of coding in the Unilateral Information Flow category (129), particularly in Communication (92), indicates a strong tendency toward one-way information dissemination, which may constrain stakeholders' active participation. Coding varies across stakeholder groups – e.g. Academia (70), Neighborhood residents (211) and Business owners (54) – reinforcing the need to incorporate multiple perspectives and to tailor engagement to each group's expectations, fostering more bidirectional and inclusive dialogue. Table 3 disaggregates the analysis by stakeholder group.

Table 3. Cross-matrix of primary data by stakeholder group and percentage of coded excerpts

Category/subcategory	Legislative branch (%)	Trade association (%)	Press (%)	Community leadership (%)	Neighborhood residents (%)	Business owners (%)	Academia (%)	Other public authorities (%)
Critical elements of social acceptance								
Trust	11	11	19	8	12	9	15	11
Strong company–community relationship	10	0	5	6	4	6	4	6
Governance	13	24	3	18	14	14	19	14
Procedural justice	5	0	4	6	4	4	4	2
Information flow								
Unilateral								
Communication	9	9	6	12	9	20	15	11
Consultation	4	0	4	6	4	2	1	4
Bidirectional								
Participation	8	0	9	4	5	8	2	7
Transactional	2	0	2	1	1	2	0	0
Engagement context								
Mandatory dialogue	7	5	2	11	10	12	9	12
Compensatory dialogue	14	29	10	14	11	10	6	5
Voluntary dialogue	3	4	5	5	3	1	4	3
Type of engagement								
Information-based	7	14	15	4	13	8	8	12
Dialogue-based	3	1	5	2	3	0	0	1
Scope of engagement								
Community	2	3	2	2	2	4	6	7
Stakeholder diversity	3	0	9	1	3	0	8	6
Source(s): Elaborated by the authors								

The results show that, among the critical elements of social acceptance, Trust is a particularly salient subcategory for the Press (19%) and Academia (15%). The prominence of this subcategory among these groups may indicate that trust is viewed as a foundational pillar for effective engagement, as it is essential to building and sustaining positive and productive relationships among the parties involved. Governance is also widely discussed, especially by the Legislative branch (13%) and Academia (19%). These findings suggest that governance is a vital factor for transparency and accountability in the mine-closure process, helping ensure that all parties are treated fairly and equitably.

The cross-analysis (Figure 3 and Table 3) reveals that residents of peripheral neighborhoods provide the most references to “Procedural Justice,” reflecting a sense of exclusion from decision-making processes. The summarized evidence indicates that most respondents focus on governance, trust and procedural justice, confirming the centrality of these themes to the social acceptance of mine closure and the prospects for a sustainable post-mining future. The following section presents key points and interpretations derived from the coded data.

Qualitative overview

Following the order of categories with the highest number of coded excerpts, the sections below draw on the interviews to present how the main components of engagement in mine-closure processes affect the city of Itabira, based on the analysis and interpretation of interviewees’ accounts.

Critical elements of social acceptance

Governance accounted for 106 coded excerpts, corresponding to 13% of the total, underscoring its central relevance. The main critique relates to the perceived limited community participation in planning and decision-making processes. As INT10 observed: “There is no effective governance to listen to the community. When they call us, it is only to tell us what has already been decided.” INT08 likewise highlighted power concentration: “The mining company and the city hall sort things out almost by themselves. People living in more distant neighborhoods take part in nothing.” These remarks point to the absence of deliberative channels that involve the population on an ongoing basis.

Limited participation also undermines trust. Interviewees’ accounts indicate that the absence of open and transparent dialogue erodes the company’s credibility, making it difficult for community members to trust Vale’s intentions. A lack of trust is strongly linked to Vale’s track record as an employer, and respondents perceive little genuine concern for local development: “I trust that they pay on time and have good facilities for employees, but I don’t feel any real concern for the city. There is lots of talk and very little concrete planning” (INT03). The gap between promises and concrete actions reinforces a climate of insecurity, as INT14 described: “They said the mine would close in 2029. Now they say 2040. We never know. It seems as if even they don’t know – or don’t want to say.”

