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Understanding South Africa's mining slowdown

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Executive Director

Understanding South Africa's mining slowdown

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Abstract

South Africa's mining sector presents a significant economic paradox: despite possessing a mineral endowment of global significance—particularly in platinum group metals (PGMs), manganese, and chromium—the industry has experienced a profound structural decline since the 1970s. This paper investigates the binding constraints that have prevented the sector from capitalising on global commodity booms and the green energy transition. Applying the Growth Diagnostics framework developed by Hausmann, Rodrik, and Velasco (2005), the study argues that the sector's decline is primarily endogenous, driven by human-made constraints rather than geological exhaustion.

The analysis identifies critical bottlenecks across multiple domains. For large-scale "majors," returns on economic activity are stifled by low social returns from collapsing network infrastructure—specifically electricity and rail—and low appropriability resulting from policy uncertainty, bureaucratic backlogs, and systemic criminality. Conversely, the junior mining and exploration sector is primarily constrained by the high cost of finance which is exacerbated by a one-size-fits-all regulatory burden that consumes 30% to 40% of operational budgets.

To transition the sector from a sunset to a sunrise industry, the paper proposes a differentiated regulatory approach. Key recommendations include the withdrawal and review of the draft 2025 Mineral Resources Development Amendment Bill to better accommodate junior miners, the implementation of a rapid backlog eradication program for licensing, and the introduction of tax incentives such as the "flow-through share" model used in Australia and Canada. Furthermore, the study calls for dedicated mining police task forces and expanding private sector concessions in rail and ports to unlock dormant export revenue and drive national growth.

Keywords: Mining sector, South Africa, Growth Diagnostics, Binding Constraints, Mineral Policy, Exploration, Junior Mining, Economic Development, South African Economy

JEL classification: L71, L72, O43, Q38

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EXECUTIVE SUMMARY

The economic history of South Africa is intimately bound to the extraction of its mineral wealth. For over a century, the mining sector served as the driver of the national economy, fuelling industrialisation, urbanisation, and capital accumulation. Yet, as we enter the mid-2020s, the sector represents an economic paradox. South Africa sits on a mineral endowment of global significance - particularly in platinum group metals (PGMs), manganese, and chromium - commodities that are critical to the global energy transition. Despite this geological lottery, the sector faces various constraints that have prevented it from taking full advantage of successive commodity booms. Once the primary engine of the economy, the sector's economic contribution has steadily waned, allowing the notion to take hold that South African mining is a sunset sector. However, we argue that by lifting these binding constrains, it can be a sunrise sector.

This paper suggests that the South African mining sector is currently trapped in a low-level equilibrium where policy uncertainty, bureaucratic delays, infrastructure failures, underdeveloped venture capital exploration, and crime and illicit activities act as high "taxes" on investment.

We argue that most of the sector's decline is endogenous, driven by human-made constraints rather than geological exhaustion.

To assist in conceptualising these binding constraints and to form a framework, this paper use concepts from the Growth Diagnostics framework developed by Hausmann, Rodrik, and Velasco (2005). It should be noted that this paper does not perform a full quantitative diagnostic based on the framework's methodology. Rather, the framework is used to conceptually identify specific "binding constraints" with the highest costs.

Institutional and Policy Backdrop

The South African mining sector is governed by the Mineral and Petroleum Resources Development Act (MPRDA) 28 of 2002, which marked a seismic shift from private mineral rights ownership to state custodianship. The MPRDA framework fundamentally changed the ownership model and operating environment of the mining sector, giving the state a mandate to manage mineral resources. By transforming mineral rights from immovable property into state-granted permits, the MPRDA fundamentally reoriented the sector's operational and legal foundations.

The regulatory environment is currently in a state of flux. While the Mining Charter has historically set transformation targets, its status as a non-binding policy instrument, confirmed by a 2021 High Court ruling, has led to the introduction of the Draft Mineral Resources Development Amendment Bill of 2025. This Bill seeks to formalise Black Economic Empowerment (BEE) requirements as mandatory legislative conditions for mining rights. Simultaneously, the failed SAMRAD administrative system is slowly being replaced with a modern, transparent mining cadastre.

Historical Context

The long-term performance of the South African mining sector is defined by a significant structural decline that began in the 1970s. This era was characterised by a two-speed phenomenon whereby a collapsing gold sector, once the backbone of the economy, dragged down aggregate production volumes.

The most profound evidence of structural failure occurred during the global "Missed Super-Cycle" (2001–2008). While peer resource-rich nations like Australia saw mining investment and GDP surge due to Chinese industrialisation, South Africa's mining contribution actually shrank by 1%. Research indicates that this divergence was largely driven by domestic policy transitions rather than geology. The promulgation of the

MPRDA in 2004 introduced significant market shocks regarding state custodianship and shifting empowerment targets.

The trajectory of investor confidence, as tracked by the Fraser Institute, reveals a steady descent. South Africa has transitioned from a premier investment destination in the early 2000s to a bottom-tier jurisdiction by 2024. This decline was accelerated by the policy shock era (2004–2010), followed by a crisis of confidence era (2011–2017) marked by labour unrest and state-led corruption. In the most recent era (2018–2024), these systemic issues have been compounded by a severe infrastructure and security crisis—specifically in rail, ports, and electricity—alongside the rise of so-called "mining mafias".

Sector Performance

Despite a long-term decline in real terms, the South African mining sector remains a cornerstone of the national economy. In 2024, the industry directly contributed R442 billion, representing 6% of nominal GDP. Beyond its direct output, the sector functions as a vital economic engine through significant multiplier effects; the Minerals Council estimates an employment multiplier of ten, meaning every direct mining job supports ten additional opportunities in other sectors. This foundational role underscores the industry's importance in sustaining domestic investment and broader industrial activity.

The sector is the primary anchor for South Africa's external trade balance, accounting for over 50% of all merchandise export earnings. This trade surplus provides a critical cushion for the current account, helping to offset structural deficits caused by the importation of machinery and refined fuels.

Fiscal contributions from mining are substantial but characterised by extreme volatility. Between 2018 and 2024, the sector accounted for between 6.5% and 10.9% of total national revenue through Corporate Income Tax (CIT), royalties, and PAYE.

The sector's nominal financial strength masks a deepening productivity crisis and a "growth illusion". In real terms, the industry has shrunk by 11.5% since 1994, exerting a persistent drag on national GDP growth. This decline is primarily driven by the collapse of the gold sector, which saw an 84% reduction in output over this period. However, if gold production is excluded, the rest of the sector actually grew by 41%, revealing a stark divergence in sub-sector performance.

Structural challenges continue to undermine the industry's long-term growth. Mining employment has steadily contracted from its 1987 peak of over 760 000 jobs to approximately 465 000 today, reflecting a disconnect between rising wages and stagnating labour productivity. Furthermore, the sector faces a capital productivity paradox where increased fixed capital formation, which reached R159 billion in 2024, fails to translate into higher volumes due to external constraints.

Sector Structure

South Africa possesses one of the world's most significant mineral endowments, with a theoretical value estimated between $2.5 trillion and $4.7 trillion. The country holds the world's largest reserves of Platinum Group Metals (PGMs) and manganese, as well as the second-largest deposits of chromium, positioning it as an indispensable anchor in global industrial value chains. Despite this wealth, the sector's full potential remains largely latent: with only 9% to 14% of the country geo-mapped at a detailed 1:50,000 scale, significant discoveries likely remain untapped.

The precious metals sub-sector is characterised by a value versus volume paradox. While gold production has plummeted by 84% since 1994 due to extreme depths and rising costs, record-high prices (reaching just under $5,600/oz in late January 2026) have generated a financial windfall for the remaining operators.

South Africa's dominance in ferrous and alloying metals makes the global stainless-steel industry heavily dependent on its supply. However, this segment faces a sharp tension between the state's push for local beneficiation and the reality of uncompetitive domestic smelting costs driven by high electricity tariffs.

Structurally, the industry is split between large-cap multinational majors and a vital but struggling junior mining sector. The majors—such as Anglo American and Glencore—operate at a massive scale, focusing on brownfields exploration to extend the life of existing assets. Junior miners serve as the industry's "research and development" arm, focusing on high-risk greenfields exploration. While juniors are responsible for the majority of new mineral discoveries globally, South Africa's juniors face a failure-to-launch crisis due to a lack of venture capital and bureaucratic delays in licensing.

The long-term health of the industry depends on a functional relationship where juniors discover new deposits and majors bring them into production. Historically, the South African regulatory framework has faltered by treating junior miners as smaller versions of majors, failing to account for the formers' unique, high-risk business model.

Growth Constraints and Recommendations

We used the Growth Diagnostics framework, developed by Hausmann, Rodrik, and Velasco (2005), to identify binding constraints. The framework provides a methodology for identifying the binding constraints that most severely inhibit private investment and entrepreneurship. This approach uses a decision tree to pinpoint whether low investment is driven by a high cost of finance or low returns to economic activity. Low returns are further categorised into "low social returns," caused by external factors like deficient infrastructure and human capital, or "low appropriability," where government failures such as corruption, weak property rights, and red tape prevent investors from capturing the value of their projects. By focusing on these specific bottlenecks, policymakers can achieve the "biggest bang for the reform buck," ensuring that the relaxation of a constraint yields the largest possible impact on growth.

For large-scale majors, the primary bottlenecks reside within the "Low Return on Economic Activity" node. The constraints are specifically linked to low appropriability—driven by bureaucratic backlogs, regulatory uncertainty, and systemic criminality—and low social returns caused by the collapse of network infrastructure. These factors create frictional costs that push project returns below global hurdle rates, rendering vast mineral deposits economically unviable despite the availability of dormant capital.

The junior mining sector is primarily stifled by constraints under the "High Cost of Finance" node, reflecting a chronic lack of venture capital and high-risk funding. The sheer accumulation of regulation acts as a prohibitive fixed cost. While majors can partially absorb these costs through scale, juniors lack the balance sheets to navigate extensive red tape, resulting in a failure-to-launch crisis for new exploration projects.

Recommendation 1: The overall policy and regulatory approach should follow a differentiated approach, especially in relation to juniors and majors.

The starting point should be to withdraw and review the Mineral Resources Development Bill 2025 as it does not distinguish sufficiently between the characteristics and constraints of junior mining operations and those of majors.

Indeed, the legislative and regulatory framework should recognise junior miners as a distinct category requiring different regulatory treatment and a differentiated compliance approach.

Policy Uncertainty

The mining sector is currently entangled in a cycle of policy uncertainty and regulatory friction that has severely compromised its global competitiveness. This decline is starkly illustrated by the Fraser Institute's Policy Perception Index (PPI), where South Africa fell to 70th out of 82 jurisdictions by 2024. In contrast, regional peers like Botswana have ascended to the 20th position globally, demonstrating that the African operating environment is not a barrier to success; rather, specific domestic policy choices and the moving of BEE goalposts have served as the primary deterrents to long-term investment.

The shift to state custodianship under the MPRDA, introduced profound fears regarding security of tenure and property rights. The Mining Charter, in particular, became a source of systemic instability due to the Department of Mineral Petroleum and Resources' (DMPR's) historical opposition to the once-empowered, always-empowered principle. By demanding that companies top up empowerment levels whenever a BEE partner exited, the state effectively mutated social policy into a perpetual fixed cost of production. While the judiciary eventually upheld the industry's position, the years of litigation required to resolve these ambiguities caused great uncertainty.

A critical signal of this binding constraint is the industry's frequent use of the courts to bypass regulatory bottlenecks. The 2021 High Court ruling, which determined the Mining Charter was a non-binding policy instrument rather than legislation, briefly provided a reprieve from administrative overreach. However, the state's response, the Draft Mineral Resources Development Amendment Bill of 2025, seeks to legislate these same contested moving targets as the new bill would empower the minister to issue legally binding empowerment targets.

The 2025 Amendment Bill introduces fresh layers of uncertainty through opaque provisions regarding strategic minerals and forced beneficiation.

Ultimately, the legislative framework and disputes have created a high-friction environment. To unlock the sector's potential, the diagnostic suggests that the state must move away from adversarial legislating and toward a differentiated regulatory approach. Without addressing the disconnect between policy formulation and industry reality, South Africa's vast mineral wealth will remain sterilised by the very framework intended to promote its development.

Recommendation 2: If the objective is to promote economic growth, and provide policy certainty, a revised bill should explicitly reflect the views of the industry and maintain the outcomes of the court rulings. This is especially relevant in relation to the notion of "once empowered, always empowered", the mining charter, and how beneficiation is pursued.

Regulatory Burden and Bureaucratic Backlogs

The regulatory and legislative landscape in South Africa should be viewed as a cumulative framework that has mutated into a prohibitive fixed cost of production. This burden is disproportionately felt by the junior mining sector, where regulatory compliance already consumes an estimated 30% to 40% of operational budgets. If the Mineral Resources Development Bill 2025 is enacted in its current form, these costs are projected to rise by another 40% to 60%, further stifling the sector and restricting the operational flexibility required for high-risk exploration.

Bureaucratic backlogs cost the sector an estimated R30bn to R50bn annually. This administrative crisis originated with the shift to state custodianship under the MPRDA. This transition overwhelmed the department's capacity, leading to the failure of successive administrative systems like SAMRAD, which was characterised by a lack of transparency and over-pegging. The resulting backlogs are staggering; as of 2021,

over 4 400 mining rights and 36 000 prospecting rights remained outstanding, stalling capital expenditure and costing the sector an estimated R30 bn to R50 bn annually in lost opportunities.

Licensing process takes approximately two years in South Africa, whereas it takes only eight months in Australia or six in Botswana.

To address these constraints, the rollout of the new online cadastral system must be accompanied by an aggressive, dedicated program to eradicate the existing application backlog. In addition to clearing the backlog, unused licences should be withdrawn and cancelled to open up new areas and opportunities.

Finally, structural institutional reform is necessary to insulate the licensing process from political interference. Establishing an independent Minerals Commission would create a professionalised Mining Licence Authority staffed by industry experts. By firewalling the administration of the cadastre from the political cycle, South Africa can begin to restore investor trust and enforce maximum processing timeframes.

Recommendation 3: A full audit of the regulatory burden and compliance costs experienced by mining companies should be conducted to inform a revised bill. The review should also explore the granting of certain exemptions to ESG and transformation requirements, especially in relation to junior mining exploration companies. The argument is that at the prospecting stage, juniors cannot necessarily handle equity dilution so these requirements should only kick in once a mining right is bankable.

Part of this recommendation is also to streamline the application process by making the DMRE the competent authority in relation to water rights for mining, and the Department of Water and Sanitation the appeals authority.

Given the nature of reforms driven by Operation Vulindlela (OV), mining should perhaps directly form part of OV's reform agenda.

Recommendation 4: A dedicated, rapid backlog-eradication programme should be pursued to fast-track outstanding mining rights and prospecting applications. Such a programme should include the secondment of extra private sector expertise to accelerate the roll-out of the new cadastral system and to clear the backlog in permits. This process should also enforce the use-it-or-lose-it principle by cancelling and withdrawing unused prospecting and mining rights, which would open up these opportunities to companies that can use these rights for exploration and mining. The revised bill should also have clear, strict and enforceable timelines for the processing of applications and outcomes of appeals. It is recommended that there should be a commitment to process all prospecting rights within three months.

Recommendation 5: Explore the potential of a Minerals Commission and whether such a commission could be firewalled from political interference and staffed by industry experts. The concept would be to have an independent regulator, which essentially functions as a Mining Licence Authority, overseeing the new online cadastral system, and enforcing adherence to licensing timelines.

Junior Mining and Exploration

South Africa's junior mining and exploration industry is underdeveloped, leading to a lost generation of mines and the effective collapse of the sector's project pipeline. While global exploration is increasingly driven by agile, venture-capital-funded juniors responsible for over 70% of new discoveries (greenfield exploration), South Africa's mining landscape remains dominated by brownfields exploration. For example, currently there are only about 12 junior resource companies listed on the JSE, whereas there are over 600 listed on the ASX (Australia) and over 1 600 on the TSX (Canada).

