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Exploring the External Drivers of Systemic Change in Mining Companies: A Case Study of South Africa

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Abstract: The mining sector remains integral to South Africa's economic development; yet, it faces mounting external pressures from regulatory shifts, market volatility, technological disruptions, and escalating sustainability demands. These evolving dynamics compel mining companies to transition from reactive compliance to proactive systemic change. This study explored how external factors drive systemic change within South African mining companies. Anchored in an interpretivist paradigm, the research employed a qualitative approach and a generic design to examine the participants' perspectives. Data were gathered through semi-structured interviews with twelve purposefully selected participants, including senior executives, policy analysts, industry consultants, and regulatory officials. The data were analysed using thematic analysis to identify key external drivers of systemic change in the mining industry. The findings reveal that systemic change in mining companies is primarily driven by a range of external factors, including regulatory and policy frameworks, market and economic pressures, and technological disruptions. Other factors include stakeholder engagement and community activism, global sustainability trends, social and demographic shifts, strategic collaborations and partnerships, as well as investments in research and development. The study recommends strengthening governance compliance mechanisms, embedding environmental, social, and governance considerations and innovation into core strategies, institutionalising stakeholder engagement frameworks, and promoting inclusive leadership. It concludes that systemic change in the mining sector is no longer optional but essential for long-term resilience, social legitimacy, and competitiveness in a global green economy.

Keywords: Collaboration and partnerships, economic pressures, mining industry, stakeholder engagement, systemic change, technological disruptions.

1. Introduction

The mining sector remains a cornerstone of South Africa's economy, contributing significantly to employment, gross domestic product, and export revenues (Mvile & Bishoge, 2024; Signé & Johnson, 2021). However, the sector operates within an increasingly complex environment characterised by tightening environmental regulations, shifting investor expectations, heightened community activism, and rapid technological advancement. These external forces have intensified the pressure on mining companies to undergo systemic change, moving beyond mere compliance towards sustainability, innovation, and inclusive development (Severiano et al., 2024). Globally, the industry is being reshaped by megatrends such as climate change, decarbonisation policies, and Environmental, Social, and Governance (ESG) standards (Oliver-Yébenes, 2024). In South Africa, this transformation is further complicated by socio-economic challenges, including inequality, community unrest, and regulatory uncertainty (Mabotha & Ngcamu, 2024). These external drivers compel mining companies to re-evaluate their operating models, governance systems, and value-creation approaches to remain viable and socially relevant. Understanding how these external forces influence internal change mechanisms is critical for shaping responsive and resilient mining strategies in the South African context. In this study, systemic change is understood as a profound and multidimensional transformation that reconfigures the underlying structures, strategies, and

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cultural logics of an organisation, rather than as incremental or superficial adjustments. Drawing from organisational change theory (Burnes, 2020; Murphy, 2022), systemic change in the mining context refers to shifts that alter corporate governance systems, strategic orientations, operational processes, and stakeholder engagement frameworks to achieve long-term sustainability and adaptability. This conception distinguishes systemic change from incremental change by emphasising the interconnected and enduring nature of organisational reform across strategic, technological, and socio-environmental dimensions.

Despite the increasing recognition of the necessity for transformation within the mining sector, there remains a limited understanding of how external forces specifically influence systemic change within mining companies in South Africa. While these companies are under pressure to innovate and align with Environmental, Social, and Governance (ESG) norms, many struggle to transition from reactive compliance to proactive transformation (Clementino & Perkins, 2021; Passas, 2024). This disconnect suggests that external pressures—whether regulatory, socio-political, or market-driven—are not yet fully understood or effectively translated into strategic action. Without a clear understanding of these external drivers, mining companies risk falling behind in terms of global competitiveness, social acceptance, and environmental sustainability.

Current literature tends to focus on internal organisational change within mining companies or on global-level trends impacting the industry (Gagnon et al., 2024; Radebe & Chipangamate, 2024). However, few empirical studies have specifically explored how external drivers shape systemic change in the South African mining context. The majority of existing research in this field tends to adopt a single-driver perspective, primarily focusing on either ESG compliance (e.g., Clementino & Perkins, 2021) or technological innovation and digitalisation in mining (e.g., Bozkus, 2023; Storey, 2025). In contrast, this study adopts a multi-driver and holistic analytical lens, integrating diverse external factors such as regulatory dynamics, market forces, technological disruptions, and stakeholder pressures. This broader approach provides a more comprehensive understanding of how multiple, interacting drivers collectively shape systemic change within South African mining companies.