With regard to the procedural justice dimension, interviewees’ accounts reflect frustration with the lack of active participation in processes that directly affect their lives: “First, we have nothing about mine closure – there is no participation, at least here where I am; in public administration or in the legislative branch, I don’t know” (INT13).

Social acceptance is also undermined by the Company–Community Relationship. Overall, interviewees suggest that this relationship is often superficial or oriented toward the company’s short-term interests. Interviewees’ assessments oscillate: they acknowledge the company’s historical role yet worry about the lack of lasting legacies: “They really need to

prepare the city for after the mine closes, but I don't feel that happening in any planned way" (INT13).

Information flow

The second most frequently coded element in the quantitative results was Information Flow. Corporate communication was predominantly unilateral: the company "releases reports" or results but does not foster productive dialogue. As INT25 mentioned, "They publish the reports but don't discuss them with us. It's more about ticking a box, you know? Real dialogue is missing." Some community leaders noted modest progress through periodic meetings: "Before, no one came to say anything. Now, at least, we have bimonthly meetings. But it still isn't the kind of participation we need" (INT13). Thus, information asymmetry remains high, hindering more meaningful engagement in decision-making forums.

Engagement context

The documentary analysis reveals that the Itabira context indicates a growing relationship of dependence between the territory and mining. The prospect of mine closure generates community anxiety and a "sense of urgency" for dialogue about the territory's future – one that needs to go beyond mandatory, compensatory exchanges surrounding socioeconomic reconfiguration. However, many interviewees reported that engagement tends to occur reactively or under legal compulsion – through licensing requirements or public hearings – offering little space for genuine dialogue that enables community contributions to shaping the post-mining period. One focus-group participant remarked, "The company only calls us when it has to meet a requirement, then it disappears" (Focus Group). Such situations – best labeled "mandatory dialogue" – undermine the long-term building of trust, as stakeholders feel that the mining company and public authorities only mobilize the population when legally pressured.

Type of engagement and scope of engagement

Concerning engagement type, information-based or merely consultative processes prevail, leaving the community little power to influence strategic decisions: "When the company holds a meeting, we raise our issues, but afterward we don't know whether they changed anything. It's like: 'You've been heard.' And that's it" (INT01). Moreover, the company is perceived to exploit informational asymmetries by relying on technical information to persuade the population, while failing to achieve genuine reciprocity or to adequately consider the community's needs and aspirations – particularly regarding mine closure: "And when information does come, it is reported in a very technical way and, at times, in my view, someone is missing to translate it. Because when it is communicated in highly technical terms – engineering language, or very specific regulations – there ends up being no broader understanding" (INT02).

At the same time, the scope of engagement is narrow, excluding less organized or less-accessible groups: "Many people who suffer the worst effects of ore dust don't even feel comfortable making demands, or they don't know where to go" (INT26). Both interviewees and focus group participants reinforced the sense of exclusion many community members experience in mine-closure discussions, as the company is perceived to privilege specific groups in the engagement process – such as public authorities and business organizations – thereby creating divisions or feelings of injustice among those who feel marginalized: "Here there is a lot of strength in collectives – whether cultural, religious, in music, (among) micro-entrepreneurs, I don't know, there is a lot... farmers, family farmers, communities,

quilombola communities, traditional communities. But these groups are left to luck or misfortune” (INT14).

Discussion

Findings on Vale’s mine-closure process in Itabira highlight the need to integrate social aspects and stakeholder engagement into closure planning and management. Consistent with the literature, particularly [Bainton & Holcombe \(2018\)](#) and [Vivoda et al. \(2019\)](#), participatory governance, transparent communication and the inclusion of local communities are central to minimizing negative post-mining impacts and ensuring a sustainable transition. In the case analyzed, interviews and the focus group reveal that governance remains weakly inclusive, with decision-making dominated mainly by the company and public authorities to the detriment of community voices.