Financially, the sector is struggling with "bad local finance" and a collapse in exploration expenditure. South Africa's share of global exploration spending has plummeted from 5% in 2004 to less than 1% today. In 2024, SA spent a negligible $43 million on exploration compared to Canada's $3 billion.

Although the MPRDA intended for the use-it-or-lose-it principle to open the sector, industry experts estimate that only 10% of the 33 000 prospecting rights granted since 2004 have been executed. The remaining 90% are held by entities lacking technical or financial capacity. This effectively ties up thousands of rights, blocking opportunities for new exploration.

To revitalise exploration, South Africa should adopt the successful blueprints of Canada and Australia, specifically the flow-through share model. In Canada, flow-through shares allow investors to claim back 70%-100% of their investment in junior mining as a tax credit. Australia has a similar model. Such an incentive would lower the cost of capital and attract the high-risk venture funding necessary for greenfields exploration.

Recommendation 6: Introduce incentives for exploration through tax rebates, modelled on the flow-through shares model used in Australian and Canadian. This will increase access to finance and reduce risk.

Reducing exploration risk requires a major investment in pre-competitive geological data. Currently, only a fraction of South Africa has been mapped at the 1:50,000 scale essential for modern exploration. Expanding the budget of the Council for Geoscience to accelerate high-resolution geophysical mapping and making this data freely available online would allow juniors to use advanced algorithms to identify anomalies before applying for rights. Combined with a transparent cadastral system and a more aggressive withdrawal of unused prospecting rights, these reforms could finally unlock untapped potential.

Recommendation 7: Increase funding to the Council for Geoscience to accelerate high-level geophysical mapping and make this "pre-competitive" data available online. Alternative funding options could be explored to supplement financing via the national fiscus.

Corruption, Crime, Security and Illicit mining

Illicit mining has grown by an estimated 757% from R7 billion in 2017 to R60 billion in 2025. Crime in the sector and illicit mining has evolved from opportunistic theft to systemic extortion and organised crime.

The lack of a transparent cadastral system has enabled corruption and information externalities, where insider knowledge from the failed SAMRAD system is exploited to grant overlapping rights. From a growth-diagnostics perspective, this forms a constraint, and the risk-adjusted return on legal investment plummets.

Recent state interventions offer a glimmer of progress, notably through Operation Vala Umgodi, but more needs to be done. The industry continues to advocate for Operation Vala Umgodi to be formalised into a permanent, dedicated Mining Police Task Force to dismantle organised syndicates in the sector. The success of reform will depend on the state's ability to purge potential corruption from within and restore the rule of law across the mineral complex.

Recommendation 8: The current actions to address illicit mining and criminal behaviour should be intensified, and Operation Vala Umgodi should be made permanent, along with the establishment of a dedicated mining police task force within the SA Police Service (SAPS). In addition, the provisions in the current bill, which should strengthen the efforts of Operation Vala Umgodi and allow for the creation of a dedicated mining police task force, should be retained in the revised bill. Given the magnitude and alleged nature of crime and corruption in the sector, a Judicial Commission of Inquiry should be considered, although its success will depend on the extent to which it is used to enforce the rule of law and prosecute wrongdoing in the sector.

Network Industries

The collapse of South Africa's network industries represents a critical constraint. Electricity tariffs have skyrocketed by approximately 937% since 2007.This energy crisis has decimated the domestic beneficiation industry; the number of operating ferrochrome smelters has plummeted from 22 to just 2 in 2025, leading to an estimated loss of up to 350 000 jobs in the broader industrial economy.

In 2021 alone, bulk mineral miners lost R35 billion in revenue due to Transnet's inability to meet targeted rail movements, while the full opportunity cost of Transnet not matching the capacity on its rail network amounted to R50 billion. An inefficient logistics system caps the sector's growth potential. Unlike the Australian model, where mining majors own and operate their own rail infrastructure, South African firms remain tethered to failing rail lines.

Recommendation 9: Reforms to accelerate private sector investment in rail and ports, and permit private concessions, are slowly gaining traction, however, they should be fast-tracked and expanded. For example, some industry experts argue that if the coal and manganese lines were privately concessioned, capacity would increase rapidly, which would unlock billions in export revenue.

Conclusion

Without addressing these binding constraints, the sun will surely set on South Africa's mining sector. But it should be the opposite; the sun should be rising. The problems facing the sector are well documented and the remedies, clear and well within the ability of South Africa to address. Fixing these constrains would unlock South Africa's great mineral potential and could contribute significantly to faster economic growth.

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1. Introduction

The economic history of South Africa is intimately bound to the extraction of its mineral wealth. For over a century, the mining sector served as the driver of the national economy, driving industrialisation, urbanisation, and capital accumulation. Yet, as we enter the mid 2020s, the sector represents an economic paradox. South Africa sits on a mineral endowment of global significance, particularly in platinum group metals (PGMs), manganese, and chromium, commodities that are critical to the global energy transition. Despite this "geological lottery" the sector faces constraints in the form of competitiveness and confidence. Once the primary engine of the economy, the sector has seen its economic contribution steadily wane and has not been able to take full advantage of commodity booms. This has led to the notion that the sector is a Sunset sector, however, we argue that by lifting binding constrains, it can be a “Sunrise” sector.

The contribution of the sector has, however, steadily waned. From contributing over 15% to GDP in 1980, the sector’s direct contribution fell to approximately 6.1% by 2024. While external factors such as declining ore grades in deep-level gold mining play a role, a review of economic literature, global market reports, and qualitative interviews with industry experts suggest a more nuanced and troubling reality, the decline is largely endogenous, exacerbated by a complex interplay of human-made binding constraints.

This is in marked contrast to other commodity-rich countries. While competitor jurisdictions like Australia and Canada capitalised on the commodity super-cycles of the early 21st century to expand their fixed capital stock and exploration pipelines, South Africa’s mining industry stagnated. In 1980, South African mining houses were global "leviathans" with entities like Anglo American standing as dominant foreign investors in the United States of America. Today, the narrative is one of missed opportunities and capital flight. Data from the Fraser Institute’s Annual Survey of Mining Companies illustrates a swift decline in institutional quality; South Africa has plummeted from being a top-tier investment destination, ranked 14th globally in 2001, to firmly occupying the bottom quartile in 2024, ranking 68th out of 82 jurisdictions (Aliakbari & Mejia, 2025).

Despite talks about encouraging competitiveness and investment in mining and exploration, there is a clear disconnect between industry needs, and the legislative, regulatory and operating environment. The South African mining sector remains caught up in a quagmire of red-tape that strangles investment and creates significant opportunity costs. Industry analysts suggest that industry concerns, especially in relation to policy uncertainty, have not been addressed, and have cost the country over half a million jobs (BusinessTech, 2025).

This domestic challenge is occurring against a backdrop of growing global opportunity. According to BDO LLP’s Annual Mining Report 2025, the global demand for critical minerals such as copper, nickel, and rare earths is projected to nearly triple by 2030 and quadruple by 2040 to meet net-zero targets (BDO LLP, 2025). While other African nations like Namibia and Zambia are launching aggressive strategies to capture this demand, South Africa remains entangled in administrative paralysis, even though South Africa has a critical minerals strategy.

This paper suggests that the South African mining sector is currently trapped in a low-level equilibrium where policy uncertainty, bureaucratic delays, infrastructure failures, underdeveloped venture capital exploration, and crime and illicit activities act as high “taxes” on investment. We argue that the current "one-size-fits-all" regulatory approach is inefficient, failing to distinguish between the survivalist economics of deep-level gold mining, the volume-dependent logistics of bulk commodities, and the fragile venture-capital dynamics of the junior sector.

The objective of this paper is to dissect the drivers of this poor performance. It moves beyond aggregate statistics to explore binding constraints, and the immense opportunity costs incurred from not addressing these binding constraints. Drawing on interviews with industry experts, alongside key literature, this report

scrutinises the debates shaping the sector with a focus on lifting these binding constraints and the sector's growth potential.

This paper argues that most of the decline is endogenous, driven by human-made constraints rather than geological exhaustion

To assist in conceptualising these binding constraints and to form a framework, this paper use concepts from the "Growth Diagnostics" framework developed by Hausmann, Rodrik, and Velasco (2005). It should be noted that this paper does not perform a full quantitative diagnostic based on the framework's methodology. However, the framework is used to conceptually identify specific "binding constraints" with the highest costs.

The paper starts off with a review of the institutional and legislative backdrop of the sector, tracing the evolution of the regulatory and administrative framework. Section two provides a brief historical analysis of the sector's trajectory, identifying key structural breaks such as the post-1970 decline and the missed Super-Cycle of the early 2000s.

Section three evaluates the sector's recent economic performance. It explores the divergence between nominal revenue growth and real production volumes as well as the productivity paradox where total factor productivity has collapsed despite capital deepening. This section also analyses the sector's contribution to the fiscus, current account and employment trends.

Section four outlines the current structure of the sector, mapping South Africa's significant mineral endowments and distinguishing between the operational realities of large-cap majors and the junior mining sector.

Section five discusses the theoretical framework, which follows the "Growth Diagnostics" approach developed by Hausmann, Rodrik, and Velasco. The section outlines the framework for identifying specific "binding constraints", in other words, the primary bottlenecks inhibiting private investment, rather than relying on a universalist list of reforms.

Section six identifies the binding constraints currently stifling growth and applies the growth diagnostics framework. Furthermore, the section makes recommendations to address these constraints.

2. Institutional and policy backdrop

The Mineral and Petroleum Resources Development Act (MPRDA) 28 of 2002 represents the foundational statutory framework governing the South African mining sector, marking a fundamental break from the pre-1994 legislative regime. The most significant shift enacted by the MPRDA was the move from a system based on private ownership of mineral rights, rooted in the common-law principle of *cuius est solum* (where land ownership included the minerals beneath it), to one of state custodianship of all mineral resources (Van der Vyver, 2012). This change fundamentally altered the ownership model and the operational nature of the sector and found its genesis in the African National Congress's Freedom Charter of 1955, which called for the transfer of mineral wealth to the ownership of the people as a whole (Cawood, 2004).

Furthermore, the MPRDA introduced the "use-it-or-lose-it" principle to discourage the hoarding and sterilisation of mineral resources that was arguably enabled by the preceding Minerals Act 50 of 1991 (Hermanus et al, 2015).

Beyond the core Act, the legislative and policy framework is shaped by several instruments and administrative systems that collectively govern the sector's operation, transformation, and environmental compliance.

Key policy tools include the Broad-Based Socio-Economic Empowerment Charter (Mining Charter), which sets transformation targets, although its legal status as a binding legislative instrument has been contested and is currently subject to potential change through the Draft Mineral Resources Development Amendment Bill of May 2025.[2]

Administratively, the system has undergone complex transitions, moving from the initial National Mining Promotion System (NMPS) to the troubled South African Mineral Resources Administration System (SAMRAD), which is now being replaced by a modern cadastre to improve transparency and efficiency in rights administration.

This entire framework operates within the One Environmental System introduced in 2014, which integrates mining authorisations with the broader National Environmental Management Act (NEMA), and is set to be directed by the Critical Minerals and Metals Strategy 2025, which focuses heavily on beneficiation to leverage the country's mineral wealth for industrialisation and the global low-carbon transition.

The following provides and overview of key aspects and changes to the framework:

MPRDA and the Freedom Charter

The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) forms the statutory framework governing mining in South Africa. Moreover, the most significant shift post 1994 was the shift to state custodianship of all mineral resources, which was enacted through the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA), and came into effect in 2004 (Hermanus et al, 2015). As Cawood (2004) points out, this shift originally emanated from the African National Congress's Freedom Charter of 1955, which, in relation to mining, states that "mineral wealth shall be transferred to the ownership of the people as a whole".

[2] See Minerals Council of South Africa v. Minister of Mineral Resources and Energy and Others, 2022 (1) SA 535 (GP). https://www.saflii.org/za/cases/ZAGPPHC/2021/623.html

Minerals Act 50 of 1991

Prior to the MPRDA, the Minerals Act 50 of 1991 formed the bases of the legislative framework, which had a strong focus on private property and the common law principle of *cuius est solum*, which means that the ownership of land includes ownership of the minerals beneath it (van der Vyver, 2012).

As such, by replacing the Minerals Act, the MPRDA fundamentally changed the ownership model of mineral rights in South Africa, and thereby the nature and operations of the sector.

MPRDA and "use-it-or-lose-it"

There were concerns that the previous framework under the Minerals Act 50 of 1991, enabled hoarding of mineral rights and "sterilisation of mineral resources" whereby mineral rights could be held without prospecting or mining, and essentially renewed in perpetuity. As such, the MPRDA adopted a "use-it-or-lose-it" principle, whereby if prospecting or mining rights are not used, they could be revoked and would be non-renewable.

MPRDA and The Mining Charter

Another key aspect of the MPRDA is that Section 100(2)(a) of the MPRDA empowers the minister responsible for mining to develop a Broad-Based Socio-Economic Empowerment Charter (Mining Charter).[3] The Mining Charter is an important aspect of the framework and is generally used to sets transformation targets for the industry.

However, it should be noted that, as ruled on by the Gauteng High Court in 2021, the Mining Charter is not legislation, and not legally binding. Moreover, section 100(2) of the MPRDA does not empower the minister to make binding laws, as such, the Mining Charter is a policy instrument, and targets conveyed in the charter are not legally binding (Minerals Council of South Africa v. Minister of Mineral Resources and Energy and Others, 2021).

Draft Mineral Resources Development Amendment Bill in May 2025

Arguably in response to the 2021 high court ruling, the minister published the Draft Mineral Resources Development Amendment Bill. The bill explicitly empowers the minister to "impose" BEE conditions when granting mining rights.

Moreover, by moving the empowerment requirements from the Charter (policy) to the Act (legislation), the DMRE arguably aims to bypass the 2021 judgment. The bill effectively makes the achievement of BEE targets a legislative condition of the mining right itself.

Unrelated to the 2021 ruling, the bill removes all references to petroleum exploration and production, which are now governed by the separate Upstream Petroleum Development Act.

It also enhances provisions relating to the beneficiation of minerals, which is done by restricting the export of raw ore for designated "strategic" minerals, aiming to force local processing.

[3] Clause reads as follows: "To ensure the attainment of Government's objectives of redressing historical, social and economic inequalities as stated in the Constitution, the Minister must within six months from the date on which this Act takes effect develop a broad-based socio-economic empowerment Charter that will set the framework, targets and time-table for effecting the entry of historically disadvantaged South Africans into the mining industry, and allow such South Africans to benefit from the exploitation of mining and mineral resources".

Although the bill is still in draft format it gives an indication of the future legislative and institutional framework of the mining sector.

Mining rights administration, NMPS, SAMRAD & Cadastre

Prior to the MPRDA, Mineral Rights were treated as a form of immovable property that could be privately owned. As such, the administration was primarily handled through the Deeds Office, not the Department of Minerals and Energy (DME).

To secure a right, a title deed registered against the property was required. Moreover, companies negotiated directly with private landowners for access, and the state's role was largely regulatory (issuing authorisations to mine) rather than granting the right to the minerals itself. Overall, this was a purely legal and paper-based conveyancing process.

With the introduction of the MPRDA and the shift to state custodianship, the DME suddenly had to manage every single mining right in the country. During the 2004-2011 period, there was a transitional process based on the manual National Mining Promotion System (NMPS).

NMPS was an internal electronic database intended to capture applications, used by DME officials. However, the system did not have the capabilities to detect overlaps in mineral rights and significantly lacked transparency given that it was essentially just an internal database.

