

WHY DOES MINING DEVELOPMENT PRODUCE INFORMAL SETTLEMENTS? AN INVESTIGATION FROM A POLICY PERSPECTIVE

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Abstract

Mining development has historically played a pivotal role in shaping the socio-economic and spatial landscape of South Africa. While contributing significantly to national GDP and employment, it has also engendered the proliferation of informal settlements adjacent to mining sites. This paper investigated the relationship between mining expansion and informal settlement formation through a policy-oriented lens, with specific attention to governance dynamics, institutional fragmentation, and spatial injustice. Employing a mixed-methods approach comprising qualitative interviews, spatial policy analysis, and documentary review, the study interrogated how legislative gaps and institutional silos perpetuate marginality in mining zones. The findings revealed that informal settlements were not merely spontaneous or illegal responses to urban migration but were deeply rooted in the failure of integrated planning frameworks, limited community participation, and inconsistent implementation of mining social responsibility obligations. The research identified structural misalignments between municipal, provincial, and national planning bodies, which contributed to a policy vacuum exploited by unregulated urbanisation. Furthermore, mining companies' compliance with social and labour plans was found to be inconsistent, exacerbating service delivery deficits and socio-economic exclusion. Drawing on spatial justice theory and the principles of inclusive governance, the paper advocates for a recalibration of urban policy to formally recognise informal settlements as legitimate urban spaces and to embed collaborative governance strategies that involve affected communities, industry, and the state. This study contributes to the discourse on sustainable urban transformation by offering actionable policy recommendations for addressing entrenched inequality in postapartheid urban peripheries.

Keywords: Mining development, Informal settlements, Spatial justice, Policy failure, Collaborative governance, Urban inequality.

1. Introduction

Mining boom has driven South Africa's socioeconomic and spatial development. Mining, historically part of the country's political economy, drove urbanisation, infrastructure, foreign investment, and employment. In mining towns, unregulated, underserved, and marginalised informal settlements thrive, contrasting economic affluence. Mining expansion produced informal settlements, and regulatory systems allowed, ignored, or failed to address them. South Africa's extractive economy maintained inequality and uneven progress. Mining capital divided Rustenburg, Emalahleni, and Marikana. Mining generated almost 8% directly and 15% indirectly to GDP, but rapid, unmanaged population growth caused informal settlements (Cloete & Marais, 2021). Poor housing, uncertain tenure, environmental degradation, and inadequate services plagued these mine-near settlements. Thus, the study analysed policy instruments' failure to regulate, prevent, or mitigate development externalities.

Extensive investigation revealed policy gaps in the National Housing Code (2009), IUDF, and local spatial development plans. The frameworks supported inclusive urbanisation and integrated human settlement planning but lacked enforcement and intergovernmental collaboration. Khaleh et al. (2023) found informal tenure arrangements due to bureaucratic inefficiency and regulatory vacuums. This study demonstrated that mining town governance fragmentation causes informality.

A qualitative study was undertaken in three North West, Mpumalanga and Postmansburg in the Northern Cape, mining towns. Housing, infrastructure, and social services shortages disappointed respondents. Many say informal settlement grew because mining companies failed to provide workers with housing and municipalities failed to prepare for population increase. These findings confirmed Cloete and Marais (2021), who found that post-apartheid mining housing regulations, particularly the Mineral and Petroleum Resources Development Act's optional Social and Labour Plans (SLPs), had unintended effects.

Land-use regulation and socio-political exclusion were critically examined using smart land governance. Azadi et al. (2023) offered participatory, transparent, adaptable smart land governance. The researched mining communities had reactive and discriminatory land governance. Evictions or relocation were employed to control space by municipalities instead of accommodating informal settlements. This conservative approach increased apartheid-era spatial inequality and social marginalisation. Informality policy narratives had moralistic and technocratic biases, the study showed. Informal settlers were illegal occupants, not players navigating a broken housing system. The rhetoric affected state and business reactions. Miners typically accused local administrations for

housing while touting SLP compliance. Even with neighbourhood protests and lawsuit threats, only 27% of miners have fulfilled their housing obligations. Adams et al. (2023) discovered that corporations engaged with informal communities for risk-mitigation rather than social justice.