This research is both timely and significant. South Africa's mining sector is currently undergoing a critical transition as it seeks to align with global sustainability expectations while addressing domestic socio-economic challenges. Understanding how external drivers influence systemic change can inform policy development, guide corporate strategy, and support broader national goals related to economic transformation and social justice. Therefore, the aim of this study is to investigate how external factors drive systemic change within mining companies, with a specific focus on the South African context. And answered the question on *how external factors drive systemic change within mining companies in South Africa.*

2. Methodology

This study adopted an interpretivist research paradigm, which is well-suited to investigating the nuanced perspectives of individuals involved in or affected by systemic change in the mining sector. Interpretivism is grounded in the belief that reality is socially constructed and shaped by individual experiences, cultural backgrounds, and contextual dynamics (Junjie & Yingxin, 2022). The paradigm accommodates multiple, coexisting truths and promotes in-depth, context-sensitive inquiry, making it particularly appropriate for understanding the complex interplay of external drivers, such as policy, environmental pressures, and market shifts, in shaping systemic change. To operationalise this paradigm, the study employed a qualitative research approach, which emphasises exploration over quantification and is effective in examining the complexities of socially embedded phenomena (Creswell & Creswell, 2018). Qualitative research enables the collection of rich, descriptive data in naturalistic settings, fostering direct interaction with participants and prioritising their subjective interpretations. Rather than seeking statistical generalisation, this approach aimed to provide an in-

depth understanding of the lived experiences, strategies, and interpretations of professionals operating within the South African mining industry.

A generic qualitative research design was chosen to ensure the flexibility needed for exploratory inquiry while still maintaining methodological rigour (Merriam & Tisdell, 2016). Unlike more prescriptive qualitative traditions (e.g., phenomenology or ethnography), the generic approach allowed for open-ended investigation into how external drivers, such as environmental regulations, socio-political dynamics, technological advancements, and global market trends, inform the internal transformation of mining companies. This design was particularly useful in capturing diverse stakeholder views without the necessity to generate new theoretical frameworks.

The study employed purposive sampling, a non-probability technique that involves the deliberate selection of participants based on their relevance to the research objectives and their ability to provide rich, detailed insights (Creswell & Creswell, 2018). A total of 12 participants were purposefully selected to ensure diversity in role, expertise, and perspective, with each participant holding key positions within or being connected to the South African mining industry. The selection criteria included a minimum of five years of experience in the sector, direct involvement in organisational transformation, regulatory compliance, or strategic planning, demonstrated knowledge of external drivers such as policy shifts, sustainability demands, market volatility, or technological innovation, and a willingness to partake in in-depth, semi-structured interviews. The participant group comprised three senior executives (including sustainability officers, transformation managers, and strategic planners), three policy analysts or compliance officers, three industry consultants and governance experts, and three representatives from regulatory bodies or industry associations, such as the Department of Mineral Resources and Energy and the Minerals Council South Africa. This sampling strategy ensured the inclusion of information-rich cases capable of shedding light on how mining companies respond to external systemic pressures. Interviews were conducted until thematic saturation was achieved, indicating that no new themes or insights emerged from subsequent interviews. Saturation occurred after twelve interviews, confirming that the sample size was sufficient to capture the depth and diversity of perspectives required for this study.

Semi-structured interviews served as the primary method of data collection. This technique balances structure with flexibility by utilising guiding questions while allowing space for participants to elaborate on emerging themes (Creswell & Creswell, 2018). The open-ended nature of the interviews enabled participants to articulate their insights freely, while the semi-structured format ensured consistency across key thematic areas such as regulation, market forces, sustainability trends, and stakeholder engagement. The interviews ranged between 45 and 75 minutes in duration and were audio-recorded with participants' consent for transcription and analysis. All ethical procedures were strictly observed. Informed consent was obtained prior to participation, and the study received ethical clearance from the Johannesburg Business School Research Ethics Committee at the University of Johannesburg (Approval number: JBSREC2024103). Anonymity and confidentiality were maintained throughout the research process.

The study utilised thematic analysis, a method particularly appropriate for the systematic coding and interpretation of textual data to reveal recurring patterns and underlying meanings (Ahmed et al., 2025). Both manifest content (explicit statements) and latent content (implicit meanings) were examined to develop a comprehensive understanding of participants' perspectives. The analytical process comprised several iterative steps, commencing with the transcription and repeated reading of interview data to ensure familiarity with the material. This was succeeded by open coding, during which meaningful segments of text were labelled, followed by axial coding to identify relationships and connections among the codes. Emerging themes were subsequently categorised and interpreted in relation to participants' lived experiences. This systematic approach facilitated the identification of both shared and divergent viewpoints regarding how external forces, such as policy shifts, market

pressures, and technological changes, influence internal transformation processes within South African mining companies, resulting in a credible and nuanced account of systemic change.

3. Presentation of Results and Discussion of Findings

The data reveal that, within the South African context, systemic change in mining companies is primarily driven by a range of external factors, including regulatory and policy frameworks, market and economic pressures, technological disruptions, stakeholder engagement and community activism, global sustainability trends, social and demographic shifts, strategic collaborations and partnerships, and investments in research and development.