In 2011, the DMRE launched the South African Mineral Resources Administration System (SAMRAD) to manage license applications. SAMRAD was meant to be an online portal for online submissions, but it has often been described as a failure. It once again lacked transparency, often granting overlapping rights ("over-pegging"), with significant delays and backlogs.

In 2024, the DMRE finally moved on to appoint a consortium including the Canadian firm, Pacific GeoTech Systems, to replace SAMRAD with an off-the-shelf cadastral system (Clowes, 2025). It is expected to provide much-needed transparency and will allow investors to instantly verify land status. The pilot was launched in the Western Cape and the new system is expected to be rolled out throughout the country in a phased manner.

One Environmental System

The One Environment System was introduced in 2014 in an attempt to streamline mining, environmental, and water authorisations. This shifted environmental regulation from the MPRDA to the National Environmental Management Act (NEMA). However, the Minister of Mineral Resources remained the "Competent Authority" for issuing authorisations with regards to mining, while the Minister of Forestry, Fisheries, and the Environment (DFFE) became the appeal authority.

Similarly, while environmental authorisation falls under the Minister of Mineral Resources, in respect of mining activities, the Department of Water and Sanitation (DWS) is still responsible for Water Use Licenses (WUL), which is critical for mining activity (Webber Wentzel, 2017).

Critical Minerals and Metals Strategy 2025

The Critical Minerals and Metals Strategy of 2025 (Department of Mineral and Petroleum Resources, 2025) is the most recent and overarching strategy for South Africa's mining sector. The strategy focus on outlining a roadmap to leverage South Africa's mineral wealth for industrialisation and the global low-carbon transition.

Overall, there is a significant focus on beneficiation: it identifies specific high-criticality minerals, such as PGMs, manganese, and vanadium, to pivot the economy from a primary upstream extractor to a strategic leader in global value chains. In other words, the central objective is to maximise economic value through local beneficiation and manufacturing rather than relying on raw ore exports. Key interventions include revitalising the exploration pipeline through a streamlined "one-stop shop" licensing system and establishing regional processing hubs.

The strategy could have significant implications for the workings of the mining sector by introducing incentives, and possibly penalties (e.g. export taxes) to encourage beneficiation, and to discourage exportation of raw materials. This may also entail fiscal incentives like differentiated tax structures and royalty adjustments to reward local processing.

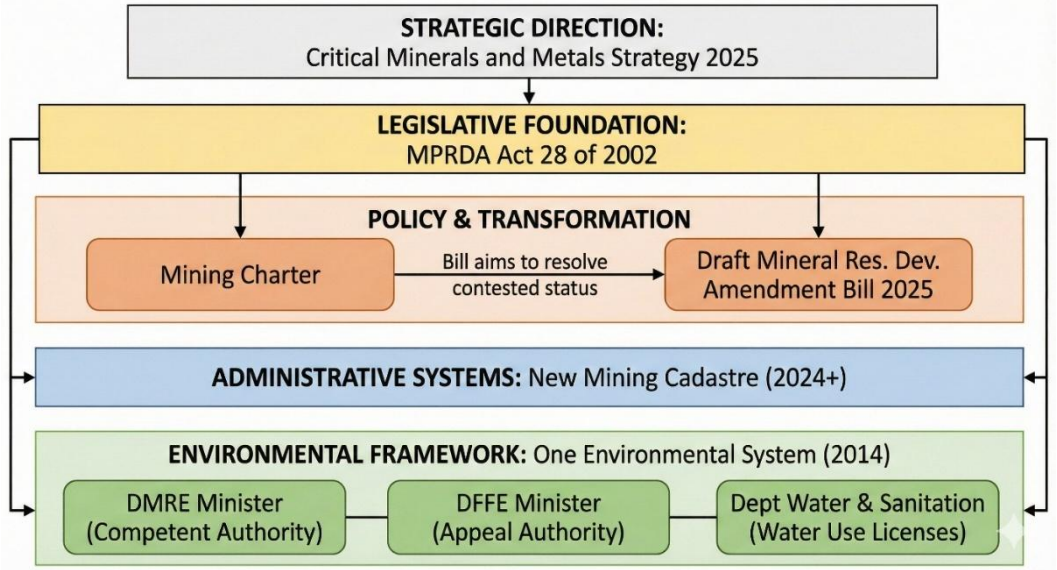
Exploration Strategy for the Mining Industry of South Africa

The Exploration Strategy and the Exploration Implementation Plan (Department of Mineral Resources and Energy, 2022) aim to arrest the decline in South Africa's mineral exploration sector and align it with the Economic Reconstruction and Recovery Plan. With the country's share of global exploration expenditure having fallen below 1%, the primary strategic objective is to recapture a minimum 5% share (approximately $0.9 billion) within a three-to-five-year horizon.

The strategy aims to pivot toward the "green economy," prioritising the exploration of critical minerals such as copper, nickel, cobalt, and rare earth elements to meet rising global demand for clean energy technologies, while leveraging existing competitive advantages in PGMs, manganese, and chrome.

To operationalise the strategy, the Implementation Plan identifies critical structural barriers, including regulatory opaqueness, an inefficient cadastral system, and a lack of pre-competitive geoscientific data, noting that only 9% of the country is mapped at a 1:50,000 scale. Key policy interventions include a mandate for the Council for Geoscience to increase this mapping coverage to 14% over five years and the urgent deployment of a transparent, online mining cadastral system to streamline licensing and enforce "use-it-or-lose-it" principles. Furthermore, the plan proposes fiscal innovations to attract capital, such as exploring flow-through share schemes and establishing public-private partnerships to fund junior explorers, specifically targeting entities with at least 51% Historically Disadvantaged South African (HDSA) ownership to ensure structural economic transformation.

Figure 1: Legislative and policy framework



Source: Author

3. Historical Context and Structural Transformation

To understand the sector's current performance, one must examine its historical trajectory. The literature identifies key "structural breaks" that fundamentally altered the economics of mining in South Africa.

3.1 The Post-1970 Decline and Structural Break

The period between 1970 and 1997 marked a significant transition. Fedderke and Pirouz (2002) provide an analysis of this era, identifying it not as a uniform decline but as a "two-speed" phenomenon driven almost exclusively by the gold and uranium sectors. During this period, the gold sector's contribution to private sector GDP collapsed from 17.2% to 4.1%.

A critical finding is the redistribution of factor shares. In 1970, labour earned less than half of the net value added in gold mining. By 1997, labour's share had risen to approximately 67%, severely squeezing the net operating surplus.[4] This shift created a "rift" where real wages rose while productivity stagnated or fell, forcing the sector to shed labour to survive (Fedderke & Pirouz, 2002). This historical decoupling of wages and productivity remains a persistent structural feature of the sector.

As gold declined, other commodities rose to prominence.

While the sector as a whole has grown significantly in nominal terms due to commodity prices, in terms of production volume, the sector is smaller today than it was in 1994. This decline is mainly driven by the collapse of gold, which dragged the aggregate performance of the sector down significantly (See Figure 6).

3.2 The "Missed Super-Cycle" (2001–2008), and policy transition

The starkest evidence of structural failure is the "Missed Super-Cycle". The early 2000s witnessed one of the greatest natural resource booms in recorded history, driven by China's industrialisation. A resource-rich nation like South Africa should have thrived.

However, research by Pienaar (2012) reveals a divergence. Between 2001 and 2008, while the mining GDP of peer resource-rich countries expanded by an average of almost 9%, South Africa's mining sector's contribution shrank by 1%. This divergence is visible in fixed investment data. Between 1987 and 2004, mining investment as a percentage of GDP was roughly comparable between South Africa (1.8%) and Australia (2.2%). Yet, as the boom accelerated (2005–2011), Australia's investment rate surged to over 9%, while South Africa's stagnated at 2.3% (Pienaar, 2012).

This failure cannot be attributed to geology.

The transition to democracy brought a transformation in the legislative framework, culminating in the Mineral and Petroleum Resources Development Act (MPRDA) of 2002. While intended to broaden access, the implementation introduced significant uncertainty. Some industry experts argue that the introduction of the MPRDA and the Mining Charter created a structural growth cap.

The shift to state custodianship, coupled with aggressive and shifting empowerment targets, shocked the market.

[4] Operating surplus is the profit a business makes from its core activities, representing the money left after paying for production costs like labour, but before accounting for interest, taxes, rent on assets, or depreciation.

The Minerals Council (2025) corroborates this, noting a clear correlation in the data - a significant decline in sector performance coincides with the promulgation of the MPRDA in 2004. Furthermore, the 2010 to 2012 debate regarding the nationalisation of mines, sparked by the ANC Youth League, further eroded investor confidence. The subsequent SIMS (State Intervention in the Minerals Sector) report proposed a 50% "Resource Rent Tax" (RRT), which Pienaar (2012) argued would have rendered the sector uncompetitive against peers like Australia and Brazil, whose effective tax rates were already lower than South Africa's existing 46% effective rate. These policy uncertainties created a perception of risk that led to a "capital strike" and contributed to the "missed super cycle".

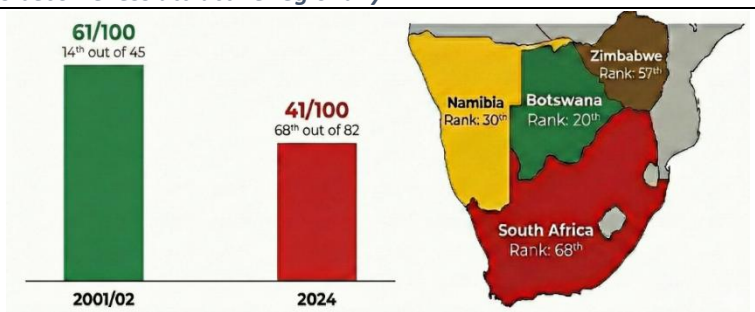
3.3 The Trajectory of Investor Confidence: Four Eras of Decline

An analysis of the Fraser Institute's Annual Survey of Mining Companies provides a granular timeline of how investor sentiment has shifted over the last two decades. The data reveals four distinct eras in South Africa's mining investment history:

- **The Competitive Era (2001–2003):** In the early 2000s, South Africa was viewed as a premier investment destination. In the 2001/2002 survey, the country ranked 14th out of 45 jurisdictions, achieving a score of 61/100 (Fredricksen, 2002). Even during this period, however, early warning signs regarding security of tenure were emerging.
- **The Policy Shock Era (2004–2010):** The promulgation of the MPRDA and the introduction of Black Economic Empowerment (BEE) charters marked a structural break. By 2004/2005, South Africa fell to 53rd out of 65, dropping into the bottom half of global rankings for the first time (Fredricksen et al., 2005). Despite the global commodities super-cycle, the country continued to slide, ranking 49th out of 71 by 2008/2009 (McMahon & Cervantes, 2009).
- **The Crisis of Confidence (2011–2017):** Defined by intense labour unrest (notably Marikana), mass corruption and regulatory unpredictability, this period saw the country fall to 64th out of 122 jurisdictions in 2014 (Jackson & Green, 2015). As some of the industry experts pointed out, this crisis of confidence was primarily driven by mass corruption during the state capture period under former President Zuma, which included waves of corruption in the mining sector, notably under the former Minister of Mineral Resources, Mosebenzi Zwane.
- **The Infrastructure and Security Crisis (2018–2024):** In the most recent era, infrastructure failure has compounded existing risks, entrenching South Africa in the bottom tier. These challenges, especially in rail, ports, electricity, mining mafias and security are often seen as a consequence and legacy of the widespread corruption grab during the state capture period. By 2023, the country ranked 64th out of 86, and in 2024, it sat at 68th out of 82 (Aliakbari & Mejia, 2025).

In addition to slipping down the rankings, South Africa also became less attractive regionally, as depicted in Figure 2.

Figure 2: South Africa has become less attractive regionally



Source: Based on data from Fraser Institute's Annual Survey of Mining Companies

4. Sector performance

Despite a long-term decline in real terms, the South African mining sector remains critical to the national economy, contributing 6% to nominal GDP and approximately 50% of total merchandise exports. The sector serves as an anchor for the current account, where the mining trade surplus helps offset structural deficits in imported machinery and fuel. Furthermore, the industry is a vital, though volatile, source of revenue for the fiscus, contributing between 6.5% and 10.9% of total national revenue through royalties and taxes such as PAYE and Corporate Income Tax.

Furthermore, given that the mining sector is a foundational sector, it has significant multipliers that catalyse activity in other areas. As such the indirect contributions to GDP, investment, tax, and employment are greater than the direct contributions. For example, it is estimated that the sector's employment multiplier is 10, in other words, for one employment opportunity created in the mining sector, there are 10 created in other sectors (Minerals Council, 2025d).

However, the financial importance is increasingly threatened by a "growth illusion" and a deepening productivity crisis. While nominal figures are supported by high commodity prices, production volumes have trended downward since 1994, mainly driven by a sharp decrease in gold production. The sector faces a significant "Capital Productivity Paradox" where rising investment in sustaining capital fails to yield higher output due to internal efficiency losses and external constraints like rail bottlenecks. Combined with a digital deficit and a disconnect between wages and labour productivity, these structural challenges have led to a 11.55% decrease in the sector's real size from 1994 to 2024.

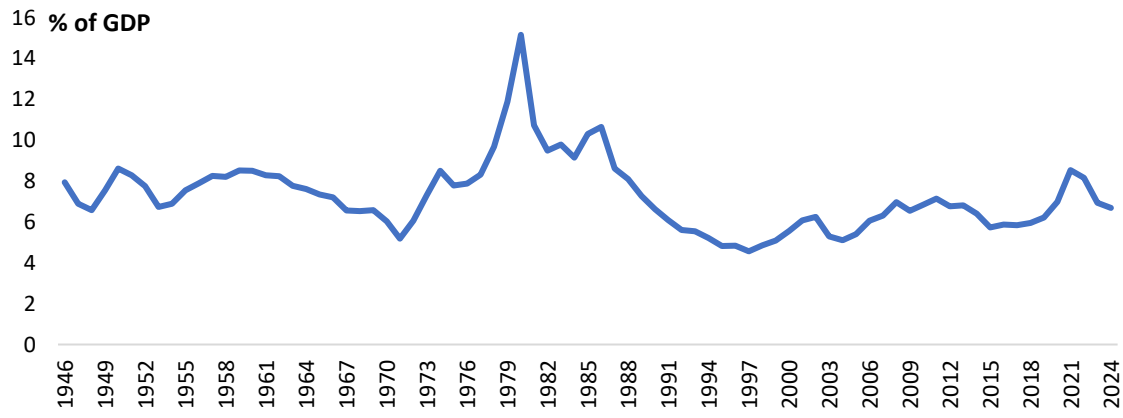
4.1 Value and Volume

Current literature and expert interviews paint a concerning picture of the sector's efficiency. While financial headlines often focus on record rand prices for commodities, the underlying operational health of the sector is deteriorating.

The sector remains significant to the South African economy. However, its nominal strength masks a long-term decline in real terms.

As depicted in Figure 3, the direct contribution of the mining sector in 2024 was R442 billion or 6% of South Africa's GDP (Stats SA, 2025). From 1993 to 2024, the general trend in terms of its GDP contribution was positive, however, it should be noted that in 1980 the sector's contribution peaked at a much higher level, at 15% of GDP (Based on data from SARB).