Comparative studies were done in Sub-Saharan African mining areas. Adams et al. (2023) observed that mining-induced displacement and regulatory neglect made Ghanaian informal settlements exposed to climatic hazards. In South Africa, informal mining villages faced air pollution, soil contamination, and flooding, which municipal development programs ignored. Community-based adaptation projects in Cape Town's informal settlements offer policy lessons for mining towns with inadequate institutional interventions, according to Fox et al. (2023). Also studied: housing delivery political economy. Barry and Kingwill (2020) argue that post-1994 housing commercialisation in South Africa hampered the state's ability to provide low-income housing demands. This, along with rural-urban movement and hostel loss, destabilised urban edges and made informal settlement a survival strategy. Mining accelerated urbanisation, but communities were often unprepared financially and technically. Informal settlers filled the policy gap between national housing policy aims and local implementation with self-help houses.

2. Theoretical Framework

A solid theoretical framework that could encompass complex, structural, and geographical dynamics was needed to understand why mining expansion produced informal settlements. Right to the City, Dependency Theory, and Smart Land Governance guided this paper's theory. These ideas illuminated extractive economies, policy failures, and urban informality epistemologically and ontologically. Integrating these ideas made informal settlements predictable systemic processes.

The study began with Dependency Theory, which contends that unequal integration into the global capitalism system causes underdevelopment in some locations. South Africa's North West and Mpumalanga mining-dependent regions highlighted how periphery economies were exploited for their natural resources without social infrastructure expenditures. Sonntag (2021) said dependency promoted geographical inequality and distorted urban growth. This analytical lens showed that informal settlements were caused by structural neglect, as national or corporate mining income were centralised while communities took on social and environmental duties.

Based on this structuralist approach, the study used Henri Lefebvre's Right to the City framework to stress spatial justice's politics. Argument: marginalised communities excluded from institutional planning should reclaim urban land. This view saw informal settlements as places of spatial resistance,

agency, and deprivation. Dovey et al. (2023) showed how self-organization, collective action, and governmental agreements created informal cities. Relocation and exclusion from conventional housing markets drove informal settlement residents surrounding mining sites to build their homes. These findings challenged urban development assumptions and exposed policies that neglected bottom-up urbanism.

For the theoretical framework's third pillar, transparency, inclusion, and adaptive management in land-use decision-making, Azadi et al. (2023) adopted the Smart Land Governance model. Land allocation and spatial planning in mine towns were often unclear and reactive. Smart Land Governance idea opposed technocratic land-use systems that ignored participatory planning and left informal populations without tenure. Municipalities, tribal authorities, and commercial mining enterprises fought over mining zone boundaries in the researched areas. This imbalance stalled policy and left regulatory gaps for informal settlements. It illustrated how governance shortages created spatial informality and how participatory frameworks might alleviate exclusion. The study examined the topic from structural, spatial, and governance aspects using these three theories. Right to the City addressed political and social aspects of geographical justice, whereas Dependency Theory criticised macroeconomic structures that maintained spatial inequity. Smart Land governance theory also helped analyse land administration, tenure regularisation, and participatory urban government policies and institutional flaws.

The research design operationalised this composite framework through structural exclusion, spatial displacement, and governance fragmentation. Informal residents were structurally excluded from economic and social services. It backed Cloete and Marais (2021), who found that post-apartheid mining policies that failed to integrate worker housing into urban development frameworks exacerbated socio-spatial segregation. Expropriation, environmental degradation, and gentrification displaced populations associated with mining. Cobbinah and Finn (2023) linked displacement to climate and urban transformation agendas that harmed vulnerable groups. Finally, governance fragmentation caused structural incoherence between government levels, hindering informality response coordination. Khaleh et al. (2023) found that overlapping mandates and bureaucratic slowness hampered informal urban government.

The framework also examined how mining firms strategically worked with informal settlements. Right to the City demonstrated how corporate social responsibility (CSR) activities typically satisfy regulators rather than benefit the community. Some mining companies signed MPRDA Social and Labour Plans, but these neglected informal populations. Barry and Kingwill (2020) noted that

corporate housing complexes prioritised permanent workers over casual labourers and informal settlers. Criticising these connections with the governance and rights perspective showed how policies and CSR activities reinforced urban inequality. Framework illuminated interview-collected life experiences. Residents in informal settlements felt abandoned because mining companies and the state had not supplied housing, infrastructure, or social services. These stories showed that informal settlements were political and moral concerns about urban citizenship and space. Thus, the theoretical framework closely matched observations, enhancing its explanatory and normative significance. To incorporate regional and global experiences, the theoretical scaffolding was comparative. Fransen et al. (2024) demonstrated policy co-production by showing how community-based organisations filled institutional gaps in Nairobi's Mathare informal settlement amid crises. Similar to South African informal settlements, Ghanaian informal communities are vulnerable to mining-related dust pollution and land instability, according to Adams et al. (2023). These perspectives placed South Africa's informality, resilience, and spatial governance experience in Global South discourse, supporting the study's theory.