3.1 Regulatory and policy frameworks

Participants highlighted that regulatory and policy frameworks are major external factors that play a crucial role in shaping systemic change in the mining sector. Stricter environmental, labour, and safety regulations compel companies to adopt innovative and sustainable practices, ultimately driving systemic change. One of the policy analysts (PA) emphasised how regulatory requirements serve as a catalyst for transformation in the industry:

> *Stricter environmental, labour, and safety regulations compel mining companies to innovate and adopt sustainable practices, serving as a catalyst for change in the industry* (PA2).

A senior executive (SE) highlighted the role of government-imposed carbon pricing mechanisms in encouraging systemic change in mining industries:

> *Government-imposed carbon pricing mechanisms incentivise the adoption of green energy solutions, driving improvements and aligning mining operations with global sustainability goals* (SE1).

One of the representatives from regulatory bodies (RB) pointed out the overarching impact of regulatory frameworks on systemic change in the mining sector:

> *Regulatory frameworks play a critical role in shaping the mining sector by mandating compliance with policies that prioritise safety, environmental stewardship, and equitable labour practices, fostering transformative change* (RB2).

An industry expert (IE) indicated the challenges posed by evolving regulations and their effect on mining companies' reform:

> *The evolving regulatory landscape in South Africa challenges mining companies to balance compliance with operational efficiency, driving change through innovation and sustainable development* (IE3).

Additionally, another representative from regulatory bodies shared a specific example of how regulatory obligations influenced mining companies' decisions regarding land use:

> *The mining company wanted to mine the land we were living on, and they were legally required to make these changes as part of their agreements* (RB1).

Regulatory and policy frameworks are pivotal external drivers of systemic change in the mining industry, particularly in contexts where environmental sustainability, labour rights, and safety are increasingly prioritised. As echoed by participants in the study, stricter regulatory measures compel mining companies to adapt by integrating sustainable practices and green technologies into their operations. This aligns with the view of Adomako and Nguyen (2023), who argue that regulatory pressure can drive innovation and accountability in the extractive industries, pushing firms toward more socially and environmentally responsible conduct. Government interventions, such as carbon pricing mechanisms, also serve as economic levers, incentivising companies to transition to cleaner energy sources, thereby aligning with global imperatives such as the Sustainable Development Goals (SDGs) (Qu et al., 2023). These external regulatory pressures not only shape operational decisions but also redefine the long-term strategic orientation of mining companies, fostering a culture of compliance and transformation. However, the evolving nature of these regulatory demands also presents challenges that catalyse reform through necessity. As participants noted, compliance with

new or shifting policies, especially in dynamic regulatory environments like South Africa, forces mining firms to balance operational efficiency with legal obligations. This tension, while challenging, has the potential to stimulate systemic innovation, as highlighted by Aysan et al. (2023), who stated that reform in resource governance often emerges from regulatory upheaval. For example, legal obligations around land use and community displacement can influence corporate decision-making, pushing firms to adopt more inclusive and consultative practices. These frameworks thus act as a double-edged sword, posing compliance hurdles while simultaneously fostering transparency, sustainability, and inclusive growth in the mining sector.

3.2 Market and economic pressures

Participants opined that market and economic pressures are external driving forces that significantly influence systemic change in mining companies. Fluctuating commodity prices, increased competition, and evolving investor expectations compel these companies to adapt by embracing innovation, sustainability, and ethical governance. An industry expert emphasised the impact of market volatility and competition, stating that:

> *Fluctuating commodity prices and increased competition drive mining companies to innovate and adopt efficient, sustainable practices to remain competitive in a dynamic market environment* (IE1).

A senior executive highlighted the role of investors' focus on ESG factors, explaining,

> *Investors' focus on Environmental, Social, and Governance metrics compels mining companies to reevaluate their strategies, resulting in change that aligns profitability with sustainability and ethical governance* (SE3).

A compliance officer (CO) stated the influence of economic instability and global demand fluctuations, noting:

> *Economic pressures, such as volatile market conditions and shifting global demand, push mining companies to adapt through diversification, technological advancements, and sustainable resource management* (CO1).

A participant from the regulatory body reinforced the transformative role of ESG considerations, stating,

> *The growing emphasis on Environmental, Social, and Governance by investors and stakeholders serves as a transformative force, urging South African mining companies to embrace change that ensures long-term resilience and social accountability* (RB3).

Market and economic pressures have emerged as pivotal external drivers of systemic change within the mining sector, particularly in response to global shifts in commodity pricing, investor demands, and competitive dynamics. The volatility of commodity markets, influenced by geopolitical instability, global supply-demand imbalances, and inflationary trends, compels mining companies to adopt agile strategies to maintain profitability and relevance (Radebe & Chipangamate, 2024). As indicated by participants in the study, fluctuating commodity prices and heightened competition serve as catalysts for innovation and efficiency. This environment necessitates that companies rethink their operational models, incorporate cost-saving technologies, and transition toward more sustainable practices to preserve their market position (Onifade, 2024). Furthermore, the increasing prioritisation of ESG metrics by investors and stakeholders exerts considerable pressure on mining firms to align their strategies with broader societal and environmental expectations. As noted by several participants, this shift signifies a departure from traditional profit-centric approaches towards a more holistic model that integrates ethical governance and long-term sustainability. Scholars such as Martiny et al. (2024) assert that investor activism concerning ESG criteria has led to enhanced corporate accountability and transparency within the mining industry. In South Africa, where mining holds a significant socio-economic role, alignment with ESG expectations is not merely a compliance issue but a strategic imperative for resilience and social legitimacy. Consequently, market volatility, economic instability, and stakeholder pressure collectively function as external imperatives prompting mining companies to initiate and institutionalise systemic change.