Figure 3: Mining Sector's Nominal GDP contribution

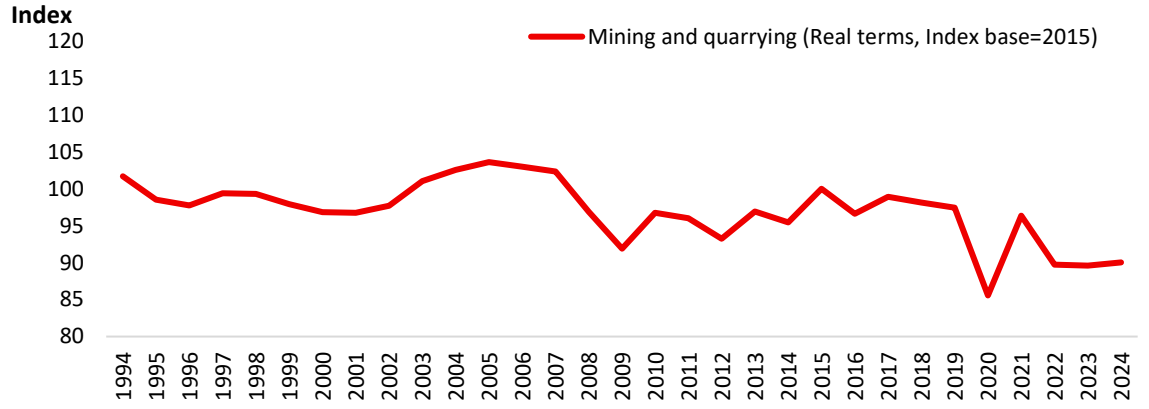


Source: GDP data from SARB

In real terms the sector has declined since 1994. Over this period, the sector achieved an average annual growth rate of -0.29% and, as depicted in Figure 5, growth was volatile. On average the sector exerted a drag on the overall performance of the South African economy from 1994 to 2024, subtracting 0.02 percentage points from the overall GDP growth on average annually.

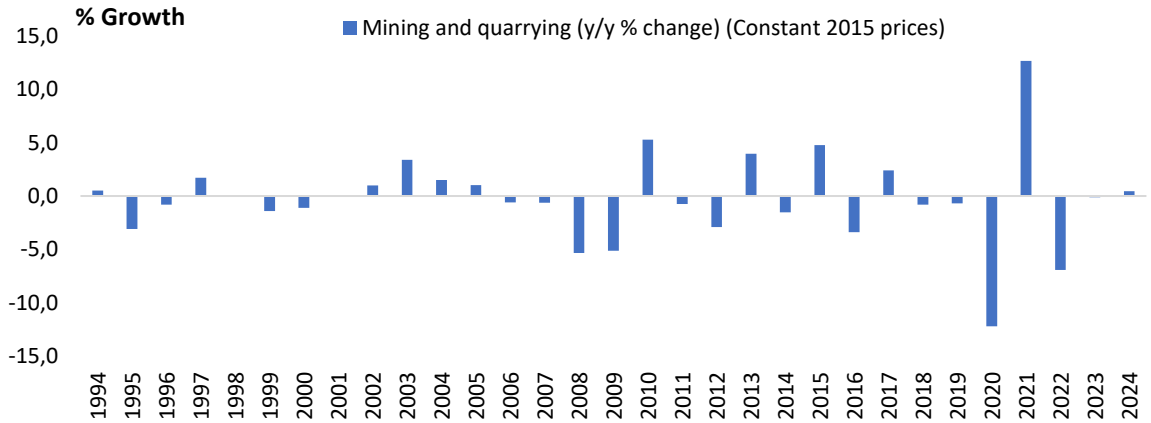
This poor performance has caused the sector to shrink in real terms. Indeed, by 2024 it was 11.55% smaller than in 1994, as shown in Figure 4.

Figure 4:The mining sector's size has decreased in real terms



Source: GDP data from Stats SA

Figure 5: The mining sector's growth has been volatile



Source: GDP data from Stats SA

Very often the performance of the sector is considered in terms of its contribution by value. However, this masks the true performance of the sector as production volumes have declined.

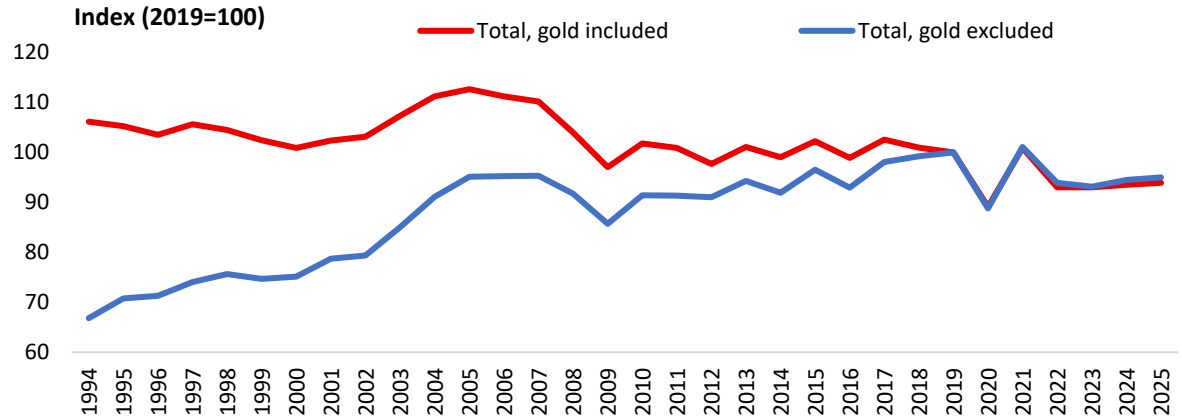
As depicted in Figure 6, production volumes have declined since 1994, despite waves of commodity booms. From 1994 to 2024, there is a downward trend in total production volumes, and based on production volumes alone, total production was 11.8% lower in 2024 than in 1994. Although 2008 to 2018 showed stabilisation and a weak upward trend, on average, mining production volumes decreased by 0.3% per annum from 1994 to 2024.

Based on the production volume index (Including gold), the average production during the period 2020 to 2024, was 9.7 % lower than during 1994 to 2000, and 14.49% lower than production levels during 2004-2008.

However, it should be noted that the main driver of the sector's poor performance was the decline of gold production, which decreased by 84% from 1994 to 2024. Indeed, if gold is excluded from the total production

volume index, output actually increased by 41% from 1994 to 2024, which is in stark contrast to the notion that the sector is in decline.

Figure 6: Production volumes



2025= Average for first 11 months of 2025 (data outstanding for last month of 2025)
Source: Mining production data used from StatsSA.

4.2 Employment

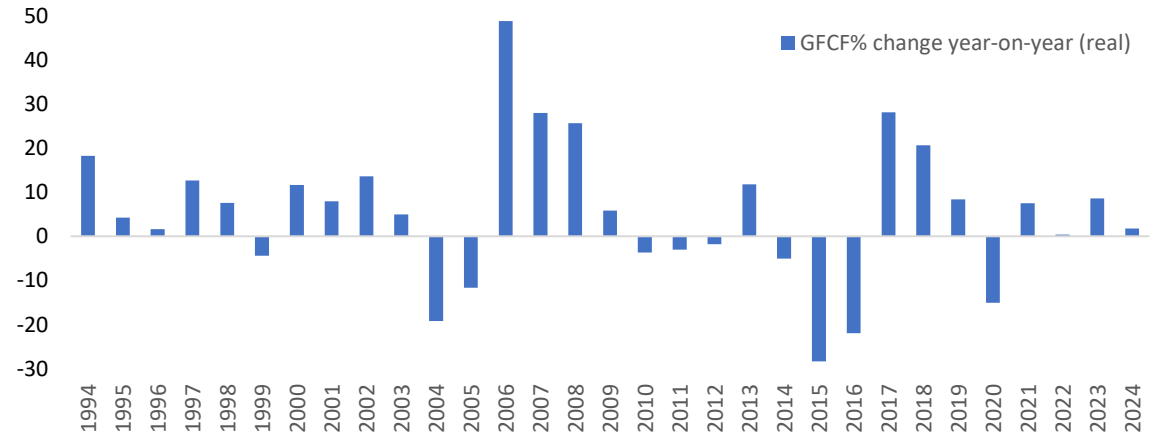
Employment in mining peaked in 1987, when the sector employed 763 319 people (StatsSA, 2015). By 1994, employment in the sector had dropped to 613 584 and throughout the 2000s, mining employment remained under 500 000, accounting on average for 5.8% of total employment in South Africa. By 2024, employment had reached 465 000 or 2.8% of total employment (StatsSA, 2025b). The sector's employment growth averaged -0.4% per year from 1994 to 2024.

However, the sector is believed to have a relatively high employment multiplier, meaning that one employment opportunity in the sector, creates multiple other indirect employment opportunities in other sectors. The Minerals Council estimates that the employment multiplier is 10, so for every one employee in the mining industry, ten other employment opportunities are created (Minerals Council, 2025d).

4.3 Gross Fixed Capital Formation

In 2024, Gross Fixed Capital Formation (GFCF) in the sector stood at R159 billion, which was 15 % of the total GFCF in the country as a whole. Moreover, since 1994, GFCF in the mining sector has grown on average by 5.3 % per annum. However, as depicted in Figure 11 and 12, its growth has been volatile.

Figure 7: Gross Fixed Capital Formation is Volatile



Source: GDP data from Stats SA

4.4 Current account and Fiscal contributions

The sector is a major source of revenue for South Africa's fiscus, and a primary driver of South Africa's trade balance.

The sector accounts for more than 50% of all merchandise export earnings (South African Reserve Bank, 2025). In 2025, a surge in global gold prices and a recovery in Platinum Group Metal (PGM) valuations provided a critical cushion, helping to sustain a merchandise trade surplus even as export volumes faced logistical headwinds. This surplus is the anchor of the current account, as it offsets the country's structural deficit in imported refined fuels and machinery, effectively preventing a much deeper overall external imbalance.

However, the sector also significantly influences the primary income account, often acting as a double-edged sword. Because many of South Africa's largest mining houses are dual-listed or have significant foreign ownership, periods of high commodity prices typically lead to large dividend outflows to international shareholders. In 2025, while high mineral prices bolstered the trade surplus, the concurrent repatriation of these windfall profits narrowed the overall current account deficit. Consequently, the mining sector dictates the volatility of South Africa's external position, where strong export revenues are frequently tempered by the need to service of foreign capital.

The contribution to the fiscus flows through the following channels[5]:

- **PAYE by mining employees:** In 2018, PAYE contributions from the sector's employees amounted to R21 billion. These increased by 9.6% on average annually from 2018 to 2024, reaching R36.1 billion in 2024.
- **VAT Payments:** In 2018, VAT payments from the sector amounted to R36.9 billion but fell to R21.5 billion in 2024.
- **Corporate Income tax (CIT):** CIT paid by the sector increased significantly from around R22 billion in 2018 to R85.5 billion in 2023. However, CIT contributions dipped by 49% to just R43.6 billion in 2024.
- **Mining Royalties:** Mining Royalties increased steadily from R7.6 billion in 2018 to R28.5 billion in 2022 before dropping to R16 billion in 2024.

In sum, the mining sector's annual contribution to the national fiscus ranged from 6.5% to 10.9% of total revenue between 2018 and 2024, demonstrating how vulnerable the sector is to cyclical commodity price swings which also makes it a relatively volatile source of tax revenue.

4.5 Productivity Collapse

Contemporary analysis reveals that the sector's stagnation and decline has deepened into a crisis of productivity. While financial headlines often celebrate record nominal Rand prices for commodities, these figures mask a deterioration in the underlying operational health of the industry leading to a "growth illusion" (PwC, 2025).

A recurring theme in the econometric literature is the collapse of Total Factor Productivity (TFP). Pain, Rapapali, and Steenkamp (2020) estimate that the sector's TFP contracted by 2% per year between 2009 and 2020 making mining one of the worst-performing sectors in the economy.

[5] Recorded from Minerals Council SA's comprehensive facts documents.

Crucially, this decline is attributed to "within-sector" efficiency losses. The Minerals Council (2025) explains that both labour and capital productivity are underperforming. "One unit of labour gives us less than a unit in terms of productivity". Surprisingly, capital productivity is also declining. This supports Havemann's (2025) Capital-Productivity Paradox which observes that while the real capital stock in mining rose between 2010 and 2024, productivity collapsed. This implies that mining firms are investing in "sustaining capital" merely to stay in business, or that their expansion capital is being neutralised by external failures, such as the inability to transport ore due to rail constraints.

Expert 1 also explains that this collapse in TFP is a function of the type of investment in South Africa's mining sector. The vast majority of investment into the sector is to sustain capital of existing operations or brownfields expansions, as opposed to investment into new mines (Expert 1, 2025. Hence the investment is in older generation labour intensive mines that accounts for the bulk of the employment, investment and output, without investing in a pipeline of new generation mines.

4.6 The Wage-Productivity Disconnect

The relationship between wages and productivity remains a structural weakness and a point of intense debate as there seems to be a "decoupling" between real gross earnings and labour productivity. The Minerals Council (2025) argues that "growth in real gross earnings is faster than labour productivity" indicating that a highly unionised workforce is negotiating wage increases that outpace increases in the value of production.

However, labour unions dispute this. The National Union of Mineworkers (NUM), for example, argues that the focus on worker productivity is a pretext for replacing permanent employees with contractors (Business Day, 2025b). Solidarity argues that "CPI-linked increases alone often mean that workers fall behind financially". It calls instead for a scrutiny of executive remuneration packages. This standoff complicates the necessary reforms to restore sector competitiveness.

4.7 The Digital Deficit

BDO's Annual Mining Report 2025 highlights a global surge in technological adoption that South Africa risks missing. Global mining leaders are achieving 10% to 20% increases in mining throughput and up to 50% improvements in procurement productivity through digital transformation (BDO LLP, 2025). Technologies such as AI, robotics, and automation are identified by 71% of global mining companies as having the biggest future impact on the industry.

However, while global peers like BHP and Rio Tinto are deploying autonomous fleets and AI-driven exploration to boost efficiency (BDO LLP, 2025), South Africa's adoption is uneven. The "productivity pivot" described by Havemann (2025) may be exacerbated by a failure to modernise at the same pace as global competitors, partly due to labour resistance to automation and partly due to capital constraints caused by the difficult operating environment.

4.8 Financial Resilience vs. Operational Decline

By 2025, the sector exhibited a "growth illusion". PwC (2025) reports that the sector's market capitalisation increased by 28% to R1.304 billion, driven almost entirely by record gold prices. However, production volumes in key areas are declining. PGM and coal producers, facing softer prices, were forced to restructure, with gross job losses exceeding 13 000. This divergence highlights that the sector is currently surviving on price rallies rather than thriving on operational expansion.

5. Sector structure

Despite relatively poor sector performance, as discussed in the previous section, South Africa has considerable potential given its mineral deposits, and there is very possibly latent potential.

While traditional stalwarts like gold and PGMs continue to anchor the sector, there is a pivot toward "green metals" (manganese, vanadium, copper) driven by the global energy transition.

Structurally, the industry is divided between large-cap multinational majors and a small but vital junior mining sector.

5.1 Mineral deposits

South Africa's mineral complex is considered one of the richest in the world and is valued at a theoretical level of $2.5 trillion to $4.7 trillion (Marshall, 2023; O'Connor, 2017). It has the biggest deposits of PGM, manganese and chromium in the world. Furthermore, while precious metals face a "value vs volume" paradox, the ferrous sector, specifically chromium and manganese, has propelled South Africa's potential to be an indispensable anchor of the global value chains.

Table 1 gives an overview of known mineral reserves in South Africa, noting that only 9% to 14 % of South Africa has been geo-mapped at a 1:50,000 scale (Department of Mineral Resources and Energy, 2022).[6] This implies that South Africa's mineral wealth is likely even greater.

