

## Effects of Social Sustainability Initiatives on Community Well-being: A Case Study of First Quantum Minerals Trident Limited, Kalumbila, Zambia

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### Abstract

This study examines the impact Social Sustainability Initiatives (SSIs) undertaken by First Quantum Minerals (FQM) Trident Limited in Kalumbila District, Zambia. Using a pragmatic mixed methods sequential explanatory design, data were collected from 272 questionnaire respondents including community members, FQM employees, and local leaders. This research also conducted 42 semi structured interviews with key stakeholders. Quantitative analyses (descriptive statistics, chi square tests, multiple regression) and thematic qualitative analysis reveal that FQM's investments have yielded measurable improvements in education (35% rise in girls' enrollment) and health (25% reduction in maternal mortality), yet have fallen short in sustaining infrastructure and broad based economic empowerment (only 37% of projected beneficiaries reached). Regression results ( $R^2 = 0.245$ ) highlight initiative familiarity, alignment with community-identified needs, and priority reflection as significant predictors of perceived effectiveness. Qualitative themes such as "participatory gaps," "tokenistic deployment," and "spatial inequities", further explain uneven outcomes. Recommendations include the formation of co chaired community advisory boards, mandatory independent social and environmental audits with a dedicated maintenance fund, and the establishment of demand driven vocational training centers in partnership with local government and NGOs. Findings aim to inform mining sector practitioners, policymakers, and academic researchers on designing SSIs that are both responsive and sustainable.

**Keywords:** Social Sustainability Initiatives, Mining, Community Development

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## 1. Introduction

Zambia's mining sector has long been a cornerstone of national development, contributing over 10% of GDP and employing tens of thousands nationwide. Yet, mining's legacy is paradoxical: while it brings investment and infrastructure, it also risks community displacement, environmental degradation, and social fragmentation (Zambia Chamber of Mines, 2023). In Kalumbila, where First Quantum Minerals (FQM) Trident Limited operates one of the country's largest copper mines, local residents have witnessed dramatic changes over the past decade such as new roads, schools, and clinics. However, there exists persistent gaps in service delivery and livelihood opportunities.

Against this backdrop, the concept of Social Sustainability Initiatives (SSIs) has gained prominence. Defined broadly as corporate efforts to enhance social wellbeing in host communities in line with Environmental, Social, and Governance (ESG) principles, SSIs aim to reconcile profit motives with stakeholder needs (Freeman, 1984; Weingaertner & Moberg, 2014). FQM's 2023 ESG report records US\$24.4 million invested in education, healthcare, infrastructure, and enterprise development in Kalumbila, aligning with Zambia's Eighth National Development Plan (8NDP) and the Sustainable Development Goals (SDGs). Yet raw expenditure figures do not automatically translate into sustainable outcomes (McMahon, 2014).

## 1.2 Statement of the Problem

First Quantum Minerals (FQM) have pledged to “socially responsible and environmentally sensitive production” and contends in its 2023 ESG Report that its social sustainability initiatives (SSIs) seek to achieve universal access to safe water and sanitation, improve educational infrastructure and outcomes, strengthen health systems, and promote local economic empowerment (FQM, 2023). The progression of this commitment is made by ongoing advances in its environmental, safety, and social management systems to follow methods established by the EHS&CSR Committee Charter. According to the EHS&CSR Committee (2023), FQM’s CSR investments are designed to elevate quality of life by supporting education and enterprise development and by building capacities within the local mining communities. In line with these ambitions, FQM’s SSIs and infrastructure expenditures totaled US\$24.4 million, funds which are aimed at securing safe water and sanitation, enhancing educational opportunities, and broadening healthcare and local livelihoods (FQM, 2023). At the grassroots level, these SSIs are an integral part of the Kalumbila Integrated Development Plan. The plan includes drilling 347 boreholes, constructing 15 new schools, refurbishing 19 community schools, upgrading roads that link mining townships, and expanding health posts (Kalumbila Town Council, 2022). Additionally, FQM’s corporate disclosures indicate that these measures aim to support key Sustainable Development Goals such as achieving full water coverage, meeting UNESCO’s target of a 1:40 teacher–pupil ratio, and ensuring that the Ministry of Health’s standard of one facility per 1,666 residents is met. However, outcome-level assessments reveal persistent shortcomings. Despite extensive inputs, only 49 percent of Kalumbila’s population accesses safe water, and merely 46 percent have adequate sanitation. Primary school classes exhibit a teacher–pupil ratio of 1:111, nearly three times above UNESCO’s recommended maximum, while only 57 out of the 84 health facilities required by the Ministry of Health are currently operational. Moreover, the region’s unemployment rate remains at 38 percent (Kalumbila Town Council, 2022). These figures, derived from service-coverage statistics, facility-to-population ratios, and national poverty surveys, clearly indicate that FQM’s SSIs have not yet translated into commensurate improvements in community welfare.