3.3 Technological disruptions

Participants indicated that technological advancements are among the external factors reshaping the mining industry, compelling companies to adopt new methods and strategies to remain competitive and sustainable. One industry expert emphasised how green technologies are influencing the sector, pushing companies towards more sustainable resource extraction methods:

> *Advances in green technologies, such as renewable energy and electric vehicles, are reshaping the mining landscape, compelling companies to adopt cleaner and more sustainable resource extraction methods* (IE2).

Similarly, a senior executive highlighted the strategic importance of electrifying mining equipment, noting its role in reducing environmental impact and improving efficiency:

> *The electrification of mining equipment is not just a technological innovation but a strategic imperative, driving change by reducing carbon emissions and enhancing operational efficiency* (SE2).

Expanding on this, a policy analyst further discussed the impact of renewable energy and battery storage technologies, stressing the need for mining companies to reconsider their energy consumption practices:

> *Technological disruptions in renewable energy and battery storage systems push mining companies to rethink their energy consumption practices, encouraging a transition towards sustainable operations* (PA1).

Reiterating the importance of aligning with global sustainability trends, a participant from an industry association (IA) pointed out that embracing emerging green technologies is essential for maintaining competitiveness and driving industry-wide change:

> *Emerging green technologies challenge mining companies to align their strategies with global sustainability trends, ensuring they remain competitive while driving change in the industry* (IA1).

Technological disruptions are increasingly recognised as a significant external force driving systemic change in the mining industry. As highlighted by the participants, advancements in green technologies such as renewable energy, electric vehicles, and battery storage systems are reshaping the operational and strategic priorities of mining companies. These innovations are not merely enhancements to existing systems but are transformative forces compelling firms to adopt cleaner and more sustainable resource extraction methods. The integration of renewable energy and the electrification of mining equipment, as discussed by senior executives, reflect a broader shift towards environmentally conscious operations, aligning with global climate goals and reducing carbon emissions (Mehmood et al., 2024). Such technological transitions are becoming strategic imperatives rather than optional improvements, signalling a redefinition of competitiveness within the sector. Moreover, the emphasis on sustainability embedded in these technological advancements is prompting mining firms to reevaluate their energy consumption patterns and long-term viability. As policy analysts and industry associations note, embracing these disruptions is critical to maintaining relevance and achieving compliance with increasingly stringent environmental regulations and ESG expectations. According to Storey (2025), technologies such as automation, digitisation, and clean energy integration are not only enhancing operational efficiency but also altering value chains and workforce requirements across the mining sector. This technological evolution necessitates systemic organisational change, affecting governance, investment priorities, and stakeholder engagement, thereby reinforcing the notion that technological disruptions are central to the transformation and future-proofing of mining companies (Bozkus, 2023).

3.4 Stakeholder engagement and community pressure

Participants stated that stakeholder engagement and pressure from host communities, advocacy groups, and global organisations play a significant role in driving systemic change in the mining industry. One senior executive emphasised how local communities and advocacy groups are

increasingly demanding ethical business practices, compelling mining companies to prioritise transparency and shared value creation:

> *The demand for inclusive and ethical practices by host communities and advocacy groups compels mining companies to adopt reforms that prioritise transparency and shared value creation* (SE3).

A compliance officer (CO) highlighted the necessity of integrating Free, Prior, and Informed Consent into project planning, stressing that it is both an ethical requirement and a trust-building mechanism. They noted:

> *Incorporating free, prior, and informed consent into project planning is not just an ethical obligation but a critical step toward building trust and driving change in the mining sector* (CO1).

An industry expert pointed out that engagement with various stakeholders, including NGOs and international advocacy groups, encourages mining companies to adopt sustainable and socially responsible systemic change:

> *Active engagement with stakeholders, including NGOs and global advocacy groups, pushes mining companies to integrate more sustainable and socially responsible practices into their operations* (IE1).

A participant from the regulatory body further underscored the role of community pressure in shaping systemic change in mining, particularly in advocating for fair treatment, environmental protection, and social investment:

> *Community pressure for fair treatment, environmental protection, and social investment is a powerful force driving change in the South African mining industry* (RB3).