Table 1: Mineral reserves of key minerals in South Africa

	Units	SA Reserves	World		Locality of major reserves		
			Rank	%	1st	2nd	3rd
Platinum Group Metals	kt	63 000	1	88.7	South Africa	Russia	Zimbabwe
Manganese (Metal)	Mt	600	1	31.6	South Africa	Australia	China
Chromium	Mt	200 000	2	35.7	Kazakhstan	South Africa	India
Zirconium Minerals	kt	5 300	2	10.4	Australia	South Africa	Senegal
Vermiculite	kt	14 000	2	n/a	USA	South Africa	Turkey
Titanium minerals (Metals)	Mt	35	6 (Ilmenite); 2 (Rutile)	4.5	Australia	China; South Africa (Rutile)	India
Gold (Metal)	t	5 000	3	5.1	Australia	Russia	South Africa
Fluorspar	kt	41 000	3	14.6	Mexico	China	South Africa
Vanadium (Metal)	kt	3 500	4	4.0	Australia	Russia	China
Diamonds (natural rough)	Mn crts	85	5	n/a	Russia	Botswana	DRC
Coal	Mt	53 156	6	3.5	USA	Russia	Australia
Phosphate Rock[7]	kt	1 500 000	6	2.0	Morocco and Western Sahara	China	Egypt
Uranium [8]	t	279 100	6	5.2	Australia	Kazakhstan	Canada
Rare Earths	t	860 000	9	0.7	China	Vietnam	Brazil
Zinc (Metal)	kt	5 900	9	2.8	Australia	Russia	Peru
Copper (in 2021)[9]	kt	11 000	11	1.0	Chile	Australia	Peru
Iron Ore (Crude ore)	Mt	620	12	0.8	Australia	Brazil	Russia

[6] A 1:50,000 scale is important for mining because it offers an optimal balance of regional coverage and sufficient detail for both early mineral exploration and initial mine planning.

[7] (Contained Concentrates)

[8] (Metal, up to $US 80/kg U)

[9] Countries have explored more and revised their reserves while SA is almost at a standstill.

	Units	SA Reserves	World		Locality of major reserves		
			Rank	%	1st	2nd	3rd
Lead (Metal)	kt	300	Not top ten	0.3	Australia	China	Russia
Nickel	Mt	3 700	n/a	0.04	Indonesia	Australia	Brazil

Source: Provided by the Minerals Council

Precious Metals

- **Platinum Group Metals (PGMs):** South Africa holds 88.7% of global PGM reserves. Despite price volatility, this sub-sector remains the largest revenue generator. The structure is highly consolidated, dominated by majors like Anglo American Platinum, Impala Platinum, and Sibanye-Stillwater. The current trend is cost containment and shaft rationalisation in response to fluctuating basket prices, which refers to input costs such as electricity, logistics and labour. Part of the response is a shift toward mechanised mining where geology permits, and there is a big focus on cash preservation.

- **Gold:** Once the undisputed leader, gold production has declined due to the extreme depth of reserves and rising costs. The only new investment in gold in South Africa in the past two decades was West Wits in 2025. However, South Africa still holds the third highest reserves in the world, and there is still significant gold potential, but it will not be tapped without a significant increase in exploration.

  Despite a decline in production the sector has seen a "value over volume" resurgence in 2024/25 due to record-high gold prices (even breaching $5 000/oz in 2026), providing a windfall for operators like Harmony Gold and AngloGold Ashanti, even as production volumes stabilise. Revenue is largely being used to fund diversification into copper and international assets rather than new deep-level South African gold projects (PWC, 2025).

Ferrous & Alloying Metals

- **Manganese:** South Africa is the top global producer of manganese (Kalahari Manganese Field), holding 31% of the world's known reserves. The sector is export orientated, supplying over 50% of China's manganese (Tong et al., 2025). While majors like Assmang and South32 dominate the sector, there is a push to increase junior miner participation. Logistics are the primary constraint on the sector with miners increasingly using road transport to bypass rail bottlenecks. It should also be noted that downstream processing is almost entirely controlled and owned by China.

- **Chromium (Chrome Ore):** South Africa is a global leader in chrome, with 35% of known reserves, and supplying approximately 81% of China's total chrome imports in 2024/25 (Tong et al., 2025). This makes the global stainless-steel industry heavily dependent on South African supply. However, there is currently a conflict in relation to the push for beneficiation. This tension emanates from the government proposal to tax chrome exports. The government's aim is to force companies to smelt ore locally (into ferrochrome) rather than exporting raw ore. But, producers (e.g., Merafe Resources/Glencore) argue that high Eskom electricity tariffs make local smelting uncompetitive, leading to idle smelters despite abundant ore.

Coal

- Coal remains a dual-purpose commodity, providing feedstock for Eskom (domestic energy security) and serving export markets via Richards Bay Coal Terminal (RBCT), though export volumes remain capped by rail constraints. However, to the extent that the private sector is awarded concessions to take over the running of key rail corridors, export volumes should stabilise in the next few years. The future of coal mining in the domestic market remains uncertain, especially in relation to local supply for energy, as the 2025 IRP plans for a significant reduction of fossil fuels in South Africa's energy mix. (See text box 2 in section six for more detail.). But at the same time, there are strategic international

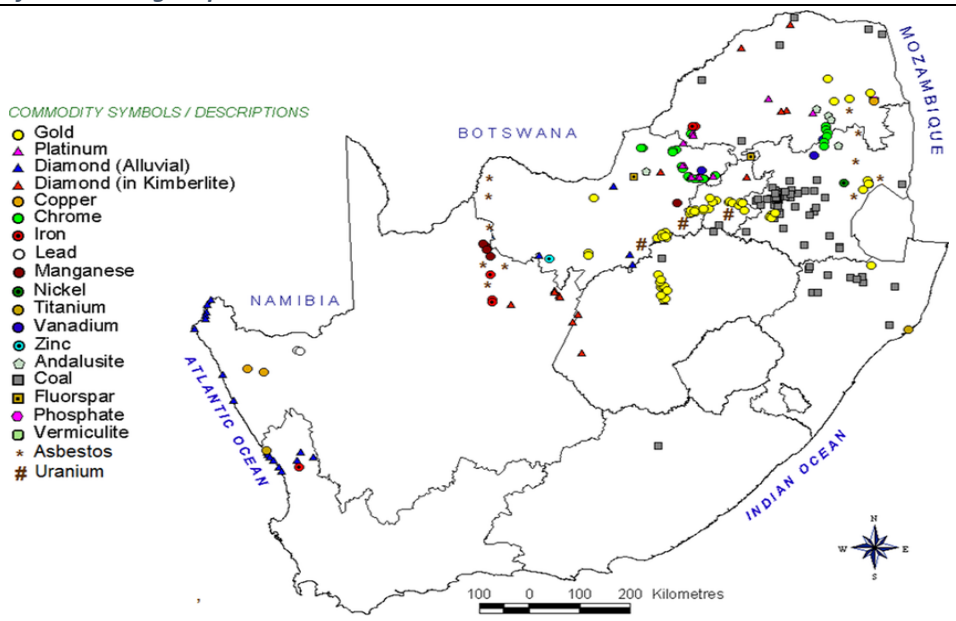
opportunities for coal mining considering that India and China have built scores of new coal fired power plants, and they will import coal, whether it is from South Africa or another jurisdiction.

The sector is also set to undergo a strategic pivot with the Critical Minerals and Metals Strategy (drafted 2024/25) explicitly targeting minerals essential for battery storage and renewable energy. South Africa is positioning its vanadium, manganese, and copper assets to capture value from the global green economy. Moreover, the Northern Cape is increasingly viewed as the exploration hotspot for these green metals.[10]

As depicted in Figure 8, most of South Africa's known mining deposits are situated in the north eastern parts of the country.

From a provincial point of view, it is important to note the importance of Mpumalanga coal mining and coal power plants. Furthermore, the Northern Cape is one of the most under-explored provinces in South Africa but believed to hold significant mining opportunities, especially in critical minerals.

Figure 8: South Africa's mining map



Source: Council for Geoscience, South Africa as used in a presentation from the Minerals Council.

5.2 Industry Organisation: Majors vs. Juniors

The sector consists of majors and junior miners. While both are essential to a healthy mineral economy, they operate on entirely different business models, funding structures, and risk horizons.

The Majors

The sector is dominated by large, often multinational entities (e.g., Anglo American, Glencore, South32). Major mining companies are characterised by their massive operational scale, diversified cash flows, and reliance on long-term, patient capital. These companies possess the balance sheets to partially weather infrastructure failures and fund their own energy solutions (e.g., solar farms), but these failures still reduce the growth and viability of mining in South Africa.

[10] https://www.gov.za/sites/default/files/gcis_document/202204/46246gon2026.pdf

This segment of the sector typically focuses on developing and mining ore bodies (as opposed to exploration, which entails finding new ore bodies), and as far as exploration goes, they typically focus on "Brownfields" exploration - activities designed to identify new ore bodies in the immediate vicinity of existing mines, thus extending the life of established assets.

Because their projects involve significant sunk costs and development timelines that can span decades, majors require extreme policy stability and predictable regulatory frameworks. Their financial models are anchored by internal revenues or traditional bank financing, leading to a risk-averse approach that prioritises steady, large-scale production over the high-stakes uncertainty of discovery in unproven territories.

This segment of the sector is currently disinvesting from South Africa (BHP, Anglogold Ashanti, etc), and is focused on portfolio optimisation, reducing high-cost assets and deepening automation.

The Junior Mining Sector

In contrast, the junior exploration sector, function as the research and development arm of the industry, focusing on exploration and finding new mineral deposits.

Unlike majors, these small, entrepreneurial firms do not typically aim to operate mines themselves. Instead, their business model is built on raising high-risk venture capital to conduct "Greenfields" exploration in frontier areas. Typically, their goal is to produce evidence of a viable deposit and sell it to a major producer. This is a high-reward but extremely high-risk endeavour since the probability of a junior firm successfully finding a viable deposit is relatively small. In addition, because they are funded by "impatient" capital and often have no operational revenue, juniors are highly sensitive to bureaucratic delays. They require rapid licensing and transparent access to geological data.

As of 2019, junior miners held an estimated 80% of mining licenses but contributed less than 10% of the sector's revenue (Kriel, 2019). This disparity highlights a "failure-to-launch" crisis where exploration projects struggle to transition to production due to a lack of venture capital and access to infrastructure.

Interaction between Majors and Juniors

The sector relies on the relationship between these two groups, where juniors act as the primary scouts for new mineral wealth and majors provide the massive capital necessary to bring those discoveries into production. While majors account for the majority of global exploration spending, juniors are responsible for more than 70% of new mineral discoveries worldwide. As such they are essential for developing a pipeline of new deposits and projects.

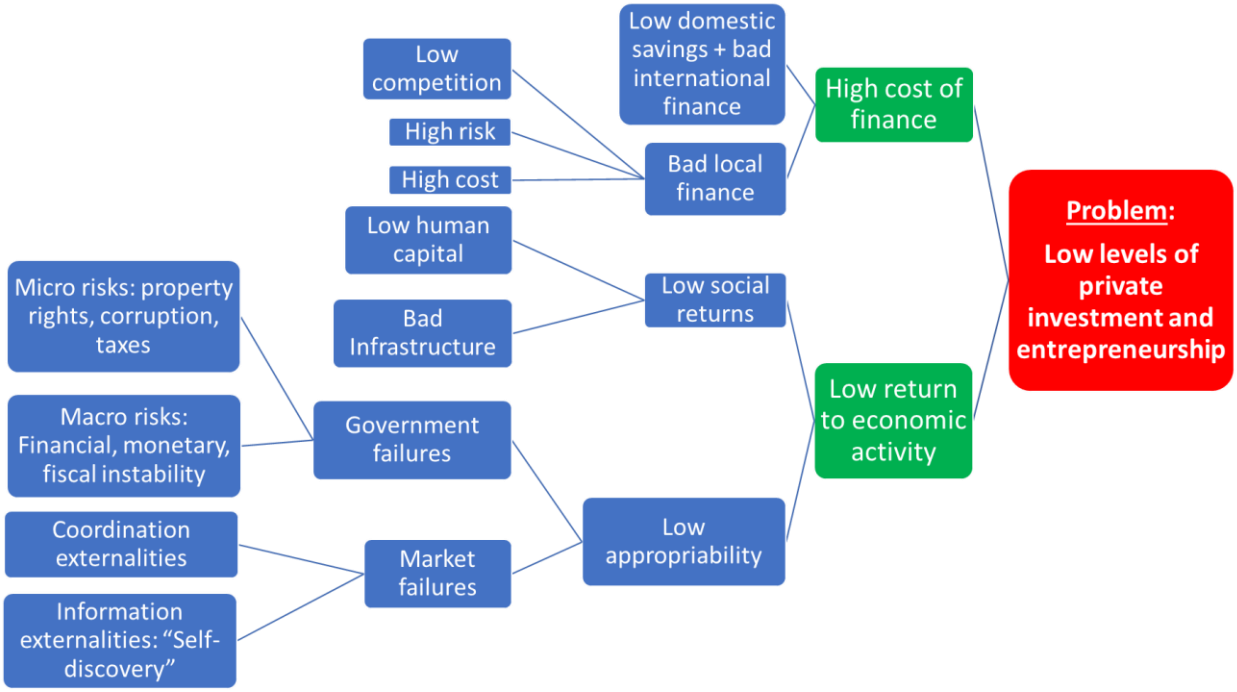
In South Africa, however, the regulatory framework has historically been designed around the Mining House system, treating juniors as smaller versions of majors rather than recognising them as a fundamentally different business model.

6. The Growth Diagnostics Approach

Binding constraints are distinct from other existing distortions in that their removal or relaxation yields the biggest bang for the reform buck- the largest immediate positive impact on growth and welfare. The Growth Diagnostics framework developed by Hausmann, Rodrik, & Velasco (2005) provides a framework to conceptualise binding constraints. This approach uses a targeted approach to identify the most significant bottlenecks, the binding constraints that inhibit private investment and entrepreneurship.

Hausmann et al (2005) provides a decision tree to assist in identifying binding constraints, as depicted in Figure 9. The framework models economic growth as a function of the accumulation of productive assets (investment) and the efficiency with which they are used. As such, the starting point is to ask, Why aren't firms investing? The decision tree provides multiple nodes to guide the identification of binding constraints.

Figure 9: Growth diagnostics decision tree



Source: Hausmann et al., (2005)

Using the tree from right to left, the first general node represents high cost of finance, which could be as a result of low domestic savings and/or "bad" international finance. For example, is the country or industry cut off from international capital markets, or is local financing inefficient. "Bad local finance" can take on the form of high spreads between deposit and lending rates, high collateral requirements, or a lack of long-term credit availability, and typically emanates from low competition, high risk and high costs.

The second general node of the tree is whether there are low returns to economic activity. If finance is cheap/available but firms still don't invest, the problem is that projects aren't profitable. This splits into two concepts:

1. **Low Social Returns:** The project itself isn't productive because the environment lacks necessary inputs. There are usually two elements to consider under this branch. The first is bad Infrastructure, such as roads, ports, or power supply. The second is low human capital, which relates to whether the workforce is unskilled or unhealthy.

2. **Low Appropriability:** The project is socially productive, but the investor cannot capture the returns. This normally entails government failures, which on a micro level entails high taxes, corruption, weak property rights, or excessive red tape. It also relates to the collapse in local government, where businesses, and in our case, mines have to step in to provide basic services. On a macro level it entails factors such as inflation, fiscal instability, or exchange rate volatility. The second branch under this stream is market failures in the form of information and coordination externalities.

A key tenet of the framework is the identification of "diagnostic signals" or shadow prices. In an economy or sector constrained by finance, we would observe high real interest rates and a high marginal return on capital. Conversely, in an economy or industry constrained by low returns, we would expect low investment despite reasonable financing costs.

Hausmann et al (2008) elaborate on the process by establishing four principles for verifying if a constraint is truly binding:

1. The price of the constraint, which would be high if the constraint is binding, or at least people or businesses should be willing to pay a high price to overcome the constraint;

2. The reaction of investment if the constraint is relaxed. If a constraint is truly binding, lifting the constraint would see investment increase.