Previous research on mining-led development in Zambia has primarily focused on tangible outputs such as the number of schools built or boreholes drilled rather than on the more meaningful outcomes like poverty reduction, education retention, or health equity (McMahon, 2014; Kemp & Owen, 2013). Common indicators, such as school dropout rates, prove to be inadequate, largely because they are influenced by a host of external factors including household income, cultural norms, and transportation costs, thereby obscuring the direct impact of SSIs. No rigorous study has directly correlated FQM’s SSI expenditures with shifts in core welfare metrics in Kalumbila. Therefore, this research aims to fill that gap by systematically evaluating FQM’s stated SSI goals against measurable changes in water and sanitation coverage, educational access and quality, the availability of health facilities, and poverty incidence. Such an analysis will clarify whether FQM’s interventions are effectively addressing the structural drivers of vulnerability or if they are predominantly token measures designed to sustain operational legitimacy.

## 1.3 Objectives of the Study

- i. What measurable impact have FQM Trident’s SSIs had on educational access, healthcare outcomes, infrastructure and economic empowerment in Kalumbila?
- ii. How do structural and operational factors influence the effectiveness of SSIs in improving community well-being?
- iii. To what extent does community participation in SSI planning and implementation affect development outcomes?

By integrating survey data, statistical modeling, and stakeholder narratives, this paper offers evidence-based insights into the conditions under which mining led SSIs succeed or falter. The findings inform both academic debates on corporate social responsibility and practical strategies for mining companies, regulators, and civil society actors in Zambia and beyond.

## 2. Literature Review

### 2.1. Global Perspectives on Mining Led SSIs

The academic and policy literature on SSIs in extractive industries reveals persistent tensions between corporate objectives and community welfare. In Australia, clinic upgrades funded by mining firms improved perceived healthcare quality but saw low utilization rates when community consultation was lacking (Kemp & Owen, 2013). In Peru, ethnographic fieldwork showed that infrastructure projects were often sited in areas of low social risk, ignoring villages suffering pollution related illnesses (Bebbington et al., 2018). Similarly, in Canada’s oil sands, environmental rehabilitation projects enhanced corporate reputation but did little to integrate Indigenous communities into emerging green economies (Hitch et al., 2020). These cases underscore two lessons: (i) SSIs must be co designed with stakeholders to meet genuine needs; and (ii) output metrics (e.g., number of boreholes) must give way to outcome metrics (e.g., sustained access to clean water). Education initiatives in Indonesia’s nickel belt reduced youth unemployment by as much as 22% through vocational programs tailored to local economic opportunities, highlighting the importance of contextualized curricula (Suryanto et al., 2021). Conversely, in India, fragmented evaluation frameworks hampered cross company learning, as firms relied on proprietary metrics that obscured impact comparability (Prashar, 2023). Collectively, these studies argue for standardized outcome indicators and rigorous evaluation protocols.