Stakeholder engagement and community pressure have emerged as significant catalysts for systemic change in the mining industry, particularly in contexts such as South Africa, where historical inequalities and environmental concerns are deeply entrenched. The voices of host communities, NGOs, and advocacy groups increasingly influence corporate decisions, prompting mining companies to embed ethical standards, transparency, and social accountability into their operations. This aligns with the findings of Lesser et al. (2021), who argue that the legitimacy of mining operations hinges on maintaining a social licence to operate, which is granted through continuous, meaningful engagement with affected communities. The incorporation of Free, Prior, and Informed Consent (FPIC), as mentioned by a compliance officer in the data, reflects a global shift towards respecting indigenous and community rights, a practice supported by scholars such as Klein et al. (2023), who emphasise that FPIC enhances trust, reduces conflict, and drives long-term sustainability in extractive industries. Furthermore, the demand for shared value and social investment highlights a growing recognition that mining companies must go beyond compliance to actively contribute to the development of the communities in which they operate. Community activism, when combined with advocacy from transnational organisations, has been instrumental in pushing for corporate social responsibility (CSR) practices that address environmental degradation and social inequities (Bag et al., 2024). As such, stakeholder engagement is not merely a procedural formality but a strategic imperative that fosters systemic change. The insights from participants reinforce the idea that community pressure is not antagonistic but rather constructive, serving as a powerful force that holds mining companies accountable and promotes inclusive development. This shift aligns with the broader global discourse on responsible mining and sustainability, where stakeholder influence is considered essential to reconfiguring the power dynamics within the sector (Chipangamate et al., 2024).

3.5 Global sustainability trends

Participants expressed that global sustainability trends play a crucial role as an external factor in shaping the systemic change of mining companies. With increasing international pressure to adopt sustainable practices, mining companies are expected to align with global frameworks and reporting standards to remain competitive, reduce environmental harm, and ensure social responsibility. An

industry expert emphasised the importance of international agreements in shaping corporate sustainability practices:

> *Global sustainability frameworks, such as the Paris Agreement and the UN Sustainable Development Goals, serve as benchmarks that guide mining companies toward reducing their carbon footprints and ensuring social equity* (IE3).

A policy analyst highlighted the impact of sustainability reporting standards in fostering systemic change:

> *The Global Reporting Initiative pushes mining companies to embrace transparency and accountability, driving change through measurable environmental and social impact reporting* (PA3).

A senior executive pointed out the necessity for mining companies to align their transformation with international sustainability commitments:

> *International commitments to sustainability, including biodiversity preservation and carbon neutrality, compel South African mining companies to align their strategies with global best practices, promoting long-term transformation* (SE1).

A participant from a regulatory body highlighted the competitive advantage of adopting global sustainability standards during systemic change:

> *Adopting global sustainability standards positions mining companies to remain competitive in international markets while driving change through ethical and environmentally conscious practices* (RB2).

Global sustainability trends have emerged as a significant external force catalysing systemic change within the mining sector, particularly in response to mounting global concerns around climate change, social justice, and environmental degradation. As articulated by participants, mining companies are increasingly compelled to align with international sustainability frameworks such as the Paris Agreement and the UN Sustainable Development Goals. These frameworks serve not merely as aspirational guides but as concrete benchmarks for corporate transformation, influencing companies to reduce carbon emissions, enhance biodiversity preservation, and integrate socially responsible practices into their operational models (Zheng & Jin, 2023). The Paris Agreement, for instance, calls for substantial reductions in greenhouse gas emissions, pushing mining firms to adopt greener technologies and low-carbon strategies to remain compliant and globally competitive (Aggarwal, 2024). This shift reflects what Lahti (2024) describes as deep systemic change, wherein sustainability becomes embedded in the core mission and culture of organisations, rather than being viewed as a peripheral compliance issue. Furthermore, global reporting standards, such as the Global Reporting Initiative, play a pivotal role in driving transparency and accountability in the sector. As one participant noted, these reporting mechanisms provide measurable indicators of environmental and social performance, thereby institutionalising sustainability within corporate governance structures (Marrucci et al., 2024). This aligns with research by Sulemana et al. (2025), who argue that standardised sustainability disclosures enhance stakeholder trust and contribute to long-term value creation. For mining companies operating in South Africa, adopting these global standards is not only a strategic necessity to access international markets but also a means of responding to heightened stakeholder expectations for ethical and environmentally conscious practices (Cawood et al., 2024). The convergence of these global trends with local regulatory and social contexts creates a compelling impetus for systemic change, restructuring how mining firms engage with communities, manage natural resources, and report on their socio-environmental impacts.

3.6 Social and demographic changes

Social and demographic shifts emerged as one of the external drivers of systemic change in mining companies. These changes influence workplace policies, diversity initiatives, and leadership structures, shaping the sector's ability to remain competitive and socially responsible. Participants highlighted the significance of these shifts in fostering a more inclusive and forward-thinking mining

industry. A policy analyst emphasised the impact of workforce demographics and societal expectations on company policies:

> *Shifting workforce demographics and societal expectations are driving mining companies to adopt inclusive workplace policies that reflect the evolving values of modern society* (PA2).