3. Agents should be attempting to bypass the constraint (e.g., firms buying generators because of poor power supply).

4. The last principle is whether agents less reliant or exposed to the constraint (the "camels") survive or thrives, while those more exposed (the “hippos”) struggle or fail.[11]

Complementing the Growth Diagnostics framework are concepts linked to the OECD’s Foundations for Growth and Competitiveness framework (OECD, 2025). A core component of this framework is the notion that the accumulation of regulation often mutates from a set of rules into a fixed cost on production. This creates frictions where rising compliance costs disproportionately penalise young firms (juniors) that lack the scale to absorb them.

[11] The terminology about Camels and Hippos comes from an analogy about camels and hippos in a desert. In a context where the main problem for survival is the lack of water (like in the desert), the animals that need more water would not survive, and the ones that need less water will be better off. In a desert, where water is scarce, you see many camels. They are thriving because they are "low-intensity" users of water; they have evolved to survive with very little of it. Hippos are "high-intensity" users of water; they cannot survive without large amounts of it.

7. Growth Constraints and Reform Recommendations

This section explores the binding constraints to the mining sector's growth and makes recommendations to address these constraints. These constraints and recommendations are identified based on literature and interviews with industry experts. Moreover, although this paper does not provide a quantitative growth diagnostic of the sector, the growth diagnostics approach, as discussed in the previous section, is used to form a general qualitative framework to consider binding constraints.

Many of the constraints are overlapping and applicable to various commodities and segments of the sector, however, it is important to recognise sector heterogeneity. The operating needs and constraints facing majors and juniors differ. This concept also supports the notion of moving away from a spray-gun strategy to a more targeted approach.

As such, the first recommendation is that the overall policy and regulatory approach should be differentiated, especially in relation to juniors and majors.

Using the framework, and applying a differentiated approach, binding constraints for majors mostly fall under the general "Low Return on Economic Activity" node. There are also signs that point away from the "Cost of Finance" being a constraint for the majors. This segment of the market is dominated by multinational majors with access to global capital markets. In light of a "capital strike", investment is being withheld not because it is unavailable, but because the risk-adjusted returns are unattractive. It is argued that lifting binding constraints could unlock a substantial increase in investment, implying that the capital exists but is dormant.

The focus narrows to "Low Appropriability" and "Low Social Returns" (see Figure 9). The specific constraints point to bureaucratic backlogs, regulatory uncertainty (the "moving goalposts" of the Mining Charter), the collapse of network industries, illicit mining and systemic criminality. These constraints create frictional costs that reduce the appropriable return on investment below the global hurdle rate.

As for the juniors, there are clear signs that the main constraints fall under the "High Cost of Finance" node and each sub-node has relevance to this segment of the sector.

Some of the constraints facing both majors and juniors also align with the OECD's frictions hypothesis which suggests that the accumulation of regulation mutates into a fixed cost of production, disproportionately penalising new entrants and junior firms (OECD, 2025).

Recommendation 1: The overall policy and regulatory approach should follow a differentiated approach, especially in relation to juniors and majors.

The starting point should be to withdraw and review the Mineral Resources Development Bill 2025 as it does not in its current form distinguish sufficiently between the characteristics and constraints of junior mining operations and that of majors. (At the time of writing, the latest version of the bill was published in government gazette 52704 of 20 May 2025, as amended by the erratum notice general notice number 6298. Note that the bill is also referred to as the Mineral Resources Development Amendment Bill, 2025).

Indeed, the legislative and regulatory framework should recognise junior miners as a distinct category requiring different regulatory treatment and a differentiated compliance approach.

Text Box 1: Beneficiation Debate

Ricardo Hausmann's well-known "monkeys jumping from tree to tree" metaphor is a useful way of thinking about structural transformation and diversification. In this framing, products are represented as trees in a

forest, where proximity reflects shared capabilities. These are skills, institutions, technologies, supply chains, and tacit know-how. Economies diversify not by making heroic leaps to distant trees, but by moving incrementally to nearby ones, exploiting capabilities they already possess. Successful development is therefore less about picking glamorous end-products and more about expanding the set of capabilities that allow firms to jump to adjacent opportunities over time.

Applied to the South African mining sector, this perspective casts doubt on traditional beneficiation strategies that focus narrowly on downstream processing of minerals. While beneficiation is often framed as a natural next step (e.g. by "adding value" by refining or fabricating minerals locally) many beneficiation activities sit relatively far from South Africa's existing capability set. They are capital-intensive, energy-hungry, exposed to global scale economies, and often compete directly with entrenched international producers. As a result, they represent long jumps between trees, with a high probability of falling, particularly in an environment characterised by high electricity costs, logistics bottlenecks, and policy uncertainty.

By contrast, mining equipment, services, and technology (METS) industries are much closer trees in the product space. South Africa already possesses deep capabilities in mining engineering, geology, project management, mechanical fabrication, digital mine planning, safety systems, and maintenance services — capabilities accumulated over more than a century of mining activity. Expanding into mining equipment and related services leverages these existing strengths and allows firms to move horizontally rather than vertically. From this base, firms can branch into adjacent activities such as automation, remote sensing, software, environmental remediation, and mine-closure services, many of which are tradable and increasingly in global demand.

The key implication is that mining equipment and services offer a more powerful and resilient pathway to diversification than beneficiation. Rather than tying diversification to a narrow set of commodity-specific value chains, METS activities generate flexible, transferable capabilities that can be redeployed across minerals, geographies, and even sectors beyond mining. In Hausmann's terms, they place the monkey in a denser part of the forest, with many nearby trees to jump to. For South Africa, this suggests that a capability-based industrial strategy centred on mining inputs and technologies may do more to support long-run diversification and growth than continued emphasis on downstream mineral processing alone.

For further reading see Kaplan, D. (2011). South African mining equipment and related services: Growth, constraints and policy. Making the Most of Commodities Programme (MMCP)(5).

7.1 Policy Uncertainty, Regulatory Burden and Bureaucratic Backlogs

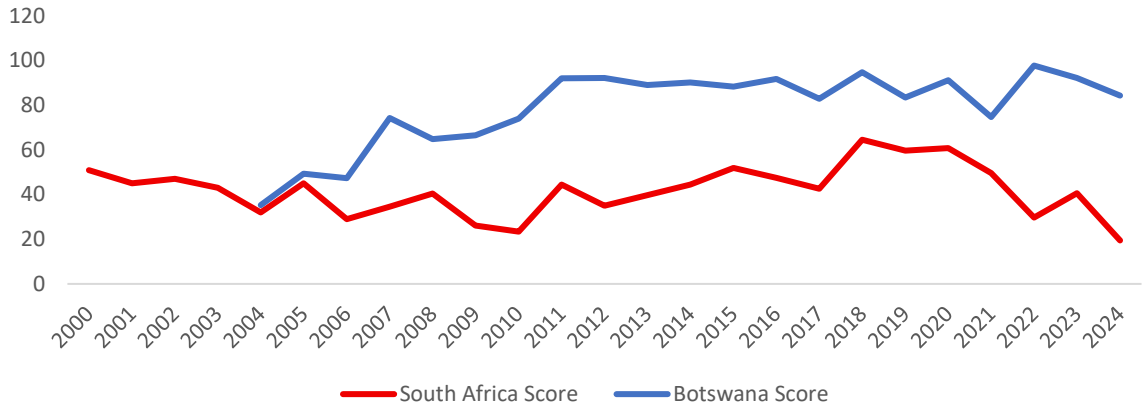
The policy and regulatory environment are characterised by uncertainty, delays and backlogs. The Fraser Institute's Policy Perception Index (PPI) serves as a report card on this failure (See Figure 10 and Figure 11 for South Africa's ranking and index score). By 2024, the country ranked 70th out of 82 on the PPI, with investors consistently citing the administration of regulations and the moving of goalposts in the Mining Charter as primary deterrents (Aliakbari & Mejia, 2025).[12]

Some of the experts interviewed for this paper contrasts this performance with Botswana, which has become the premier African mining jurisdiction. In 2024, Botswana ranked 20th globally on the Investment Attractiveness Index, while South Africa ranked 68th (Aliakbari & Mejia, 2025). This disparity demonstrates that decline is not an inevitable consequence of the African operating environment, but the result of specific domestic policy choices.

[12] In 2012, South Africa ranked last (96th out of 96) for labour regulations (Wilson et al., 2013).

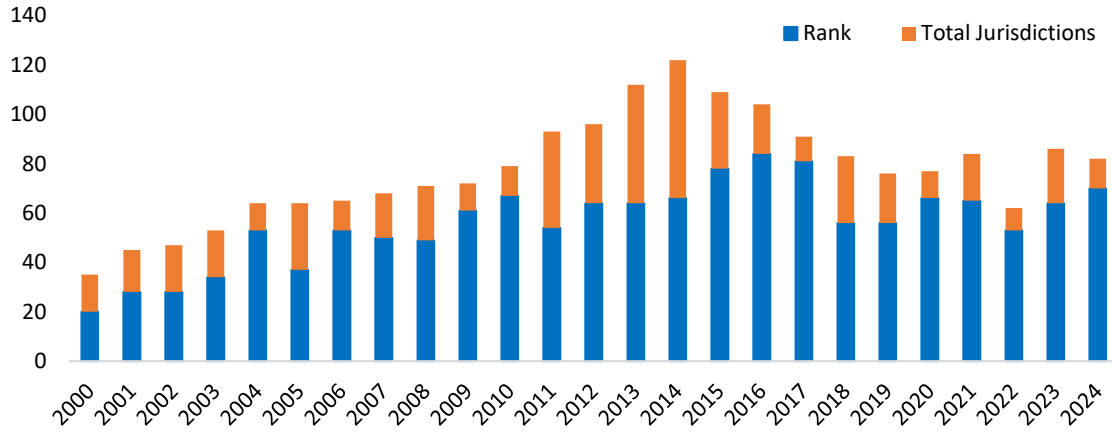
The transition from the Minerals Act 50 of 1991 to the MPRDA and the introduction of the Mining Charter via the MPRDA, as discussed in section one, is an important factor to understand the topic of policy uncertainty, regulatory burden and bureaucratic backlogs. As such, the discussion in this section will predominantly be anchored in this transition.

Figure 10:Fraser Policy Perception Index



Source: Data used from Fraser Institute

Figure 11: South Africa's Policy Perception Ranking (2000 to 2024)



Source: Data used from Fraser Institute

Policy Uncertainty

The shift to state custodianship, coupled with aggressive and shifting empowerment targets raised fears over the security of tenure, property rights, and of nationalisation. The mining charter also created great uncertainty. As an example, a mere leak of the first draft 2002 Mining Charter, which proposed that control (51+ per cent) of all new mines would have to be in the hands of black business within ten years, wiped out R50 billion off the market value of mining shares listed on the Johannesburg Stock Exchange (Fauconnier, 2019).

The Mining Charter has introduced two areas of concern. The first relates to the DMRE's opposition to the notion of "once empowered, always empowered". The second is the fact that targets set out in the Mining Charter move, creating moving goal posts. As is true with most binding constraints, actors attempt to by-pass them. In this case, it took the form of legal action.

DMRE opposed the notion of “once empowered, always empowered”. The DMRE argued that if a BEE partner sold their shares, the mining company’s empowerment status was no longer guaranteed. They would have to find new BEE partners to "top up" their black ownership if stipulated thresholds were no longer met. In addition to creating uncertainty, this policy stance has mutated regulation into a fixed cost of production, as described in the OECD “friction hypothesis”, due to its impractical nature.

The Mining Charter targets move. The second and main issue that industry experts pointed out is the fact that the targets are not necessarily the problem, but the fact that the targets are moving goalposts is highly problematic. This is not conducive to long term investment decisions, and acts as a deterrent to growth.

The court ruled in favour of the “once empowered, always empowered” principle. After a long dispute, the industry took the matter to court in 2015, seeking a declaratory order to end the ambiguity over this aspect of the charter. In April 2018, a full bench of the Gauteng High Court ruled in favour of the Chamber of Mines. The Court held that once a mining right holder had achieved its Historically Disadvantaged South Africans (HDSA) ownership target, its empowerment status would be retained for the duration of that right, even if the HDSA partner later disposed of their shares (Chamber of Mines of South Africa v Minister of Mineral Resources and Others, 2018).

The Charter has been found to be not legally binding. The Minerals Council’s challenge and questioning of the legal status of the Charter in 2021 can be seen as a signal of bypassing a constraint (Minerals Council of South Africa v. Minister of Mineral Resources and Energy and Others, 2021). It was ruled that the MPRDA does not empower the minister to make binding laws through the Mining Charter, as the charter is a policy instrument and not legislation in of itself. As such, targets set out in the charter are not legally binding (Minerals Council of South Africa v. Minister of Mineral Resources and Energy and Others, 2021). In effect, this ruling set aside the 2018 Mining Charter.

As noted in section two, arguably in response to the 2021 high court ruling and as an attempt to by-pass the ruling, the minister published the Draft Mineral Resources Development Amendment Bill. The bill makes additional provision to explicitly empower the minister to impose BEE conditions when granting mining rights. Moreover, by moving the empowerment requirements from the Charter (policy) to the Act (legislation), the DMRE arguably aims to bypass the 2021 judgment. The bill effectively makes the achievement of BEE targets a legislative condition of the mining right itself.

The bill also introduces additional uncertainties in relation to beneficiation (See Text Box 1 for a short discussion on beneficiation). Essentially the bill enhances provisions relating to the beneficiation of minerals, which is done by restricting the export of raw ore for designated "strategic" minerals, aiming to force local processing. However, as the Junior Mining Council points out, the provisions for beneficiation in the bill are ill-defined and opaque which further creates uncertainty, especially for junior miners. Indeed, the definitions used in the bill and the extent of discretion given to the minister, formed part of the legal dispute between the Minerals Council and the minister. The court ruled in favour of the council (Minerals Council of South Africa v. Minister of Mineral Resources and Energy and Others, 2021).

The risk in this situation is that policy uncertainty combined with an onerous regulatory burden would be legislated and possibly intensified via the bill**.** Furthermore, by attempting to by-pass previous court rulings, the formulation of the bill ignores the industry’s position and input on critical policy areas. As an example, Minerals Council CEO, Mzila Mthenjane, publicly stated that the bill ignored the organisation’s contributions during prior consultations saying, “The draft Bill is not altogether optimal. We did have engagements with the [DMPR], but we cannot see where our inputs were taken into consideration”. (Parker, 2025). This should be noted in the context of the Minerals Council representing 72 members, accounting for around 90% of South Africa’s mineral production (Minerals Council South Africa, 2025c).

Considering the framework and decision tree, this situation speaks to “low appropriability” with attempts to bypass the constraint, and in response, the current bill aims to legislate binding constraints.

Recommendation 2: If the objective is to promote economic growth, and provide policy certainty, a revised bill should explicitly reflect the views of the industry, and maintain the outcomes of the court rulings. This is especially relevant in relation to the notion of “once empowered, always empowered”, the mining charter, and how beneficiation is pursued.

Regulatory Burden and Bureaucratic Backlogs

Regulation and legislation should be viewed within a framework, as opposed to individual legislation or regulations. A set or framework of legislation and regulations have a cumulative impact, and often mutates into fixed cost of production. As is evident from South Africa’s score on the Fraser Policy Perception Index, the current framework constitutes a regulatory burden, and the Mineral Resources Development Bill 2025, in its current form, is likely to add to this burden.

Regulatory burdens are typically most felt by smaller firms. The Junior Mining Council estimates regulatory compliance already consumes 30-40% of operational budgets in the junior mining segment. The compliance costs are expected to increase by 40-60% if the new bill was enacted, while also reducing access to capital and operational flexibility (Junior Mining Council).

In addition to the regulatory burden, administrative and bureaucratic delays and backlogs also hinder growth. Administrative and bureaucratic capacity was placed under severe pressure with the transition from the Minerals Act 50 of 1991 to MPRDA**.** The shift in ownership models from the Minerals Act 50 of 1991 to MPRDA, impacted administrative and bureaucratic processes. Prior to the MPRDA, mineral rights were treated as a form of immovable property (real rights) that could be privately owned. As such, their administration was primarily handled through the Deeds Office, not the DME/DMPR/DMRE. To secure a right, a title deed registered against the property was required. Moreover, companies negotiated directly with private landowners for access, and the state’s role was largely regulatory (issuing authorisations to mine) rather than granting the right to the mineral itself. Overall, this was a purely legal and paper-based conveyancing process.