The research also confirms [Xavier’s \(2013\)](#) assertion that the transition must be addressed beyond the closure stage, underscoring the urgency of policies that foster economic diversification and mitigate socio-environmental impacts. The weak community participation, coupled with the lack of clarity in dialogue channels, reinforces a scenario of informational asymmetry, in line with [Mitchell et al. \(1997\)](#). The findings indicate a need for more robust engagement processes in which the population can exert real influence and share in decision-making, thereby reducing distrust over the territory’s future. However, the salience of trust, procedural justice and governance – understood as essential elements of a social-acceptance process that supports a mine-closure trajectory aligned with local aspirations – has done little to advance that process. The community’s negative perceptions are connected to a historical trajectory of strong symbiosis between the company and the territory, in which Vale was socially perceived as “Mother Vale” (“Mãe Vale”) due to its role as a development agent and provider of urban infrastructure, as noted by [Guimarães & Milanez \(2017\)](#). However, in the post-privatization phase, job reductions intensified conflicts, and conflicting information regarding mine closure timelines became more prevalent, increasing uncertainty and insecurity within the community.

The lack of integrated planning for closure has been observed to create governance gaps that impede coordination among social actors. This aligns with the observations of [Bainton & Holcombe \(2018\)](#) regarding the importance of institutional mechanisms for local participation. According to testimonies, the current strategy emphasizes technical and environmental concerns while sidelining long-term socioeconomic impacts. This neglect fosters uncertainty about job preservation, infrastructure investment and viable alternative solutions. This finding resonates with recent evidence that closure plans tend to address socioeconomic impacts superficially and poorly (or inconsistently) document community-engagement methods and outcomes, which constrains accountability and the assessment of the quality of social planning for closure ([Monosky & Keeling, 2021](#)). In the case analyzed, no clear responsibilities were identified – such as those outlined by [Measham et al. \(2024\)](#) – for integrating closure planning with regional planning, thereby weakening long-term institutional arrangements. The analysis also reflects the concern identified by [Alonzo et al. \(2024\)](#), whereby a focus on compliance-oriented activities comes at the expense of building a positive social legacy.

The evidence from Itabira reinforces [Xavier et al. \(2015\)](#), who warn of the need for a transition that genuinely involves the community and builds mutual trust. Participatory engagement – deemed essential for the SLC – cannot be limited to one-way report releases or perfunctory public hearings; instead, it demands continuous dialogue and openness to influence so that residents can contribute contextualized knowledge and perceptions.

Field narratives show that the community recognizes its historical dependence on mining yet worries about the lack of adequate mechanisms to manage closure. This mirrors the concerns raised by [Beckett & Keeling \(2019\)](#) regarding the risk that cumulative socio-environmental liabilities may emerge at the end of a mine's life cycle and undermine local capacity to reverse adverse impacts. Although the company cites sustainability commitments and initiatives to discuss the post-mining future, interviewees view these actions as fragmented, poorly institutionalized and lacking the inclusion of vulnerable groups, corroborating the diagnosis of scant procedural justice. The very economic centrality of mining in Itabira – already reinforced by the documentary analysis ([Fundação João Pinheiro, 2022](#); [IBGE, 2022](#)) – marked by substantial revenue dependence and limited economic diversification largely confined to activities complementary to Vale itself, alongside indicators of social vulnerability – helps explain why negative perceptions of procedural justice and trust recur so frequently in participants' accounts, particularly in the absence of permanent and influential deliberative channels.