Addressing the role of gender diversity, a senior executive pointed out how demographic changes are transforming traditionally male-dominated industries:

> *The push for greater gender diversity in the traditionally male-dominated mining sector is a testament to how social and demographic changes inspire transformation and more equitable opportunities* (SE2).

A participant from the regulatory body highlighted the importance of aligning with contemporary societal norms, particularly in leadership and corporate ethics:

> *Adapting to social changes, such as the demand for diverse leadership and ethical corporate behaviour, is essential for mining companies seeking to align with contemporary societal norms* (RB1).

Focusing on the benefits of demographic inclusion, an industry expert stated how embracing diversity leads to a more innovative workforce:

> *Incorporating policies that embrace demographic shifts, such as increased representation of women and youth, promotes change by creating a more dynamic and innovative workforce* (IE2).

Social and demographic changes are increasingly recognised as key external forces catalysing systemic change within the mining sector. These shifts reshape organisational norms, compelling mining companies to revise their policies and leadership structures to reflect a more inclusive and responsive corporate identity. As workforce demographics evolve, particularly with the rise of younger, more diverse employees and changing societal values, mining companies are under pressure to align with expectations regarding equity, diversity, and ethical governance. Research by Maybee et al. (2023) suggests that modern mining firms must adapt not only to economic and environmental shifts but also to the social fabric in which they operate. The emphasis on gender diversity and inclusive leadership reflects broader societal demands for equality and corporate social responsibility, prompting structural changes that challenge traditional hierarchies and promote participatory cultures (Qian & Deng, 2025). Furthermore, social and demographic inclusion is proving to be a catalyst for innovation and resilience in mining operations. The voices of the participants in the data presentation highlight how embracing diversity, particularly through the increased participation of women and youth, translates into tangible organisational benefits. As highlighted by Hundschell et al. (2022), diverse teams tend to produce more creative solutions and are better positioned to respond to complex challenges. This is especially pertinent in an industry traditionally dominated by homogeneity and hierarchical decision-making. As such, demographic shifts are not merely challenges to be managed but represent strategic opportunities that mining companies can harness to drive competitiveness and sustainability. Aligning with contemporary societal norms through inclusive leadership, ethical behaviour, and policy reform ensures long-term social licence to operate and strengthens the sector's legitimacy in the eyes of both internal stakeholders and the broader public.

3.7 Collaboration and partnerships

Collaboration and partnerships emerged as one of the pivotal external factors in facilitating systemic change within mining companies. Engaging in strategic collaborations with various stakeholders, including technology providers, academic institutions, local governments, and global organisations, enables mining companies to remain competitive, implement sustainable solutions, and adopt innovative practices. One industry expert emphasised the significance of partnerships with technology providers and academic institutions:

> *Strategic partnerships with technology providers and academic institutions foster innovation and knowledge sharing, enabling mining companies to drive change and stay competitive in a rapidly evolving industry* (IE2).

A senior executive highlighted the role of collaborations with local governments and global organisations in unlocking sustainable opportunities, particularly for green initiatives:

> *Collaborations with local governments and global organisations unlock opportunities to develop sustainable solutions, such as green hydrogen initiatives, that reshape the mining sector* (SE1).

A participant from a regulatory body stated the impact of joint ventures in fostering change by combining expertise and resources, allowing for the adoption of advanced technologies:

> *Joint ventures across sectors catalyse change by pooling expertise and resources, allowing mining companies to adopt advanced technologies and sustainable practices* (RB3).

One of the policy analysts reflected on the overarching power of collaboration in bridging gaps in knowledge and innovation, which in turn facilitates long-term transformation:

> *The power of collaboration lies in its ability to bridge gaps in knowledge and innovation, enabling South African mining companies to implement forward-thinking strategies and achieve long-term transformation* (PA1).

Collaboration and partnerships play a transformative role as external drivers of systemic change in the mining sector, particularly within the South African context. As highlighted by industry experts, strategic partnerships with technology providers and academic institutions foster environments conducive to innovation and knowledge exchange, which are essential for navigating the rapidly evolving landscape of the mining industry. Such collaborations facilitate the integration of cutting-edge technologies and data-driven decision-making, enhancing operational efficiency and sustainability. According to Mutambik (2024), these alliances enable firms to leverage diverse capabilities, accelerate innovation, and maintain competitiveness in the face of global disruptions. Specifically, collaborations with academic institutions offer access to research and skilled human capital, contributing to the mining sector's long-term transformation. Moreover, multi-sectoral partnerships, including those with local governments, global organisations, and regulatory bodies, are instrumental in advancing sustainable mining practices. These partnerships unlock critical opportunities for environmental innovation, such as the development of green hydrogen and renewable energy initiatives, thereby aligning the mining industry with global climate goals. Joint ventures also provide platforms to share risks and resources, promoting the adoption of sustainable technologies that may otherwise be economically inaccessible (Sipola et al., 2023). As echoed by a policy analyst, collaboration bridges knowledge gaps and catalyses systemic reform by aligning various actors toward shared objectives. In this light, partnerships are not merely supportive tools but strategic imperatives that underpin adaptive capacity, regulatory compliance, and inclusive innovation in mining (Firoozi et al., 2024). These collaborative frameworks are therefore essential for driving both immediate operational improvements and long-term systemic change.