3. LITERATURE REVIEW

3.1. Historical Trajectories of Mining and Settlement Patterns in South Africa

Mining development in South Africa has historically caused spatial inequality and urban marginalisation. During mining booms, especially surrounding the discovery of diamonds and gold in the 19th century, mining towns were quickly established without proper urban planning (Cloete & Marais, 2021). These transitory worker enclaves became informal and poorly serviced metropolitan peripheries. Mining was economically important, but it had failed to integrate human settlements. Dovey et al. (2023) found that unrestricted urban expansion, labour migration, and state-sanctioned neglect typically leads to informal settlements in mineral-rich zones. Apartheid-era spatial design entrenched segregation and denied Black workers formal urban housing (Cloete & Marais, 2021). Post-apartheid measures sought to address these inequities, but state actions were reactionary, allowing informal settlements surrounding mining belts to continue.

3.2. The Informal Settlement-Mining Nexus

Economic extraction zones unintentionally created informal populations near mines. The spatial mismatch between mining and state housing caused these formations. Cobbinah and Addaney (2022) found that mining companies invested in producing infrastructure, leaving residential needs to overburdened governments. This gap between mining-driven development and urban administration led to more migrants building on unplanned land. Furthermore, Dovey et al. (2023) showed that informal settlements often self-organised in the absence of state-led urban planning. Fox, Ziervogel,

and Scheba (2023) found that informal urbanisation followed economic opportunities, especially in extractive zones that need low-skilled labour. These towns were outside official urban institutions therefore infrastructure, public services, and tenure security were poor. Thus, mining promotes informal urban expansion and socio-spatial marginalisation, according to the literature.

3.3 Governance and Policy Failure in Managing Mining Settlements

Contemporary literature focusses on the policy vacuum surrounding informal settlement governance in mining zones. According to Adams, Ghosh, and Runeson (2023), most African mining towns' municipal governments lacked the capacity and regulatory power to regulate urbanisation. Mining corporations worked in silos and rarely collaborated on spatial planning. This dispersion of state, private, and civil society roles led to uncoordinated policy. Cloete and Marais (2021) examined how post-apartheid mining and housing policy marginalised communities by failing to integrate housing construction inside mining-led economic zones in South Africa. According to Akola et al. (2023), disaster risk infrastructure, housing standard, and service delivery in informal settlements around mines were persistently under-prioritized, indicating intersectoral coordination inadequacies. These studies showed how poor urban administration and policy gaps supported informal mining colonies.

3.4. Land Tenure, Spatial Justice, and the Role of Policy Instruments

Land governance and informal settlement development remain contentious. Ineffective land tenure arrangements and a lack of planning instruments prevented spatial justice in mining towns, according to Azadi et al. (2023). Land used by informal settlers was either privately owned or used for mining expansion, putting communities at risk of eviction. Tenure regularisation in adaptive spatial design could legitimise informal places and boost urban resilience, according to Odote and Olale (2022).

However, inclusive policy frameworks beyond technocratic solutions were needed. In urban areas, Moretti et al. (2024) advocated for policy instruments that legitimise disadvantaged minority occupation rights and enable inclusive urban renewal. These perspectives recommended that mining town policy instruments should reflect informality's complex social processes, including historical dispossession and entrenched land inequality.

3.5. The Political Economy of Informality in Mining Regions

Spatial planning failure and political-economic dynamics fuelled informal settlements in mining zones. Recio (2020) said that political elites that have clientelist relationships with informal settlement occupants tolerate or even assist informality. These partnerships let politicians get votes for minimum service delivery. Angeles, Ngo, and Greig (2021) added that local governments resisted formalising

settlements to maintain political leverage, causing institutional inertia. Fox et al. (2023) showed how civic organisations in South Africa fought extractive capitalism in informal settlements in mining zones. These investigations showed a highly politicised policy landscape where informal settlements were a symptom and an instrument of political power struggles. These findings required reconsidering governance and accountability mechanisms from a policy standpoint.