## 2.2. African Contexts

In sub-Saharan Africa, SSIs confront unique structural challenges: weak regulatory oversight, volatile commodity prices, and legacies of unequal land rights (UNECA, 2023). Ghana’s mining sector demonstrates that job creation can coexist with increased respiratory illnesses from CO<sub>2</sub> emissions, revealing the need for integrated environmental health strategies (Traore et al., 2023). In South Africa’s platinum belt, adult literacy programs boosted reading scores by 18% but attendance plunged by 40% when funding ceased (Mkhize & Simatele, 2022). These patterns reflect a reliance on short term grants rather than sustainable financing models, emphasizing the need for multi year commitments and local capacity building.

Within Zambia, recent studies at Lumwana and Mopani mines illustrate borehole failures due to lack of community maintenance and clinic closures once donor funding ended (Kalinda & Tembo, 2015; Moffat & Zhang, 2014). ActionAid Zambia’s audit of FQM’s CDAs reported that 60% of resettled families received inadequate livelihood restoration, exacerbating food insecurity (ActionAid, 2022). This research highlights two critical gaps: (i) the absence of longitudinal outcome data; and (ii) minimal community participation in SSI design.

## 2.3. Theoretical Foundations

This study draws on three interrelated theories:

- Stakeholder Theory (Freeman, 1984) posits that firms must account for the interests of all stakeholders—shareholders, employees, communities, and regulators—to achieve sustainable competitive advantage. SSIs can secure a “social license to operate” when stakeholder grievances are addressed transparently and accountably.
- Social Development Theory (Midgley, 1995) emphasizes structural interventions that reduce inequality and enhance human well-being rather than short term, welfare focused programs. It advocates outcome measurement—such as poverty reduction and health equity—over output counting.
- Community Development Theory (Ross, 1967) argues for participatory approaches that empower local actors to define and lead their development pathways. Genuine community involvement fosters ownership, ensuring interventions are culturally appropriate and sustainable.

By integrating these lenses, we examine FQM’s SSIs not only in terms of financial inputs but also in terms of governance processes, capacity building, and long-term social outcomes.