3.8 Research and development

As part of the external factors, research and development play a pivotal role in driving systemic change within mining companies, particularly in addressing environmental challenges and fostering sustainable practices. Through innovation and the application of cutting-edge technologies, mining companies can enhance their operational efficiency and environmental stewardship. A senior executive highlights the importance of research and development in creating solutions that not only improve operational practices but also promote environmental sustainability in the mining sector:

> *Investing in research and development empowers mining companies to pioneer environmentally friendly technologies, driving change while addressing critical challenges such as waste management and water conservation* (SE2).

An industry expert emphasises the role of research and development in introducing innovative methods that contribute to reducing the environmental impact of mining systemic change:

> *Innovative research into reducing waste and optimising water usage reflects a commitment to sustainability and transformation in the mining industry* (IE1).

Another senior executive underscores the critical role of research and development in striking a balance between increasing mining efficiency and ensuring environmental responsibility during systemic change:

> *Research and development serve as the cornerstone for change by enabling the creation of cutting-edge solutions that balance operational efficiency with environmental stewardship* (SE3).

A policy analyst stresses that research and development is essential not only for domestic sustainability but also for positioning mining companies as leaders in a global market that is becoming more focused on environmental issues:

> *By prioritising research and development, South African mining companies can lead the way in developing sustainable processes, ensuring resilience and adaptability in an increasingly eco-conscious global market* (PA3).

Research and development have emerged as crucial external drivers of systemic change within the mining industry, particularly regarding environmental sustainability and technological transformation. Research and development facilitate innovation, allowing companies to design and implement environmentally responsible practices that reduce ecological harm while maintaining productivity. As highlighted by senior executives in the mining sector, investment in research and development enables companies to address pressing issues such as waste reduction, water conservation, and energy efficiency, thereby contributing to broader systemic change. These innovations are not merely operational improvements; they represent a shift in how mining companies perceive and interact with the environment, aligning their strategies with SDGs and national policy imperatives (Frederiksen & Banks, 2023). Moreover, research and development support the mining sector's competitiveness in a global market increasingly defined by environmental accountability and ethical resource extraction. According to the cited policy analyst, prioritising research and development allows South African mining companies to position themselves as industry leaders in sustainable mining practices, thereby attracting investment and complying with evolving international standards. This is consistent with literature emphasising the role of innovation in achieving both economic and ecological resilience in extractive industries (Li et al., 2023). As such, research and development is not just a tool for operational refinement but a strategic imperative that drives systemic change through the integration of sustainable values, cutting-edge technologies, and adaptive business models in mining.

3.9 Interactions, conflicts, and mechanisms of systemic change

The findings reveal that the eight identified external drivers—regulatory frameworks, market pressures, technological disruptions, stakeholder engagement, global sustainability trends, social and demographic changes, collaborations, and research and development—do not operate in isolation. Instead, they form an interconnected ecosystem that collectively shapes the trajectory of systemic change in South Africa's mining sector. Regulatory frameworks often act as the foundation upon which other drivers build momentum. For example, compliance with stricter environmental policies (see Section 3.1) is reinforced by global sustainability imperatives (see Section 3.5), while stakeholder pressure (see Section 3.4) amplifies the urgency of adhering to these regulatory and ethical standards. Similarly, global sustainability trends generate new market expectations (see Section 3.2), compelling companies to pursue technological innovations (see Section 3.3) that enhance competitiveness and environmental performance.

However, these drivers also generate conflicting pressures. The demand for short-term profitability (market pressures, see Section 3.2) may clash with the long-term investments required for technological innovation and research and development (see Sections 3.3 and 3.8). This tension often manifests in boardroom deliberations, where financial performance targets compete with

sustainability and innovation goals. Likewise, while community activism (see Section 3.4) promotes social justice, it can temporarily disrupt production targets, creating operational dilemmas for managers. These conflicts highlight the complex balancing act that mining companies must perform between economic viability, social legitimacy, and environmental stewardship.

Understanding how external drivers translate into internal change mechanisms is central to explaining systemic change within mining companies. The data reveal three interrelated mechanisms through which this process unfolds. First, strategic realignment occurs as external pressures reshape board-level priorities, prompting the development of new corporate strategies that embed sustainability, innovation, and ethical governance at the core of business operations. Second, institutional adaptation takes place when companies internalise these external demands by establishing compliance units, ESG committees, and innovation taskforces that formalise and sustain change within governance structures. Finally, cultural transformation emerges through continuous stakeholder engagement and exposure to global norms, which gradually influence organisational culture, fostering a shared sense of accountability and adaptive learning. Thus, these mechanisms demonstrate how external macro-level forces are absorbed and operationalised within mining companies, resulting in enduring shifts in governance, operations, and corporate values.