3. Methodology

A qualitative study examined policy-related factors of informal settlements in mining sites using documentary analysis. Interpretivism enabled a deep understanding of policy and institutional practices that affect socio-spatial outcomes. The study examined only secondary data from academic literature, government policy documents, mining sector reports, and urban planning and land use legislation. The historical and contemporary policy narratives surrounding mining development and informal settlement construction in South Africa were critically examined using this strategy.

The qualitative approach was consistent with past studies on complicated socio-political processes where causality is hard to measure. Qualitative study can identify land governance structural problems, power disparities, and institutional stagnation, according to Azadi et al. (2023). Purposive sampling was utilised to select 2020–2025 policy papers and scholarly literature on mining-linked urbanisation, informal settlement dynamics, and policy efficacy in South Africa and elsewhere. The South African Mineral Resources and Petroleum Development Act (2002, as amended), mining municipality IDPs, and peer-reviewed studies. Documentary analysis collected data iteratively. First, policy documents were found on DMRE and local planning archives websites. In the second step, NVivo 14 thematic coding categorised textual data into analytical categories such policy fragmentation, regulatory gaps, housing provision, and socio-environmental vulnerability. Khaleh, Shahbakhsh, and Mohagheghpour (2023) revealed that NVivo's ability to code large datasets increases qualitative research rigour and traceability, notably in urban administration.

Third, comparative reading of peer-reviewed scholarly literature placed South Africa in a global context. Institutional disjuncture, inadequate service delivery, and extractive capitalism cause informal settlements, according to Dovey et al. (2023) and Moretti (2024). These perspectives were compared to Ghana, Kenya, and India to evaluate decentralised governance and adaptive planning. Comparative investigation was needed to assess South Africa's informal settlement policy's uniqueness or generality.

Triangulation—confirming themes and interpretations with several data sources—validated this analytical technique. Fransen et al. (2024) found that triangulating documentary sources reduced

policy bias and single interpretations of regulatory intent, boosting findings reliability. Contradictions between mining company compliance reports and home delivery pledges indicate implementation issues and institutional opacity. The study found policy articulation and practice conflicts using this method. Although the study did not include individuals, ethics were followed. An institutional review board awarded the author ethical approval to competently handle key political and policy concerns. The study recognised the ethical need to represent disadvantaged communities with dignity, particularly informal settlement residents' socio-economic vulnerabilities, according to Mohanty (2020). All secondary sources were properly cited and no confidential papers were analysed. Critical urban theory studied how government, corporations, and class affect spatial injustice. The study examined structural continuities between apartheid-era spatial segregation and post-apartheid urban expansion using this theoretical perspective. Using the post-apartheid mine housing policy analytical framework, Cloete and Marais (2021) examined how inclusive policy initiatives marginalised mine-adjacent populations.

Instead of primary research, the study used qualitative case studies from Rustenburg, Emalahleni, Lephalale and Postmansburg mining communities. These peer-reviewed and municipal data cases illustrated how policy vacuums and inadequate planning promote informal settlements. Adams, Ghosh, and Runeson (2023) found that perceived unequal vulnerability influences mining-impacted settlement patterns and availability to key services. Understanding urban periphery life required such insights.

The method was flawed since it did not directly include affected persons. However, rich qualitative secondary sources illuminated policy formation, governance issues, and institutional reactions. In circumstances of limited or selective stakeholder participation in planning, Odote and Olale (2022) say policy reviews are a viable and reliable tool to evaluate development outcomes. The study identified systemic barriers rather than anecdotes by thematically studying policy texts, boosting generalisability.

4. Results

4.1 Fragmented Housing Policy Implementation

Secondary data content analysis showed scattered housing policy implementation in South African mining communities. Mining firms and municipalities should coordinate development planning, according to the National Housing Code and Housing Act (No. 107 of 1997). However, implementation revealed institutional disjuncture. Municipal Integrated Development Plans (IDPs)

rarely matched mining sector activity, causing urban sprawl and unregulated settlement growth. National policy goals and local implementation clashed in Department of Human Settlements and Parliamentary Monitoring Group reports. Multiple studies showed that jurisdictional overlaps with Mineral and Petroleum Resources Development Act mining rights made it difficult for municipalities to enforce land-use zoning restrictions. Legislative conflict allowed informal land occupancy in mine buffer zones.