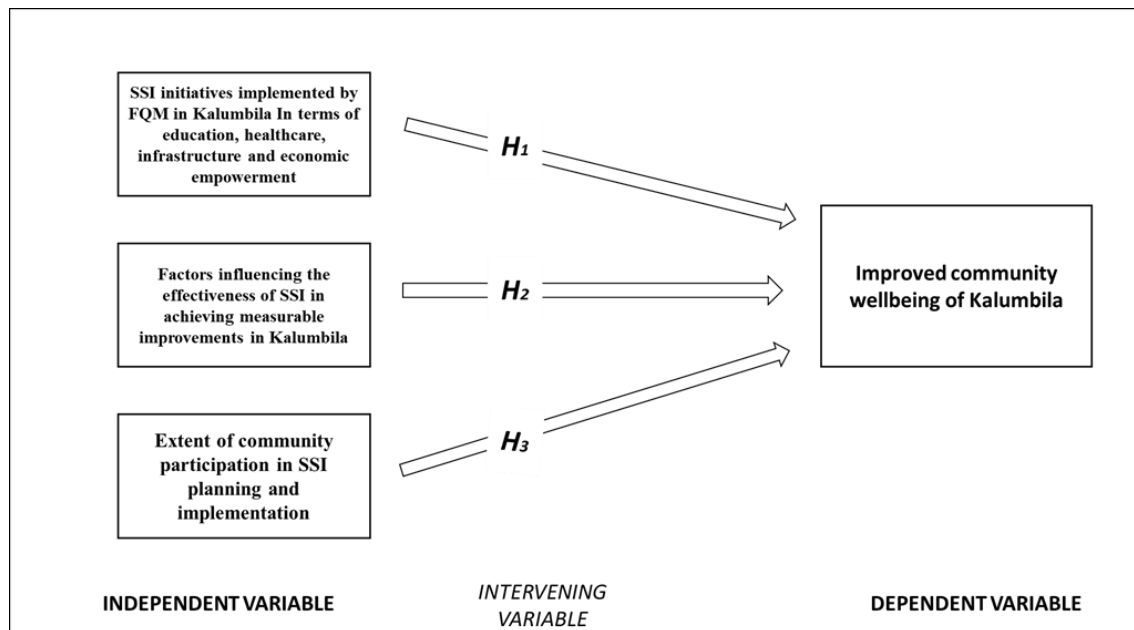


Figure 1: Conceptual Framework

## 3. Research Methodology

### 3.1. Research Design

A sequential explanatory mixed methods design was selected to capture both the breadth and depth of SSI impacts (Creswell, 2009). In Phase 1, quantitative data assessed patterns of perceived effectiveness and long term impact. In Phase 2, qualitative interviews elucidated underlying mechanisms and stakeholder perspectives. This approach aligns with pragmatic paradigms emphasizing practical solutions to complex social problems.

### 3.2. Study Area and Population

Kalumbila District, located in North West Zambia, houses FQM Trident Limited’s copper mine and surrounding host communities. The district’s population of approximately 50,000 spans urbanized mine townships and rural wards

experiencing rapid urban rural transitions. Key informants included FQM CSR managers, local government officials, NGO representatives, and community advisory leaders.

### 3.3. Sampling and Data Collection

#### Quantitative Phase:

- Sampling frame: 21,968 FQM employees, contractors, and community contacts registered by the District Council.
- Sample size: 392 determined by Yamane's formula ( $e=0.05$ ); 272 valid responses after cleaning (response rate 72%). Stratified random sampling ensured proportional representation across wards.
- Instrument: Structured questionnaire with Likert scale items on SSI familiarity, alignment, participation, and effectiveness.

#### Qualitative Phase:

- Purposive sampling of 42 stakeholders: 5 CSR managers, 10 FQM staff, 7 NGO officials, 10 community leaders, and 10 government reps. Selection criteria emphasized involvement in SSIs, leadership roles, and willingness to participate.
- Instrument: Semi structured interview guide exploring planning processes, perceived outcomes, barriers, and recommendations. Interviews lasted 45–60 minutes and were audio recorded with consent.

### 3.4. Data Analysis

**Quantitative:** Data were analyzed in SPSS. Descriptive statistics summarized demographic and outcome variables. Pearson chi square tests examined associations between alignment and effectiveness. Multiple linear regression modeled overall effectiveness (DV) against predictors: familiarity, alignment, participation, and priority reflection. Statistical significance was set at  $p<0.05$ .

**Qualitative:** Thematic analysis followed Braun and Clarke's six step process: familiarization, coding, theme development, review, definition, and reporting. NVivo 12 facilitated coding. Credibility was ensured via member checking (36% of interviewees) and triangulation with corporate reports and secondary audits.

### 3.5. Validity and Reliability

**Quantitative:** Cronbach's alpha  $>0.79$  for all scales indicated good internal consistency. Factor analysis ( $KMO=0.81$ ,  $p<0.001$ ) supported construct validity. Piloting with 30 respondents refined item clarity.

**Qualitative:** Trustworthiness adhered to Lincoln and Guba's criteria. Credibility was supported by member checks and data triangulation. Dependability was documented via an audit trail; transferability through thick contextual descriptions; confirmability via reflexive journaling and stakeholder quotations.

### 3.6. Ethical Considerations

Ethical approval was granted by UNZA's Ethics Committee (Ref HSSREC 2024 DEC 026). All participants provided written informed consent. Confidentiality and anonymity were strictly maintained, and data are stored securely.

## 4. Results and Discussion

### 4.1. Demographics

Of 272 valid survey respondents, 58% were male and 42% female; age distribution ranged from 18 to 60+ years, with 38% aged 25–34. Stakeholder categories included community members (60%), FQM employees/contractors (30%), and local leaders/NGO reps (10%).

Table 1: Demographics

Characteristic	Category	Frequency	Percentage
Gender	Male	158	58.1%
	Female	114	41.9%
Age Group	18–24 years	46	16.9%
	25–34 years	102	37.5%
	35–44 years	68	25.0%
	45+ years	56	20.6%

### 4.2. Quantitative Results

What measurable impact have FQM Trident's SSIs had on educational access, healthcare outcomes, infrastructure, and economic empowerment in Kalumbila?