In sum, analysis of Vale's situation in Itabira indicates that social and political dimensions still receive insufficient attention in mine-closure debates, echoing the theoretical points raised by [Vivoda et al. \(2019\)](#). In practice, establishing participatory forums and consolidating governance bodies that incorporate multiple perspectives would help reduce the power asymmetries described by interviewees and support long-term planning for the post-mining period. Therefore, territorial sustainability requires the full integration of economic, social and environmental interests, making it urgent to broaden equitable and transparent dialogue among the company, public authorities and the community, as [Xavier \(2013\)](#) advocates. Only then will it be possible to strengthen mutual trust and advance toward fairer and more responsible mine-closure processes.

Conclusions

The findings presented here highlight the need to prioritize social and engagement aspects in mine closure processes. While mitigating environmental impacts and ensuring mining safety are essential, a lack of inclusive governance and limited local participation can increase socioeconomic vulnerabilities after closure. Meeting technical and environmental regulations alone is insufficient; communities must be assured that all levels of government will collaborate transparently. As [Monosky & Keeling \(2021\)](#) argue, more stringent governance could lead to better integration of community knowledge in closure plans, yet industry practices often focus on technical aspects rather than meaningful social engagement. This results in vague strategies to address the socioeconomic effects of mine closure.

In Itabira, demands for coordination, transparency and legitimate representation are intensified by a history of high dependence and changes in the company-territory relationship, including restructurings and reduced local investment and benefits. These factors make trust and procedural justice particularly sensitive issues for the community. Ultimately, a sustainable post-mining transition in Itabira relies on transparent planning that clearly discloses timelines, impacts and economic diversification strategies. It also requires participatory governance through the expansion of deliberative forums and investment in dialogue mechanisms that go beyond legal obligations, enabling continuous exchange, building trust and leaving a meaningful legacy.

Likewise, the literature underscores the importance of social dynamics linked to mine closure, yet there remains a paucity of in-depth academic work on effective stakeholder engagement. This research revealed that trust, procedural justice, information flow and governance are crucial to building a social-acceptance process for mine closure, thereby fostering a SLC.

When these elements are inadequately addressed, distrust and distance grow between the population and the institutions responsible for ending mining activities. Discontinued communication channels, centralized decisions and merely formal – or “mandatory” – participation reinforce this lack of substantive dialogue. Without delving into the broader critical debate on the Social License to Operate (SLO), the concept of a SLC is used as an analytical lens to foreground the legitimacy and governance of closure. In this sense, recent studies emphasize that closure and transition also constitute a governance challenge, mobilizing formal and semi-formal mechanisms – including industry standards, regional-planning initiatives, and, in certain contexts, co-governance arrangements – to manage long-term impacts, liabilities and legacies.

Another major weakness is the lack of clarity regarding economic and social transition strategies once mineral resources are exhausted. Although there is consensus on the need for productive diversification, the community frequently expresses concrete concerns about the impacts of closure, especially job losses, reduced public investment, and the weakening of local social policies. These perceptions stem from the absence of long-term planning and effective participatory instruments through which different groups could voice expectations and share knowledge to co-govern territorial transformation. This point is consistent with recent literature highlighting the lack of a shared vocabulary and clear responsibilities for the “post-mining transition,” which is often weakly embedded in regulation and other forms of governance, thereby creating confusion between closure planning and regional planning – and, in highly dependent territories such as Itabira, heightening the perceived risk of socioeconomic collapse.

Empirical evidence further suggests that proactive territorial governance – featuring permanent forums and deliberative bodies – can reduce power asymmetries and significantly promote community engagement. However, achieving this requires coordinated action by companies, municipal governments and organized civil society, including capacity-building for historically vulnerable groups. This can support closure plans that combine socio-environmental protection, vocational training and the stimulation of new economic activities, while strengthening local public institutions. This research also reinforces a gap highlighted by critical reviews of closure plans, namely, that the methods and outcomes of community engagement are often described in vague terms and with limited traceability (Monosky & Keeling, 2021). Accordingly, in line with industry guidelines that advocate stakeholder involvement and the documentation of planning outcomes in closure plans and related documents (APEC, 2018; IBRAM, 2024; ICMM, 2019), it becomes even more necessary to institutionalize – and verifiably record – forums, participation mechanisms, and the incorporation of stakeholders’ contributions into closure decisions.