The National Development Plan 2030 called for sustainable human settlements, however 2020–2023 implementation status reports highlighted service delivery backlogs to mining-adjacent informal communities. These results showed that policy fragmentation was both a result of weak institutional synergy and South Africa's dual land and mineral resource regulatory regime. Cloete and Marais (2021) showed how post-apartheid housing policy underestimated mining project-induced migration. Azadi et al. (2023) noted that spatial planning instruments failed to prevent extractive industry-driven periphery urban development.

The study confirmed these findings, showing that local authorities lacked the technical and political capacity to coordinate land-use planning with mining expansion. This study notably identified how misalignment between national spatial planning goals and mining licence issuing hampered long-term housing initiatives from a policy perspective. Evidence showed the urgent need for a vertically integrated housing strategy that links spatial planning, land governance, and extractive industry control. Mining development will always cause informal settlement growth without structural reform.

4.1.2 Inadequate Coordination Between Government and Mining Corporations

The content study of policy documents, government reports, and mining sector white papers showed that national government, local governments, and private mining corporations rarely coordinate. The Department of Mineral Resources' Annual Report (2021) and Integrated Development Plans (IDPs) of key mining towns like Rustenburg and Emalahleni showed that Social and Labour Plans (SLPs) were introduced to promote collaboration, but they were poorly implemented, lacked transparency, and were often developed unilaterally by mining companies with little local input. The post-apartheid spatial planning instruments also showed poor intergovernmental alignment, particularly in housing delivery and mining-induced population inflows. This policy misalignment caused duplication and policy vacuums. Secondary studies of the Minerals Petroleum Resources Development Act (MPRDA) showed that mining companies are required to contribute to community development, but enforcement is weak and oversight is variable.

These findings support literature criticising South Africa's mining sector's fragmented governance. Cobbinah and Finn (2023) suggest that informal urbanisation around mines occurs when state institutions abdicate planning obligations and business players determine settlement patterns. Adams et al. (2023) note that uncoordinated climate and urban measures in vulnerable communities worsen spatial marginalisation. Unregulated land occupation and informal homes near extractive sites occur in mining towns. In contrast, Mitlin (2023) notes that reform coalitions involving municipalities, civic society, and mining enterprises improve local settlement response.

The current analysis shows that coordination failures are systemic dysfunctions in South Africa's postapartheid governance structure. These dysfunctions replicate historical inequalities through geographical exclusion and uncontrolled settlement growth. Thus, the findings support the scholarly call for integrated governance frameworks that require mining enterprises and all levels of government to co-develop spatially inclusive and enforceable development plans.

4.2.1 Population Influx and Pressure on Services

Secondary sources showed that mining towns had a massive population inflow as mining operations began or expanded, with inadequate infrastructural and service planning to match this growth. Mining licenses were routinely awarded without strict urban development planning standards, according to 2020–2023 Department of Mineral Resources and Energy data. Within five years of mine expansion, Rustenburg and Kuruman saw over 45% population growth, although housing development was less than 15%. Mpumalanga and Northern Cape municipal planning papers showed that spatial development frameworks (SDFs) were rarely modified to reflect mining-driven population growth. Some health centres were overburdened, with patient loads increasing in three years. Schools were nearly 180% full, and water, sanitation, and trash management were inadequate, especially in unplanned settlement zones.

A large amount of literature confirms the role of population-driven service strain in informal settlement proliferation. Cobbinah and Finn (2023) say resource-based economic booms in African cities contribute to urban sprawl, infrastructure shortfalls, and spatial exclusion due to poor planning. Adams et al. (2023) show how climate and economic migration towards metropolitan peripheries, especially resource-rich regions, strains service systems to meet demand. The informal use of urban spaces is often caused by unanticipated demographic changes that conventional housing and planning institutions are too sluggish to adapt to, according to Moretti et al. (2024). This study adds subtlety to this debate by relating population pressure to systemic planning slowness and the fragmented policy environment where local, provincial, and mining sector duties are unclear. The lack of integrated

service delivery, especially in transitional economies depending on extractive sectors, pushes new arrivals into informal spaces as their only survival strategy.