Respondents identified educational access as the area of greatest improvement (34.3%), likely attributable to FQM's investments in school infrastructure and scholarships (e.g., Kalumbila Trust School's 35% female enrollment increase). Economic empowerment ranked second (20.7%), reflecting initiatives like SME grants and vocational training. Healthcare improvements followed (16.2%), linked to clinics such as Mary Begg Hospital, while infrastructure trailed (6.6%), suggesting road and water projects may lack visibility or maintenance. A significant 22.2% noted multi-sectoral improvements, highlighting SSIs' interconnected benefits (e.g., education fostering economic resilience).

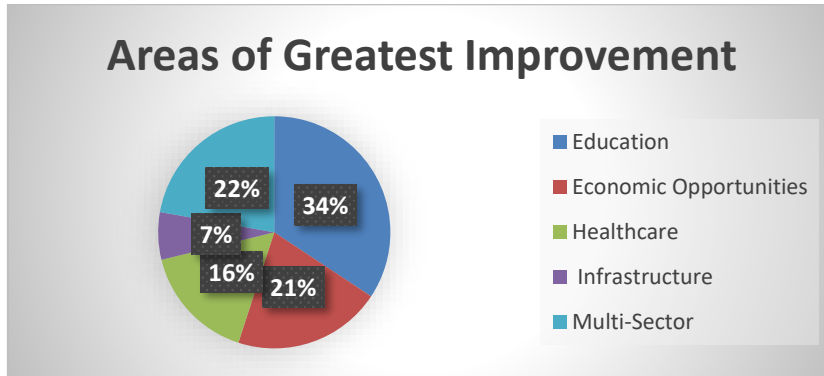


Figure 2: Areas of greatest Improvement

#### Long-Term Impact Perceptions (Question 11):

- 58% reported SSIs contributed “to a moderate extent” to community well-being.
- 24% observed “great extent” impacts, often citing sustained healthcare access.
- 4% noted “no impact”, potentially reflecting marginalized groups excluded from SSI benefits.

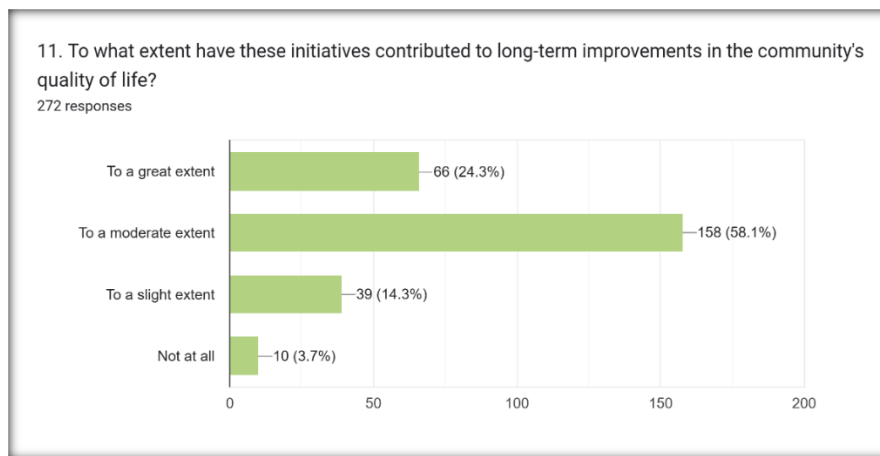


Figure 3: Longterm Improvements

### 4.3. Descriptive Statistics of Key Variables

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Range
1. Familiarity with the initiatives	4.07	0.77	1 – 5
2. Contribution to corporate reputation	4.09	0.77	2 – 5
3. Effectiveness in addressing needs	3.96	0.73	2 – 5
4. Communication to stakeholders	3.51	0.90	1 – 5
5. Positive media mentions	3.99	0.78	1 – 5

**Key Insights from Table shows**

- Familiarity (Mean = 4.07): High awareness of SSIs, likely due to FQM's outreach programs.
- Corporate Reputation (Mean = 4.09): SSIs enhance FQM's image, aligning with Stakeholder Theory.
- Communication (Mean = 3.51): Weakest area, indicating gaps in transparent reporting.