With the introduction of the MPRDA and the shift to state custodianship, the DME suddenly had to manage every single mining right in the country. During 2004-2011 there was a transitional process involving the National Mining Promotion System (NMPS).

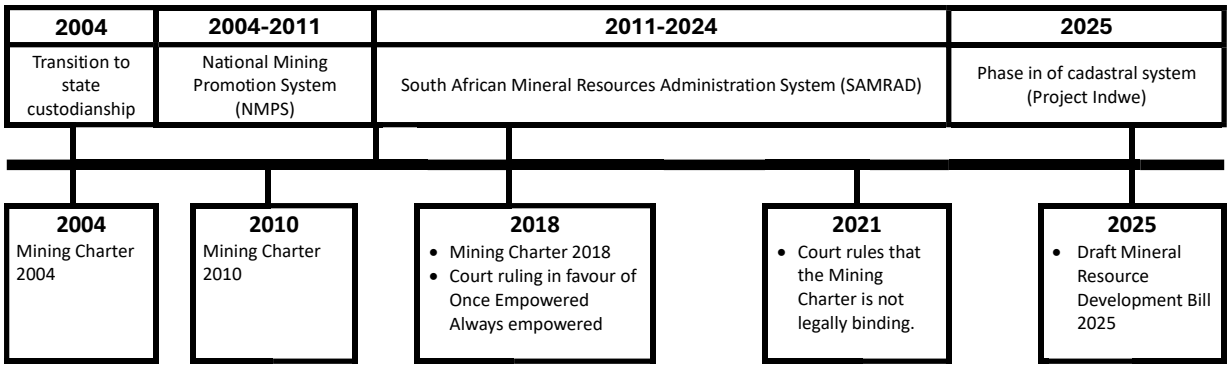
The NMPS was an internal electronic database used by DME officials to capture applications. However, the system did not have the capability to detect overlaps in mineral rights, lacked GIS capabilities, lacked interface capabilities with other planning systems and it significantly lacked transparency, given that it was essentially just an internal database operated manually.

In 2011, DMRE launched South African Mineral Resources Administration System (SAMRAD) to manage license applications. SAMRAD was meant to be an online portal for online submissions, but it is often described a catastrophic failure. It once again lacked transparency, often granting overlapping rights (so-called “over-pegging”) and was plagued by significant delays and backlogs.

These inefficient and untransparent systems, which are also vulnerable to corruption (see next section), caused applications to pile up and for backlogs to form, costing the South African sector approximately R50 billion per year.

For many years, the industry has been calling for a transparent cadastral system. In 2024, the DMRE appointed a consortium, including the Canadian firm Pacific GeoTech Systems, to replace SAMRAD with an off-the-shelf cadastral system (Clowes, 2025). It is anticipated to provide much-needed transparency and will allow investors to instantly verify land status. The pilot was launched in the Western Cape and is expected to be rolled out throughout the country in a phased manner. See Text Box 2 for more details on cadastral systems.

Figure 12: Timeline of legislative and regulatory framework



Source: Author

Text Box 2: Mining cadastral systems

A mining cadastral system is a comprehensive digital registry and management platform used by governments to administer mineral land and the legal rights associated with its development. At its core, the system integrates a Geographic Information System (GIS), which is an interactive map showing the exact boundaries of mining claims, with a legal database that tracks the lifecycle of every permit, from initial application to final closure

By providing a "single source of truth", it prevents the common administrative failure of "double granting" or "double pegging" where rights to the same piece of land are issued to different companies, thereby improving security of tenure for investors (Feast et al. 2011).

Governance and Transparency

From a governance and economic policy perspective, a modern cadastre acts as a critical tool for transparency and institutional reform. By automating workflows and applying a strict "First-In, First-Out" (FIFO) principle, the system minimises human discretion, which significantly reduces the potential for corruption, political favouritism, and the accumulation of massive administrative backlogs (World Bank 2011). For a country like South Africa, the transition to such a system, designated as Project Indwe, is designed to regain investor confidence and reverse the decline in exploration spend by making the licensing process predictable, auditable, and accessible to the public (DMPR 2025).

Fiscal and Strategic Impact

Beyond permit tracking, the system serves as a tool for resource management and fiscal oversight. It allows the state to monitor compliance with social and labour plans in real-time and ensures the accurate collection of royalties and land rents by linking spatial data directly to production and tax records (World Bank 2010).

Despite the roll-out of the cadastre system, the backlogs and delays have not been cleared yet. This administrative failure to process mining rights has a direct financial cost. In a 2020/2021 survey, the Minerals Council found that just 21 responding companies had 178 outstanding applications, stalling over R30 billion in planned capital expenditure (Minerals Council South Africa, 2021). Furthermore, the DMRE's own data from 2021 revealed a staggering backlog of 4 408 outstanding mining rights and over 36 000 outstanding prospecting rights (Minerals Council South Africa, 2021). While the Junior Mining Council estimates the opportunity cost of these delays to be as high as R50 billion per year (Junior Mining Council, 2025). In addition, poor enforcement of the "use-it or lose-it" principle has led to thousands of unused prospecting rights, which have not been cancelled and withdrawn. These unused rights are holding up new mining exploration and mining projects.

One industry expert also noted that obtaining a mining right in South Africa takes around 356 working days (effectively two years), compared to 8 months in Australia or 6 months in Botswana, rendering South Africa highly uncompetitive.

In addition to these delays in processing applications, the One Environmental System as briefly described in section one, could also be streamlined. For example, sometimes mining rights are granted, however, water use rights might still be outstanding, which renders the mining right moot. Some of the industry experts suggested that the system could be streamlined by making the DMRE the competent authority in relation to water rights for mining, which would mean that the Department of Water and Sanitation would become the appeal authority. This would emulate the process followed for environmental rights for the mining sector.

With reference to our framework and decision tree, the constraints presented by policy uncertainty, the regulatory burden and bureaucratic backlogs erode appropriability. This erosion is mainly via government failures, and micro risks in the form of red-tape, bureaucratic delays and by creating indirect uncertainty over property rights.

The fact that companies are still willing to apply for mining and prospecting rights, despite the significant delays and the costs associated with this, is a clear sign that the constraint has a high "shadow price", in other words, that agents are willing to pay a high price. This supports the notion that the process and delays are in fact a true binding constraint.

Another strong signal that policy uncertainty, the regulatory burden and bureaucratic backlogs are binding constraints to South Africa's mining sector is the fact that the part of the sector least reliant on policy certainly, regulatory and bureaucratic efficiency and transparency, is illicit mining, which is thriving with an estimated growth of 757% from 2017 to 2025 (PwC ,2025; Manduna, 2025; Jacobs, 2025). In terms of our framework, this presents a "camel" flourishing without water, while the legal segment of the sector, the "hippos", are stagnating. Crime and illicit mining will be discussed in greater detail later in this paper.

Although the new cadastre system is being rolled out, the backlog is still in place. As such, it is recommended that applications are fast-tracked and that a dedicated programme be introduced to eradicate the backlog, in addition to streamlining processes. Part of this process should also include the cancelation and withdrawal of unused mining rights that have already been issued.

Furthermore, establishing an independent Minerals Commission similar to Ghana's commission should be explored (See Text Box 3 for more information on Ghana's commission). Such a commission, would essentially be a Mining Licence Authority, and should be firewalled from political interference and staffed by industry experts. This body would then oversee the new online cadastral system and ensure strict adherence to licensing timelines. This institutional reform could assist in addressing the "Low Appropriability" constraint by restoring trust and reducing the tax of uncertainty.

Recommendation 3: A full audit of regulatory burden and compliance costs should be conducted to inform a revised bill. It should also explore potential exceptions, especially in relation to (but not limited to) junior mining exploration companies. For example, exploring possibilities of granting certain exemptions to ESG and transformation requirements. The argument is that at the prospecting stage, juniors cannot necessarily handle equity dilution so these requirements should only kick in once a mining right is bankable.

Part of this recommendation is also to streamline the application process by making the DMRE the competent authority in relation to water rights for mining, and the Department of Water and Sanitation the appeals authority.

Given the nature of reforms driven by Operation Vulindlela (OV), mining should perhaps directly form part of OVs reform agenda.

Recommendation 4: A dedicated rapid backlog eradication programme should be pursued to eradicate and fast track outstanding mining rights and prospecting application. Such a programme should include the secondment of extra private sector expertise to accelerate the roll-out of the new cadastral system and to clear the backlog in permits.

This process should also enforce the use it or lose it principle by cancelling and withdrawing unused prospecting and mining rights, which would open up these opportunities to companies that can use these rights for exploration and mining.

The revised bill should also have clear, strict and enforceable timelines for the processing of applications and outcomes of appeals. It is recommended that there should be a commitment to process all prospecting rights within three months.

Recommendation 5: Explore the potential of a Minerals Commission and whether such a commission could be firewalled from political interference and staffed by industry experts.

The concept would be to have an independent regulator, which essentially functions as a Mining Licence Authority, overseeing the new online cadastral system, and enforcing adherence to licensing timelines.

Text Box 3: Ghana's Minerals Commission

In Ghana, the Minerals Commission (MC) serves as the primary statutory body responsible for the regulation and management of the country's mineral resources. Established under the Minerals Commission Act, 1993 (Act 450) and mandated by Article 269 of the 1992 Constitution, it acts as the essential intermediary between the government, the mining industry, and the public. Its overarching goal is to foster a competitive environment that makes Ghana a leading destination for mining investment in Africa while ensuring that mineral extraction contributes to sustainable national development (Ministry of Lands and Natural Resources, n.d.; Mining Indaba, n.d.).

The commission's mandate is largely advisory and regulatory in nature. It is tasked with recommending national policies for mineral exploration and exploitation to the Minister of Lands and Natural Resources and providing technical advice on the granting of mineral rights and the review of mining agreements. Beyond policy formulation, the commission monitors the operations of all entities involved in the minerals sector to

ensure strict compliance with the Minerals and Mining Act, 2006 (Act 703). This oversight includes managing the Register of Mineral Rights, which tracks the status and transfer of all licenses, ensuring that the legal chain of custody for mineral assets remains transparent (LEX Africa, 2022).

A significant portion of the commission's work focuses on the formalisation and regulation of Artisanal and Small-Scale Mining (ASM). Since ASM is legally reserved for Ghanaian citizens, the commission plays a vital role in designating viable areas for these activities and providing the necessary technical assistance to improve safety and environmental standards. This function is critical for local economic development and is managed through specialised units that work to bring informal miners into the legal framework, thereby improving tax collection and environmental oversight (Ministry of Finance, 2015).

Institutionally, the MC is governed by a board of directors appointed by the President, which includes a chairman, a chief executive officer, and representatives from relevant government ministries. This structure is designed to provide a blend of political accountability and technical expertise. While the board sets the strategic direction, the chief executive manages the day-to-day administration and specialised technical divisions, such as policy and planning or monitoring and evaluation.

7.2 Junior Mining and Exploration

Perhaps the most damaging opportunity cost is the lack of future capacity and exploration which translates to a pipeline of new mining projects. For exploration to expand, the operating model and environment of juniors, and venture-capital-funded Greenfields exploration companies need to be considered and accommodated. Referring back to our framework, there are constraints under the “High Cost of finance” branch, particularly in relation to the “high risk” and “high cost” nodes. (Note that this section is a synthesis of interviews conducted with industry experts, hence the limited directed in-text references)

Juniors are usually funded via venture capital, and these companies are normally efficient, agile, and specialise in finding deposits that the majors later acquire. Promoting junior exploration companies is not necessarily difficult, and there are many examples of countries that have done it successfully, for example Australia, Canada, Botswana, etc.

However, the junior mining sector is not well developed in South Africa and, given the limited access to finance, there is a general shortage of junior mining companies. For example, currently, there are only about 12 junior resource companies listed on the JSE, whereas there are over 600 listed on the ASX (Australia) and over 1 600 on the TSX (Canada).

Moreover, some of the industry experts noted that South Africa accounted for 5% of global exploration expenditure in 2003/2004 but has now fallen to less than 1%. In 2024, exploration expenditure in South Africa amounted to a negligible $43 million, compared to approximately $3 billion in Canada (Expert 1, 2025; Leon, 2025). This collapse represents a "lost generation" of mines, and an inability to develop a pipeline of mining projects.

The business model for juniors differs significantly from majors, and so does the type of exploration they typically undertake, with the former focusing on Greenfields exploration, and the latter mostly on Brownfields exploration.

At a global level, junior exploration companies accounts for about 42% of all exploration dollars while large company/majors exploration efforts form the rest. In addition, global estimates for 2024 suggest that over 70% of new mineral discoveries were driven by junior exploration companies and only 30% by the majors, despite junior exploration companies only accounting for about 42% of global expenditures.

In contrast, approximately 90% of exploration in South Africa is Brownfields in nature, which entails exploration by existing companies/majors around their current operations, rather than "Greenfields" (new discoveries). This means that the industry is merely treading water rather than growing through new mineral discoveries. However, the fact that only 9-14% of the country has been geo-mapped at a 1:50,000 scale suggests that the industry has significant untapped potential.

Part of the reason why South Africa's junior mining sector is so underdeveloped can be found in the way the mining sector developed historically in South Africa.

The sector has been dominated by the development of large-scale mining companies, originally based on the mining house system[13]. In many respects, it is the mining house system that enabled the country to develop the particularly large gold, coal, diamond and PGM deposits it has. These mining houses were able to accumulate technical skills, experience and the funding capability, almost acting as their own banks, to develop these massive ore bodies. This system, supported by historic legislation, allowed these large mining houses to accumulate most of the country's mining rights.

The model did not lend much support to junior mining exploration companies, and over the last 150 years, South Africa gained very little experience in these areas with most of the exploration consequently being done by the majors.

As mentioned in section one, the Minerals Act 50 of 1991 was criticised for enabling the hoarding of mineral rights and the "sterilisation of mineral resources" whereby mineral rights could be held without prospecting or mining and essentially be renewed in perpetuity. The MPRDA's use of the "use-it-or-lose-it" principle was an attempt to address the hording of rights and to open up the sector for new investment in exploration.

However, there are concerns that the use-it-or-lose-it principle has not been enforced. Indeed, since 2004, more than 33 000 prospecting rights have been granted, but industry experts estimate that only 10% of these have ever been executed. The main reason for this is that most recipients of prospecting rights lack the financial or technical expertise to do so. And since most of these unused prospecting rights have not been cancelled by the department, this effectively ties up thousands of rights, blocking opportunities for exploration.

For South Africa to become competitive and to develop junior exploration companies there needs to be a fundamental shift in its approach. This new approach will have to be adapted to the high-risk high-reward operating and business models of junior exploration companies, which is distinctly different from the mining activities of majors. Moreover, there needs to be much greater effort made to enhance investment and incentivise investors to provide venture capital to the sector.

The model used in Australia and Canada could be used as a blueprint. Both Australia and Canada have put incentives in place to stimulate the emergence of junior mining firms. For example, Canada achieved success by introducing "flow-through shares", which allow investors to claim back 70 to 100% of their investment in junior mining as a tax credit. Australia has a similar model.

Although the Industrial Development Corporation (IDC) has launched a Junior Mining Exploration Fund (JMEF), allocating R400 million in the first window, and R240 million in the second window, the Junior Mining Council pointed out that the quantum was far too low, and the conditions attached to the funding remained a constraint. There are even cases where funding has been rejected by junior miners because of the conditions attached, since these normally require them to give up significant equity.