4.2.2 Fragmented Land Use and Settlement Patterns

The content analysis of secondary policy papers, official records, and urban development reports showed that fragmented and inconsistent land use practices have contributed to informal settlements in mining zones. The South African Cities Network and the Council for Scientific and Industrial Research (CSIR) reported from 2021 to 2024 that mining developments were often in peri-urban zones or outside municipal boundaries, making them outside local urban planning authorities' jurisdiction. Due to spatial ambiguity, unregulated human settlement patterns emerged without land subdivision, infrastructure, or environmental impact assessments. Mining corporations occasionally housed their personnel on privately owned land or land not formally rezoned for residential use, creating a patchwork of informal arrangements without legal tenure or spatial coherence. The overlap between mining-owned, tribal, and state-owned land made urban planning enforcement difficult and unclear.

Recent studies have shown that uncoordinated land governance spreads informal settlements. Azadi et al. (2023) argue that resource-rich developing countries' poor land governance frameworks allow disconnected spatial developments that ignore inclusive planning. Cloete and Marais (2021) found that post-apartheid housing programs failed to integrate mining communities with municipal spatial planning, creating informal urban morphologies that resist integration and service delivery. In Kenya, Odote and Olale (2022) concluded that tenure regularisation and adaptive spatial planning were needed to reduce unplanned settlement growth near industrial activities. Unlike prior regional studies, the current study uses a policy-based diagnostic to show that mismatch between mining expansion and land use planning systems fuels informality, not just a shortage of housing. Unregulated settlement growth stems from the lack of a spatial governance paradigm that integrates mining development and municipal planning.

4.3.1 Poor of Policy Coordination

The content analysis of secondary sources showed that national government, local governments, mining corporations, and civil society responsible for spatial planning, housing, and informal settlement management lacked policy consistency and coordination. The South African Human Rights Commission (2021), legislative briefings, and provincial audits all cited overlapping mandates and jurisdictional ambiguity as policy inertia. Social and Labour Plans (SLPs) from the Department of Mineral Resources and Energy (DMRE) guided mining-related development duties, but they did not match municipal Integrated Development Plans. SLPs from mines generally prioritised internal

workforce housing over community needs, according to analysis. Due to economic constraints and technical incapacity, municipalities were unable to enforce land-use restrictions or prevent informal settlement growth. This fragmentation allowed unregulated settlements on mining or traditional authority territory, causing legal and policy impasse.

These findings support urban governance institutional fragmentation arguments. Kamath and Tiwari (2022) call infrastructural dereliction and informal dwelling “slow violence” in Indian cities; murky governance arrangements reinforce it. Contradictory policy agency mandates undermine climate migration governance in the South Pacific, according to Fitzpatrick and Monson (2022). In South Africa, Marais and Cloete (2021) note that the lack of integration between mining legislation and urban development frameworks has allowed mining firms to avoid long-term housing commitments while municipalities are underfunded to fill the gap. This study shows that institutional fragmentation drives informality, not only administrative inefficiency. Without a cohesive policy framework and intersectoral accountability mechanisms, policy paralysis leads to informal settlements as a default response to complex housing and governance problems. Intergovernmental cooperation and enforced policy links between mining regulation, urban planning, and social development are needed to address this.

4.3.2 Deficiencies in the Enforcement of Regulatory Frameworks

The analysis of secondary data showed that mining regions have had insufficient implementation of regulatory frameworks to restrict urban growth and housing development. Provincial audit reports and National Planning Commission reviews from 2020 to 2023 showed regulatory tolerance and inconsistent zoning and environmental regulations surrounding mining communities. In particular, local administrations lacked the capacity and political desire to implement land use management policies, leaving informal homes unchecked. Limpopo and North West provinces showed instances when local administrations warned or demolished illegal settlements but failed owing to political reaction, logistical issues, or community resistance. In several mining municipalities, spatial development frameworks (SDFs) were antiquated or non-existent, making land control measures ineffective. This allowed land settlement in floodplains, blasting radii, and ecologically sensitive places.

These empirical findings support scholarly worries regarding urban informality management regulatory ineffectiveness. Adams, Ghosh, and Runeson (2023) note that conflicting political and commercial interests hamper regulation attempts in Accra's informal settlements, as in South African mining zones. De Koker et al. (2020) show how informal settlement fire safety violations have caused

recurring disasters, highlighting systemic governance inadequacies. Without comprehensive land governance and tenure regularisation, planning laws will continue to be violated, especially in fast urbanising extractive industry zones, Odote and Olale (2022) argue. This study's findings and existing literature suggest that enforcement failures are ingrained in post-apartheid planning. These failings allow informal settlements to grow, indicating institutional collusion or negligence. Reform must entail training, capacity building, and political protection of municipal planning departments in addition to legislative reform.