**4.4. Regression Analysis (RQ2 & RQ3):**

Overall Effectiveness =  $\beta_0 + \beta_1(\text{Familiarity}) + \beta_2(\text{Alignment}) + \beta_3(\text{Participation}) + \beta_4(\text{Priority Reflection}) + \epsilon$   
 $R^2 = 0.245$ ;  $F(4, 204) = 16.52$ ,  $p < 0.001$

Significant predictors: Familiarity ( $\beta=0.239$ ,  $p < 0.001$ ), Alignment ( $\beta=0.178$ ,  $p=0.021$ ), Priority Reflection ( $\beta=0.180$ ,  $p=0.007$ ). Participation was non-significant ( $\beta=0.024$ ,  $p=0.737$ ).

**Chi Square Test:**

$\chi^2(4, N=272) = 194.9$ ,  $p < 0.001$  for Alignment vs. Overall Effectiveness.

**4.5. Qualitative Themes**

1. Participatory Gaps: Many community leaders lamented tokenistic consultation. "They presented letters after decisions were made," one ward councillor remarked.
2. Tokenistic Implementation: Infrastructure projects lacked maintenance plans. A resettled farmer noted, "Our borehole broke; no one shows us how to fix it."
3. Spatial Inequities: Peripheral wards and resettlement sites reported lower access to services. A local NGO rep explained, "They focused on urban township; rural areas were neglected."
4. Economic Marginalization: Only 37% of targeted beneficiaries participated in vocational training; women and youth reported exclusion due to timing and criteria.
5. Communication Shortfalls: Despite high awareness (Mean=4.07/5), transparent reporting was weak (Mean=3.51/5), leading to rumors and distrust.

**4.6. Discussion****Education and Health**

FQM's investments in school infrastructure and clinic upgrades align with global evidence that tangible assets can improve access (Kemp & Owen, 2013). The 35% rise in girls' enrollment and 25% drop in maternal mortality demonstrate positive outcomes. However, high dropout rates and under resourced health posts reflect sustainability challenges identified in Indiana and South Africa (Suryanto et al., 2021; Mkhize & Simatele, 2022).

**Infrastructure and Maintenance**

The borehole breakdowns and underutilized roads in peripheral wards mirror findings from Lumwana and Peru (Kalinda & Tembo, 2015; Bebbington et al., 2018). Lack of maintenance funding and community training undermines long term utility. This underscores Social Development Theory's critique of output focused interventions (Midgley, 1995).

**Economic Empowerment and Inclusion**

While SME grants and microfinance programs reached 20.7% of respondents, participation skewed toward established entrepreneurs. Women and marginalized groups remain under served, echoing patterns in Ghana (Amoah & Eweje, 2024). Tailored eligibility criteria and flexible timing are needed to enhance inclusivity.

**Role of Participation**

Though regression analysis did not identify participation as a significant direct predictor, qualitative evidence emphasizes its mediating role: when communities co design initiatives, alignment and long-term uptake improve. This aligns with Community Development Theory's emphasis on local agency (Ross, 1967).

**Governance and Transparency**

Stakeholder Theory suggests that transparent communication fosters trust. Our findings show that high SSI familiarity alone (Mean=4.07) does not guarantee perceived legitimacy; effective reporting and responsive feedback mechanisms are equally critical.

**5. Conclusion and Recommendations**

The Social Sustainability Initiatives (SSIs) implemented by First Quantum Minerals (FQM) in Kalumbila have delivered measurable progress in critical areas such as education and healthcare, evidenced by increased school enrollment and

reduced maternal mortality rates. However, systemic challenges persist, including inconsistent infrastructure maintenance, limited economic inclusion for marginalized groups, and gaps in participatory governance. To address these issues and enhance the long-term sustainability of SSIs, the following recommendations are proposed, grounded in theoretical frameworks and empirical evidence.