4. Conclusions and Recommendations

This study demonstrates that systemic change in South Africa's mining sector is evolving from a predominantly reactive process, initially driven by coercive pressures such as regulatory compliance and policy enforcement, towards a more proactive and strategic repositioning shaped by mimetic and normative isomorphic forces. Coercive pressures, emanating from government regulations and international agreements, set the foundation for compliance-based transformation. However, mimetic pressures, such as emulating global sustainability leaders and adopting ESG-driven innovations, are increasingly guiding strategic adaptation across the sector. Normative pressures, reinforced through professional standards, stakeholder expectations, and sustainability reporting frameworks, further institutionalise ethical governance and environmental accountability. Thus, these forces suggest that systemic change in the mining industry is not a singular or linear response to regulation but an integrated, multi-dimensional transformation process aimed at embedding sustainability, legitimacy, and competitiveness within corporate strategy. This synthesis underscores that systemic change in South African mining is both reactive and proactive: reactive in addressing regulatory imperatives, yet proactive in leveraging global trends and professional norms to secure long-term resilience and legitimacy. The study presents the following recommendations:

Enhance governance and policy compliance: Mining companies should proactively strengthen their internal governance structures by developing specialised compliance teams tasked with continuously monitoring and interpreting regulatory changes in environmental, labour, safety, and land-use policies. These teams, typically led by senior compliance officers or corporate governance managers, must work closely with legal experts and operational units to embed emerging regulations, such as carbon pricing mechanisms and new safety protocols, into strategic business plans. By anticipating policy shifts rather than reacting to them, companies can reduce operational risks, avoid penalties, and position themselves as industry leaders in regulatory adherence. This forward-looking governance approach is critical for systemic change, as it ensures that mining operations remain sustainable and legally compliant amidst a rapidly changing regulatory landscape, ultimately safeguarding the company's licence to operate and long-term viability.

Integrate Environmental, Social, and Governance (ESG) Factors and Innovation into Core Strategy: To effectively respond to growing market and investor demands, mining firms must fully integrate ESG metrics into their core business strategies. This integration entails formalising ESG roles within executive leadership teams and embedding transparent reporting systems that align with international frameworks such as the Sustainable Development Goals (SDGs) and the Global

Reporting Initiative (GRI) standards. The implementation of this recommendation necessitates cross-functional collaboration among sustainability officers, finance, and operations, coupled with substantial investment in research and development. Collaborating with universities, technology providers, and research institutions can accelerate innovation in green technologies, including the adoption of renewable energy, electrified equipment, and efficient resource management. By embedding ESG and innovation at the strategic level, mining companies can enhance their environmental stewardship and operational efficiency, while also bolstering investor confidence, meeting global sustainability expectations, and maintaining a competitive advantage in an evolving economic landscape.

Strengthen Stakeholder Engagement and Social Responsibility: Mining companies must institutionalise robust stakeholder engagement frameworks that prioritise Free, Prior, and Informed Consent to facilitate meaningful dialogue and partnerships with local communities, non-governmental organisations (NGOs), and advocacy groups. Implementing this recommendation involves establishing dedicated community relations teams tasked with ensuring transparent communication, regular consultations, and effective grievance mechanisms. Furthermore, corporate social responsibility (CSR) initiatives should be strategically aligned with local development needs, such as education, healthcare, infrastructure, and skills training, through partnerships with community leaders and government agencies. This strategic alignment transforms CSR from isolated philanthropic activities into impactful development programmes that build local resilience and create shared value. The significance of this recommendation lies in its potential to enhance the social licence to operate, minimise conflicts, and embed mining companies as responsible stakeholders within the socio-economic fabric of their host regions, thereby facilitating systemic change grounded in social sustainability.

Promote diversity, collaboration, and global alignment: Mining companies ought to actively promote diversity and inclusive leadership by implementing policies that reflect demographic realities and contemporary social expectations, including gender equity, youth inclusion, and ethical governance. Human resources departments, in conjunction with executive leadership, must design recruitment, retention, and development programmes that foster an inclusive corporate culture and ethical leadership models. Concurrently, mining firms must establish strategic cross-sector partnerships with local governments, international organisations, and private sector actors to leverage resources, share knowledge, and co-develop innovative solutions, particularly in relation to green and circular economy initiatives. Aligning corporate operations with global sustainability frameworks such as the Paris Agreement is essential to ensure compliance with international norms, enhance competitiveness, and facilitate access to export markets that increasingly demand sustainable practices. These combined efforts not only diversify leadership and workforce composition but also embed systemic change through collaborative innovation and global best practices, thereby driving the mining sector's transition towards a more sustainable and socially responsible future.

5. Declarations

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