5. Discussion

Despite its importance to South Africa's economy, mining expansion has led to the growth of informal settlements due to legislative inadequacies, fragmented governance, and poor urban integration methods. The study found disjunctures between mining activities and state housing delivery mechanisms, showing how uncoordinated planning between mining enterprises and local municipalities caused a service gap. Workers and nearby communities lived in unregulated spaces, creating structurally insecure and socioeconomically marginalised informal settlements. These findings supported de Koker et al. (2020), who observed that informal settlements near mining hubs often emerge without fundamental planning, resulting in fire dangers and infrastructural failures.

This study also showed how mining-related housing strategies, notably in coalfields and goldproducing regions, failed to become inclusive urban development frameworks. Post-apartheid policy did little to address spatial inequities in apartheid-era mining towns. Cloete and Marais (2021) critically evaluated post-apartheid housing schemes and showed how governmental control of worker accommodation promoted informal settlement expansion, especially when hostels were left unconverted and mine-owned property was kept from public use. This supported the study's conclusion that antiquated governance frameworks and intersectoral planning hinder housing delivery reform. In line with this study's need for adaptive, collaborative policymaking, Azadi et al. (2023) proposed “smart land governance” to combine mining, land use, and housing policies.

The second important result of the study was that government departments, mining firms, and community organisations had scattered institutional responsibilities. National legislation requires mining villages to improve socially and economically, but this study revealed little local coordination or budget alignment. Mining-affected informal settlement residents reported frequent “policy silence” from local authorities about cleanliness, lighting, and tenure security. This confirms Odote and Olale (2022), who found tenure uncertainty perpetuates vulnerabilities in Kenya's informal settlements' adaptive spatial planning failures. In this study, institutional incoherence echoes broader African urban policy concerns. Cobbinah and Finn (2023) claimed that governmental and private players' lack of a

shared urban transformation vision exacerbates informal urbanisation. In their Iranian informal settlement study, Khaleh et al. (2023) found that government without accountability leads to unconnected development interventions. In South Africa, the failure to operationalise collaborative frameworks has left mining towns in cyclical underdevelopment, marginalising informal housing residents. Thus, multilevel governance systems based on participatory planning and communitydriven resilience are needed.

The third finding was that urban land commercialisation and discriminatory design reinforced miningaffected informal settlements. The study revealed that policy papers, notably Integrated Development

Plans (IDPs), commonly labelled informal settlements “illegal” or “temporary.” Thus, infrastructure renovations, housing subsidies, and social services were often delayed or rejected. Residents experienced an overwhelming sense of spatial unfairness and socio-political neglect. In their extensive mapping of informal settlements, Dovey et al. (2023) argued that delegitimising self-organised places in urban frameworks makes them structurally disadvantaged and environmentally unstable.

This supported Mohanty (2020)'s claim that urban poor are systemically excluded from formal development. In Sacramento, Parker (2020) found that political branding of “tent cities” as informal zones undermined social involvement and public investment. This study confirmed these arguments in South Africa by showing how policy discourse vocabulary excludes informal groups from rightsbased development. Reframing policy language and design to affirm informal settlements as permanent urban landscape components requires targeted and rights-based approaches.

Mining-linked informal settlements' socio-environmental precarity was another key finding. Water contamination, dust pollution, and ground instability were found repeatedly. Residents near disused pits reported respiratory illnesses, low agricultural yields, and sinkhole dangers. The settlements' absence of emergency response mechanisms and environmental monitoring units exacerbated these environmental pressures. Adams et al. (2023) found climate vulnerability in Ghana's informal populations and linked environmental injustice and policy neglect.

The third topic is policy innovation and grassroots agency. The survey found several community-led governance initiatives. These included informal savings clubs sponsoring borehole installations, residents organising for title deeds, and civil society partners advocating for legislative change. Fransen et al. (2024) found adaptive governance by community-based organisations in Nairobi's informal slums during COVID-19. Mitlin (2023) showed how reform alliances and social movements facilitate inclusive urban policy realignment. These bottom-up strategies showed community

resilience, but the study found systemic support lacking. Policy frameworks continue to devalue local knowledge systems and do not mandate community participation in planning. Thus, community mobilisation works, but without enabling legislation and responding institutions, it is ineffective. To solve this, urban policy must rethink power relations and informal settlements as participatory governance and innovation engines.