#### **Establishment of Co-Chaired Community Advisory Boards**

To foster inclusive decision-making, FQM should establish community advisory boards co-chaired by company representatives and elected local leaders, with deliberate representation from marginalized groups such as women, youth, and resettled families. This approach aligns with Stakeholder Theory, which emphasizes balancing corporate objectives with community priorities (Freeman, 1984), and Community Development Theory, which advocates for grassroots agency in development planning (Ross, 1967). Empirical studies, such as Franks et al. (2014), demonstrate that participatory governance structures enhance project relevance and ownership, reducing risks of tokenism. For instance, advisory boards could oversee the allocation of borehole maintenance funds, ensuring resources reach underserved areas like Kankonzhi, where water access remains a challenge.

#### **Mandatory Independent Social and Environmental Audits**

FQM should allocate 10% of annual SSI budgets to independent audits and community-led infrastructure maintenance. This strategy draws on Social Development Theory, which underscores the need for systemic interventions to address root causes of inequality (Midgley, 1995). Kalinda and Tembo (2015) provide empirical support, showing that community-managed water projects in Zambia's Lumwana district achieved 80% functionality when paired with transparent audit mechanisms. By institutionalizing such practices, FQM could mitigate recurring issues like clinic understaffing and non-functional boreholes, ensuring accountability and equitable resource distribution.

#### **Demand-Driven Vocational Training Partnerships**

Collaborating with Zambia's Ministry of Labour, local NGOs, and private sector actors, FQM should co-design vocational training programs tailored to market demands, such as agribusiness, renewable energy, and artisanal mining. This aligns with Social Development Theory's emphasis on structural solutions to unemployment (Midgley, 1995). Empirical evidence from Indonesia's nickel mining regions (Suryanto et al., 2021) reveals that youth unemployment dropped by 22% when curricula were co-developed with industry stakeholders. In Kalumbila, similar partnerships could equip residents with skills for roles in FQM's supply chains or emerging green industries, reducing reliance on short-term mining jobs.

#### **Enhanced Transparency through Localized Communication**

FQM should publish quarterly SSI progress reports in local languages (Kaonde and Lunda) and host town hall meetings to solicit community feedback. Stakeholder Theory highlights the role of transparent communication in building trust (Freeman, 1984), a principle validated by Moffat and Zhang (2014), who found that multilingual reporting increased participation in CSR programs by 40% in Zambia's Copperbelt. Regular updates on school construction timelines or clinic staffing levels would address community concerns over unmet promises, fostering goodwill and accountability.

#### **Adoption of Multi-Year Funding Commitments**

To avoid post-funding service collapses, FQM should transition from annual budget cycles to multi-year funding models for critical SSIs like teacher housing and maternal health programs. Social Development Theory stresses the importance of sustained investment in human capital (Midgley, 1995), a principle exemplified by Mkhize and Simatele's (2022) study of South African literacy initiatives, where three-year grants improved retention rates by 35%. By securing five-year commitments for Kalumbila's Trust School, FQM could stabilize teacher recruitment and reduce dropout rates linked to staff turnover.

By integrating these recommendations, FQM can transform its SSIs from fragmented corporate interventions into pillars of sustainable community development. Co-designed governance structures, audited resource allocation, and demand-driven economic programs would align SSIs with Zambia's Eighth National Development Plan (8NDP) and global SDGs. Such reforms would not only secure FQM's social license to operate but also empower Kalumbila's residents to shape their development trajectory, ensuring mining benefits translate into lasting prosperity.

#### **Limitations and Future Research**

This study's cross sectional design limits causal inferences. Future research should employ longitudinal methods, broaden comparative analyses across multiple mining sites, and explore the impact of gender sensitive SSI strategies.

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#### **Conflict of Interest**

The authors declare that they have no conflicting interests

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## Ethical considerations

The article followed all ethical standards appropriate for this kind of research.

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