The challenges of achieving sustainable mine closure go beyond legal compliance and decommissioning infrastructure. It is essential to construct a SLC, which focuses on legitimate decision-making, equitable benefit distribution and participatory governance. In the Itabira experience, a successful post-mining transition requires ongoing dialogue, cross-sector coordination, transparent information and genuine participatory mechanisms. Investing in these areas fosters positive legacies, mitigates the risks of socioeconomic collapse, and promotes long-term development alternatives for the community.

Theoretical contributions

This study advances the literature in three ways. First, it refines stakeholder-engagement debates in mine closure by showing that post-mining transitions cannot be understood only through the presence or absence of consultation mechanisms, but by the interaction among information flow, engagement context, scope of engagement, type of engagement and critical

elements of social acceptance. Thus, the multidimensional framework proposed here extends studies on the social dimension of closure and stakeholder participation (Bainton & Holcombe, 2018; Marais et al., 2017; Xavier et al., 2015) by specifying how these components operate together in a mining-dependent territory. Second, the findings complement the SLC literature by demonstrating that closure legitimacy depends less on isolated engagement initiatives than on institutionalized deliberative channels capable of reducing information asymmetries, strengthening procedural justice, and building trust over time (Kivinen et al., 2018; Monosky & Keeling, 2021; Zvarivadza, 2018). Third, the Itabira case adds nuance to mine transition governance debates by showing that, in Global South contexts marked by economic dependence and social vulnerability, weakly deliberative engagement may reproduce power asymmetries even when formal consultation practices exist. Thus, the article connects stakeholder theory, mine-closure planning and transition governance within an integrated analytical approach applicable to other mining territories.

Managerial implications

For managers, the findings offer a pathway to institutionalizing engagement in mine closure, shifting it from *ad hoc*, compliance-driven initiatives to enduring territorial-governance arrangements. Mining companies should establish a permanent multi-stakeholder closure forum, preferably with independent facilitation, involving the company, public authorities, regulators, neighborhood representatives, business associations, workers, civil society organizations, vulnerable groups and technical experts. This forum should meet periodically, access updated information on closure timelines, socioeconomic impacts, environmental risks, workforce transition, local procurement, infrastructure reuse and post-mining land-use alternatives, and produce public records showing how stakeholder contributions were incorporated into decisions. Managers should also organize thematic workshops throughout the closure process – for example, on employment and reskilling, economic diversification, environmental monitoring and future land use – using participatory tools such as scenario-building, simulation exercises, negotiated action plans, and, where appropriate, voting mechanisms to prioritize alternatives after deliberation. In line with closure-planning guidelines that emphasize continuous stakeholder involvement and documentation of planning outcomes, this architecture would make bidirectional communication a routine managerial practice, helping reduce power asymmetries, build trust, broaden social acceptance and contribute to reducing inequality, promoting social inclusion, and fostering local development, as envisaged in SDG 10.

Limitations and future research

This study is subject to limitations common in single-case qualitative research. Its focus on Itabira restricts the generalizability of the findings to other mining territories, and the absence of interviews with Vale representatives limits the analysis of the company's perspective on the closure and engagement process. Nevertheless, the singularity of the case – as one of the first large-scale mine-closure processes in Brazil – suggests that the findings may serve as an important reference for future mine decommissioning processes committed to more meaningful engagement with local communities. Future research could examine additional mining contexts to compare different engagement strategies and their effects on social legitimacy. Further studies could also investigate how public policies shape mine-closure processes and support post-mining transitions. Finally, longitudinal research would be valuable for understanding how local communities restructure economically after mining operations cease, and identifying the factors that facilitate or hinder the emergence of more resilient, inclusive and environmentally sustainable development models.

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Data availability

The data supporting the findings of this study are not publicly available because they contain information that could compromise research-participant confidentiality.