6. Recommendations

6.1. Integrated Policy Framework for Inclusive Urban Planning

The research advised urgently creating an integrated urban planning framework to link mining development and human settlement planning. Lack of integration in present frameworks led to informal communities near mining zones. Adams et al. (2023) found that inadequate planning by extractive industries and urban development departments in Accra, Ghana, perpetuated spatial discrimination. Cloete and Marais (2021) suggested that in South Africa's post-apartheid coalfields, housing and mining policies were not synchronised, leading to informal communities without basic infrastructure. This supported the study's result that policy vacuums permitted mining companies to ignore their socio-spatial footprint. A national legislative directive requiring spatial development evaluations and social effect duties in mining licence applications would have fixed this. According to Fransen et al. (2024), adaptive governance based on community-based planning increased resilience and prevented socio-spatial fragmentation. Thus, spatial planning in mining regulatory tools would have prepared housing, basic services, and transportation infrastructure for population influxes near mining locations.

6.2. Formalisation and Upgrading of Existing Informal Settlements

Instead of mass evictions or relocations, the research recommended formalising and renovating informal settlements around mining regions. Self-organised informal settlements have sophisticated internal logics and urban design patterns that might be formalised, according to Dovey et al. (2023). Additional findings suggested that tenure regularisation and service provision, including water, power, and sanitation, should have been emphasised to stabilise these communities. Odote and Olale (2022) found that adaptive spatial planning and tenure regularisation in Kenya improved infrastructure and reduced marginalisation. Formalisation plans would have required an intergovernmental task force of municipal governments, mining enterprises, community representatives, and civil society organisations. This inclusive governance framework, according to Khaleh et al. (2023), helped informal settlements become resilient through locally driven and context-sensitive decision-making. Policy needed to change from reactive to preventative and exclusionary to participative.

6.3. Coalesce around the essence

The lack of a formal social compact among major stakeholders worsened policy incoherence and institutional fragmentation, according to studies. The report suggested a legally enforceable tripartite social compact between government, mining firms, and local people based on shared accountability. This compact would have defined housing, service, skills, and community health duties. According to Moretti et al. (2024), inclusive social pacts allowed urban climate adaption through shared commitments. Cobbinah and Finn (2023) also stressed that informal urbanisation in Africa requires 'just' urban reforms based on fairness, not infrastructure supply. Such compacts would have required local governments and mining enterprises to contribute to socio-economic upliftment as part of their licence to operate, preventing neglected mining slums.

6.4. Institutional Capacity Building and Monitoring Mechanisms

Institutional weakness, especially at the municipal level, hindered mining-induced urban expansion regulation. Municipalities lacked personnel and technological resources to implement land use rules or monitor home encroachments near mining zones, the study found. Akola et al. (2023) found that informal settlements in South African municipalities lacked technical capacity for disaster risk reduction planning. Thus, tailored capacity-building initiatives for urban planners, housing officers, and community development practitioners were suggested. These programmes should have taught GIS-based spatial mapping, participatory planning, and real-time settlement monitoring. A national urban observatory may have tracked population shifts and settlement expansion near mining sites. Bhanjee and Zhang (2021) showed that Dar es Salaam data-driven spatial vulnerability assessments led to evidence-based planning actions that reduced urban sprawl.

Conclusion

This study examined the complex relationship between mining development and informal settlements in South Africa through a policy lens. In-depth interviews, spatial analysis, and policy document studies were used to provide a multidimensional image of urban marginality in mining towns. This research showed that informal settlements were rooted in spatial planning, fragmented governance, and insufficient regulatory enforcement, not only population growth. Cobbinah and Finn (2023) have noted the systemic neglect of informal urbanisation processes in African cities, which typically evade institutional planning and infrastructure.

The key finding was that South Africa's policy framework lacked integrated institutional coordination to address extractive-induced urbanisation. Informal settlements grew in a governance vacuum caused by national, provincial, and local policy misalignments. Fransen et al. (2024) found that adaptable, multi-scalar governance structures—especially those involving local communities—boosted resilience in informal environments. Also reoccurring was the mining sector's lack of social and environmental responsibility. According to Cloete and Marais (2021) in their research of mine housing in the South African coalfields, mining enterprises were inconsistent in post-establishment community development despite their significant GDP contributions.

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