[13] System where a few powerful parent companies, the "Mining Houses", provided centralised financial, technical, and administrative services to a large number of individual mining companies.

Based on our framework, this is a classic example of “bad local finance” and poor access to finance.

Given the nature of junior miners and their operating environment, it is recommended that South Africa introduce incentives similar to the Australian and Canadian models, for example flow-through shares, which would improve access and lower the cost of finance. This can be capped per person, but provides direct tax incentives for individuals to invest in high-risk venture-capital activities.

Another aspect that makes junior exploration companies less competitive in South Africa, is the low amount of publicly available high-resolution geo-mapping. Australia and Canada have transparent mineral cadastral systems that provide pre-competitive geological and mining/exploration right information, including high-level geophysical mapping. Junior exploration companies take the pre-competitive exploration data of a country, run various algorithms and find areas of abnormalities that may signal deposits before applying for the prospecting rights in that area. This reduces the risk of exploration significantly, and as such also increases investment.

As such, there needs to be significantly more investment in the Council for Geoscience to enable it to accelerate high-level geophysical mapping and make this pre-competitive data available online. This would reduce the risk to junior miners and to all other potential investors.

Recommendation 6: Introduce incentives for exploration through tax rebates, modelled on the flow through shares model used in Australian and Canadian.

This will increase access to finance and reduce risk.

Recommendation 7: Increase funding to the Council for Geoscience to accelerate high-level geophysical mapping and make this "pre-competitive" data available online. Alternative funding options could be explored to supplement financing via the national fiscus.

7.3 Corruption, Crime, Security and Illicit mining

Crime in the sector and illicit mining has evolved from opportunistic theft to systemic extortion and organised crime. Indeed, it is estimated that sector losses from illicit mining have grown by an estimated 757% from R7 billion in 2017 to R60 billion in 2025 (PwC ,2025; Manduna, 2025; Jacobs, 2025). It is also estimated that more than 10% of South Africa’s chrome is exported illegally, which is 2.7 million tonnes per annum (Lucas, 2025)

Illegal mining and organised crime in the sector are believed to be linked to globally connected criminal syndicates. These groups, known as Zama Zamas in South Africa, are often heavily armed, have explosives and, when trespassing on operating mines, set ambushes and booby traps for employees, security personnel and rival groups of illegal miners (Minerals Council South Africa, n.d.).

To clamp down on illegal exports of minerals, such as illegally mined chrome, one solution adopted by the South African government is to require that exporters of chrome obtain a permit from the International Trade Administration Commission of South Africa (ITAC). However, there have been significant delays in getting this off the ground. In addition, this option poses the risk of adding to the industry’s administrative burden. Another challenge is that this process does not necessarily prevent illicit mining, merely the export of the ore (if implemented effectively).

These illegal mining organisations are often entrenched in government departments. For example, one industry expert described the existence of a "procurement mafia" that shuts down mine operations to demand up to 30% of contracts. It is alleged that illegal mining in the North West province alone stretches DMRE

resources, diverting personnel from processing applications to managing illegal operations (Minerals Council South Africa, 2021).

With the excessive delay in rolling out a transparent cadastre system, which the industry has been calling for some time, the disfunction and lack of transparency also facilitates corruption. This corruption and collusion often exploit the granting of overlapping rights. One industry expert provided a stark example of the corruption enabled by the SAMRAD system: operator X, operating a [commodity X] mine, discovered a mineral called Y on their property. A third party, using insider knowledge from the system, applied for mining rights on the same land. The lack of a digital cadastre meant the department nearly awarded the conflicting right, which would have forced operator X to buy out the third party to protect their operation.[14]

From our framework, this is a constraint that works through the "low appropriability" channels as a government failure in the form of corruption and a threat to property rights. In addition, this is also a constraint that flows through the channel of market failures, via the information externalities node, where the mere discovery of minerals, or application to mine, could pose a risk.

In fairness, it should be noted that in November 2023, a multi-agency initiative known as Operation Vala Umgodi was launched. This operation is a coordinated, national joint operational and intelligence initiative led by South African Police Service (SAPS), aimed at combating illegal mining and associated crimes. Initially, the initiative was set to continue up until 31 May 2025 (Operation Vala Umgodi, 2025). However, the operation has been extended and is likely to be made permanent. The industry has long been calling for a permanent, dedicated Mining Police Task Force to deal in a systemic and organised fashion with the crime afflicting mining.

It should also be noted that a compact on illegal mining is expected to be signed at the 2026 Mining Indaba, taking place on 9 to 12 February 2026. At the time of writing, the content of the compact was not public, but the notion of a compact is a positive development. However, it will be critical for it to focus on all forms of illegal mining and corruption in the sector, including international syndicates, and the possible infiltration of government departments and political structures.

In addition, the Mineral Resources Development Bill makes provisions to combat illicit mining by strengthening criminal sanctions through prohibiting the provision of support services to illegal miners, and by expanding the police's powers. The bill also attempts to formalise artisanal mining, which some believe would reduce some illegal activity.

Recommendation 8: The current actions to address illicit mining and criminal behaviour should be intensified, and Operation Vala Umgodi should be made permanent, along with the establishment of a dedicated mining Police Task Force within the SAPS.

In addition, the provisions in the current bill should be retained in the revised bill, which should strengthen the efforts of Operation Vala Umgodi and a dedicated mining Police Task Force.

Given the magnitude and alleged nature of crime and corruption in the sector, a Judicial Commission of Inquiry should be considered, although its success will depend on the extent to which it is used to enforce the rule of law and prosecute wrongdoing in the sector.

[14] Names and commodity details have been left out due to the sensitivity of the case.

7.4 Network Industries

The collapse of network industries is cited as a primary constraint, although this environment is changing slowly.

Energy: Electricity tariffs have risen 937% since 2007 (Minerals Council, 2025). Pienaar (2012) notes that the surge in prices began aggressively between 2008 and 2011, when domestic prices rose by 151%, eight times faster than in competitor nations like Australia. Since the study by Pienaar, tariff rates have continued to increase at unsustainable rates. This has decimated beneficiation. Operating ferrochrome smelters dropped from 22 to just 2 by 2025 (Minerals Council, 2025). Furthermore, it is estimated that 300 000 to 350 000 jobs have been lost in the broader industrial and smelting economy over the last decade due to electricity constraints and pricing (McKay, 2025).

However, there is progress and South African mines have committed $3.8 billion to solar projects with a capacity of 3,900 MW to mitigate this risk (BDO LLP, 2025). There have also been developments via Operation Vulindlela and South Africa's National Energy Crisis Committee to stabilise electricity supply.

Ultimately, it would be beneficial to the sector if it could reduce its reliance on Eskom via the use of renewables, by generating its own power or via Independent Power Producers (IPPs).

Logistics: The arteries of the mining sector are blocked. The Minerals Council estimates that in 2021 alone, bulk mineral miners lost R35 billion in revenue due to Transnet's inability to meet targeted rail movements, while the full opportunity cost of Transnet not matching the capacity on its rail network amounted to R50 billion (Minerals Council South Africa, 2022). Unlike in Australia, where the mining majors own and operate their own rail infrastructure, South African firms are tied to a failing state monopoly whose performance in rail and port operations have capped the sector's ability to export.

In terms of our framework, these constraints fall under the "Low return to economic activity" branch of the decision tree; more specifically the "bad infrastructure" node. Bypassing is also clear in relation to these constraints in the form of mines committing their own energy projects and using road freight at a higher cost to transport commodities that ought to be transported via rail.

There have been reforms in the network industries, most notably under Operation Vulindlela, however, these need to be sped up. Moreover, regardless of the pace of these reforms, this shows that Operation Vulindlela is focusing on addressing the actual binding constraints and reforming operating models, as opposed to merely fixing what is broken.

Recommendation 9: Private sector investment in rail and ports, and concession models are already under way, however, it should be fast-tracked and expanded.

For example, some industry experts argue that if the coal and manganese lines were privately concessioned, capacity would increase rapidly, which would unlock billions in export revenue.

Text Box 4: The Coal Conundrum: Resilience vs. Vulnerability

The transition away from fossil fuels poses a unique paradox to the South African mining sector: while the workforce is highly vulnerable, the mining companies themselves are surprisingly buoyant.

A study by the University of Cape Town's Future Water Institute highlights the precarious position of coal workers. With 100,000 direct employees and over 2.5 million dependents, the stakes are high. The study found that contract and low-skilled workers, who account for 43% of the workforce, face the highest risk. These risks

are concentrated in Mpumalanga municipalities like Emalahleni, creating a potential "economic crater" if mines close (Tsobo, 2025).

The Minerals Council (2025) also presents a sobering narrative based on the government's Integrated Resource Plan (IRP) 2025. The plan indicates that coal's contribution to the energy mix will fall to 11% by 2042, implying the "death of coal" domestically, with no new coal builds envisaged in the 2025 IRP. This creates a massive conflict: domestic demand is legislated to collapse, while export demand remains robust, provided the logistics crisis can be solved.

Calculations by the Mineral Council paint a bleak picture for coal, based on IRP 2025. Currently Eskom accounts for almost half of SA's total coal production which amounted to approximately 236 million tonnes in 2024.

However, the consumption of coal will drop significantly according to the IRP 2025. Indeed, as shown in the table below, coal use by Eskom is estimated to decrease by 21 million tonnes by 2030, an additional 39 million tonnes by 2034, and a further 62 million tonnes by 2042.

	Year	Eskom coal installed capacity (MW)	Amount of coal used by Eskom (million tonnes)	Reduction in coal used by Eskom (million tonnes) [Reference year 2025]
	2025	42 000	108	
IRP 2025: 50-year life plan	2029	42 000	108	-
	2030	34 000	87	21
	2034	27 000	69	39
	2042	17 960	46	62

Source: Minerals Council

7.5 Total Opportunity Costs of constraints

A critical aspect of the sector's performance is the opportunity cost, the wealth that was not created due to binding constraints. The interviews and historical data provide stark quantifications of this lost value. Table 2 gives a breakdown of the opportunity costs.

Table 2: Opportunity Costs from constraints

Category of Constraint	Specific Mechanism	Opportunity Cost
Administrative / Regulatory	Licensing Backlog: Over 4,000 outstanding mining/prospecting rights.	R30-50 billion per year (6.7% to 11% of sector value in 2024)
Policy uncertainty	Erodes investor confidence	Not able to calculate this.
Logistics	Rail Capacity Collapse: Transnet failure to move bulk commodities (Coal/Iron Ore).	R35 billion- R50 billion per year (7.9% to 11% of sector value in 2024)
Exploration Pipeline	"The Lost Generation": Collapse in exploration spend from 5% of global share (2004) to <1% (2024).	$43 million (Current Spend) vs. $3 billion (Peer Benchmark - Canada)

Category of Constraint	Specific Mechanism	Opportunity Cost
Crime/Illicit Mining	Theft, illicit mining, and corruption, erosion of confidence.	R60 billion per year (13% of sector value in 2024) NOTE: This excludes the impact on investor confidence, the additional cost for greater security, and the cost of doing business
Electricity	Electricity tariff increases and unreliability of energy supply render the sector, and smelters uncompetitive.	300 000 to 350 000 jobs

8. Conclusion

The analysis presented in this paper confirms that the South African mining sector is characterised by a widening divergence between its immense geological endowment and its stagnating economic performance. The evidence paints a picture of a sector defined by a stark economic paradox: South Africa possesses a geological lottery of immense global significance, holding the world's largest reserves of Platinum Group Metals (PGMs), manganese, and chromium, yet it remains trapped in a low-level equilibrium.

As the global economy pivots toward a green energy transition that demands the very commodities South Africa hosts, the domestic sector is failing to capitalise on this demand. Instead of serving as a "sunrise" sector it risks becoming a "sunset" industry, managed for decline not due to a lack of resources, but due to a complex interplay of human-made binding constraints.

By using concepts from the Growth Diagnostics framework, and informed by literature and interviews with industry experts, this paper identifies specific binding constraints that prevent the sector from growing, and developing a pipeline of mining projects.

There is a split reality where majors and juniors face distinct hurdles, yet both are strangled by a deteriorating operating environment. The constraints identified are not merely headwinds, they are effectively high implicit taxes on investment that render the sector uncompetitive against peers like Australia and Canada.

The primary binding constrains to investment and growth were identified as follows:

- **Policy Uncertainty and Regulatory Burden:** The "moving goalposts" of the Mining Charter and the persistent uncertainty regarding Black Economic Empowerment (BEE) targets, specifically the "once empowered, always empowered" dispute, have acted as a deterrent to long-term capital deployment. This was compounded by severe bureaucratic inefficiency. The collapse of the SAMRAD system has resulted in a staggering backlog of over 4 000 outstanding mining rights. This administrative paralysis has stalled billions in potential expenditure and created an environment where transparency is low, and corruption vulnerabilities are high. The opportunity cost is estimated at approximately R30 billion to R50 billion per year.

- **The "Lost Generation" of Exploration:** Perhaps the most damaging long-term constraint is the "failure to launch" within the junior mining sector. South Africa's share of global exploration expenditure has plummeted from 5% in 2004 to less than 1% in 2024. This is driven by a "High Cost of Finance" and a lack of pre-competitive geological data. Without specific incentives to de-risk exploration, such as the flow-through share schemes used successfully in Canada, the country is failing to discover the next generation of deposits, leaving the industry to tread water with brownfields expansion.

- **Inefficient Network Industries:** The sector's ability to export has been capped by the failure of logistics. Transnet's inability to meet rail targets for bulk commodities like coal and iron ore is estimated to cost the industry between R35 billion and R50 billion annually. Simultaneously, the energy crisis has decimated the potential of beneficiation the government seeks to promote. With electricity tariffs rising by 937% since 2007, the ferrochrome smelting industry has collapsed from 22 operating smelters to just two, proving that energy security and affordability are prerequisites for beneficiation.

- **Systemic Crime and Illicit Mining:** A critical finding of this paper is the evolution of crime from opportunistic theft to systemic extortion and organised crime. Illicit mining is no longer a fringe

activity but a parallel industry run by globally connected syndicates, costing the economy an estimated R60 billion in 2025, which is an increase of 757% since 2017. The emergence of "procurement mafias" that demand cuts of contracts and the entrenchment of Zama Zamas threaten not only profitability but the physical security of mining staff and assets. In the language of the Growth Diagnostics framework, the illicit sector represents the "camel" that thrives in a lawless desert, while the compliant "hippos" (legal mines) are suffocated.

The Opportunity Cost and the Way Forward

The cumulative impact of these constraints directly impacts the performance of the sector. However, this decline is reversible. South Africa's mineral endowment remains a formidable competitive advantage. To realise this potential, targeted, high-impact interventions are required.

- **Differentiated Regulation**: Policy must distinguish between the survivalist economics of deep-level mining, the logistics-dependent bulk sectors, and the fragile venture-capital dynamics of juniors.

- **Institutional Reform:** The rapid rollout of the new cadastral system is non-negotiable to clear backlogs and restore investor trust. Going forward the cadastral system should ideally be overseen by an independent Minerals Commission to insulate its administration from political cycles.

- **Network Liberalisation:** The state must accelerate private sector participation in rail and ports to break the logistics bottleneck, alongside the continued deregulation of energy generation.

- **Substantial incentivisation of exploration:** Incentivise exploration through schemes similar to Canada's flow-through shares.

- **An apex priority of the sector and the state's role in the sector is to rule out any illicit activity in the sector.**

- **Significantly increase investment in geo-mapping South Africa.**

In conclusion, the South African mining sector is not in a terminal decline caused by resource exhaustion, but in a manufactured stagnation caused by binding constraints. The capital and the geological wealth exist, but what is missing is the enabling environment to unlock them. By decisively lifting these constraints, restoring the rule of law, fixing logistics, incentivising junior mining exploration and providing policy certainty, South Africa can leverage its critical minerals to transform the sector from a perceived Sunset sector to a Sunrise sector.

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