



South Africa's Critical Minerals Advantage: Building Inclusive Value Chains for Sustainable Industrialisation



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ACRONYMS AND ABBREVIATIONS

AfCFTA	Africa Continental Free Trade Area
AU	African Union
BSS	Battery storage systems
CETM	Critical energy transition minerals
CSIR	Council for Scientific and Industrial Research
DMPR	Department of Minerals and Petroleum Resources
DMRE	Department of Mineral Resources and Energy
ESG	Environmental, social, and governance (standards)
EU	European Union
EUR	Euro (currency)
EV	Electric vehicle
G20	Group of 20 (intergovernmental forum)
GDP	Gross domestic product
JET	Just Energy Transition
JETP	Just Energy Transition Partnership
MPRDA	Mineral and Petroleum Resources Development Act
NATO	North Atlantic Treaty Organisation
NDP	National Development Plan
NEV	New energy vehicle
PGM	Platinum group metals
R&D	Research and development
RDI	Research, development and innovation
REE	Rare earth element
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SADC	Southern African Development Community
STEM	Science, Technology, Engineering and Mathematics
ZAR	South African Rand (currency).

EXECUTIVE SUMMARY

This report presents a desk study of South Africa's critical minerals sector, commissioned by the Southern Africa Resource Watch (SARW) as part of its Strategic Minerals and the Energy Transition in Southern Africa Research Series. It examines how South Africa can leverage its rich mineral resources to build sustainable value chains that promote equitable resource-based industrialisation. The study evaluates the effectiveness of the country's policies, laws, and strategic frameworks for critical minerals, and their capacity to encourage beneficiation, green manufacturing, employment, and a just energy transition. It highlights key critical minerals, including platinum group metals (PGMs), manganese, chromium, vanadium, and rare earth elements, which are crucial for electric vehicles, batteries, storage systems, hydrogen fuel cells, and renewable energy technologies. Notably, South Africa has also designated coal, a fossil fuel, as a highly critical mineral.

As one of the most advanced industrial economies on the African continent, South Africa is uniquely positioned to move beyond exporting raw minerals and to establish itself as a regional and global centre for EV battery materials, battery storage systems, hydrogen technologies, catalytic converters, and other environmentally sustainable industrial products. The government's 2025 Critical Minerals and Metals Strategy, together with proposed amendments to the Mineral and Petroleum Resources Development Act and related mining legislation, provides a robust policy foundation for advancing beneficiation, domestic manufacturing, and regional value chains. Strategic alliances with the European Union under the Clean Trade and Investment Partnership, alongside opportunities presented by the African Continental Free Trade Area (AfCFTA), have the potential to mobilise investment, facilitate technology transfer, and expand market access, thereby supporting this industrial transformation.

Nevertheless, the research delineates multiple structural impediments that continue to restrict South Africa's capacity to extract greater value from its essential minerals. These include regulatory delays, fragmented policy frameworks, obsolete cadastral systems, insufficient electricity supply, elevated and uncompetitive electricity tariffs, grid constraints, and operational inefficiencies in rail and port services. Additionally, minimal investment in downstream processing and manufacturing, coupled with ongoing social and environmental issues, further impede equitable and inclusive development.

The report recommends five strategic priorities: (1) align mineral, industrial, energy, and climate policies within a unified national strategy; (2) modernise mining legislation and licensing systems to promote beneficiation, local content, and regional value chains; (3) invest in reliable, affordable, and competitively priced electricity, transport, and water infrastructure; (4) develop industrial Special Economic Zones dedicated to critical minerals beneficiation and green manufacturing, supported by targeted incentives and robust social and environmental protection measures; and (5) expand skills development, research, innovation, and support for artisanal and small-scale miners, including Zama Zamas, to ensure they are legitimate contributors to inclusive and responsible supply chains.

The report concludes that, if implemented effectively, these reforms can enable South Africa to transform its critical minerals advantage into a foundation for equitable and sustainable industrialisation, job creation, energy security, and inclusive economic growth, while positioning the country as a leading African hub for clean-energy technologies and regional value chains.

1. INTRODUCTION

This policy brief analyses the effectiveness of South Africa's policies, legislation, and strategic plans governing critical mineral value chains and assesses their potential to support green industrialisation and a just energy transition. South Africa has globally significant reserves of platinum-group metals, manganese, chromium, vanadium, and other strategic minerals essential for renewable energy technologies, electric vehicles, battery storage, and green hydrogen. The report examines how current frameworks—including the Mineral and Petroleum Resources Development Act, the Mining Charter, the Critical Minerals and Metals Strategy (2025), and the Just Energy Transition Implementation Plan—can be better aligned to promote local beneficiation, industrial development, job creation, and social and environmental justice. It identifies key constraints, including regulatory uncertainty, infrastructure bottlenecks, high electricity costs, and policy fragmentation. It also proposes practical recommendations to strengthen South Africa's role in regional and global critical mineral value chains.

The report is structured into six sections. Following this introduction, Section 2 provides background on critical minerals and the rapid growth in global demand driven by renewable energy technologies, electric vehicles, artificial intelligence, and defence applications. Section 3 examines South Africa's critical minerals landscape, including the policy and legislative framework, the 2025 Critical Minerals and Metals Strategy, linkages to the Just Energy Transition, grid and infrastructure constraints, and opportunities for skills development, research, and innovation. Section 4 identifies the key policy and implementation challenges that continue to constrain beneficiation, industrialisation, and inclusive value chain development. Section 5 presents detailed policy recommendations focused on integrated governance, social and environmental justice, industrial development, skills and innovation, and regional and global trade integration. Section 6 concludes by highlighting how South Africa can leverage its critical mineral endowment to drive sustainable industrialisation, inclusive economic growth, and leadership in the global green economy.

2. BACKGROUND: CRITICAL MINERALS AND EXPONENTIAL RISE IN DEMAND

Critical energy transition minerals (CETMs) are essential for clean technologies such as batteries, green hydrogen, solar, and electric vehicles.¹ These minerals are also becoming increasingly in demand for the production of microchips that are critical to military technology and artificial intelligence. According to the Department of Minerals and Petroleum Resources (DMPR), South Africa possesses a globally significant share of critical energy transition minerals, holding approximately 88% of the world's PGMs, 80% of manganese, 72% of chromite, and substantial reserves of vanadium, rare earth elements (REEs), and titanium.² The country has 16 commodities ranked in the top 10 internationally and 10% deposits of titanium-group metals,

including zirconium (10%), vanadium (32%), vermiculite (40%), and fluorspar (17%).³

These resources position the country to build green industrial capacity and develop regional value chains, both within the Southern Africa Development Community (SADC) and in the broader African continent. In addition, South Africa has deepened its partnerships with key critical-mineral consumer economies to create avenues for developing value chains in the sector. In this regard, in March 2025, South Africa entered into a partnership with the European Union (EU) under the Clean Trade and Investment Partnership (CTIP) programme. An initial EUR4.7 billion package was announced at the EU-South Africa Summit, while an extra EUR12 billion was extended to Pretoria during the Global Gateway Forum held in Brussels in October 2025.⁴ In addition, South Africa was included in the EU's Global Gateway programme, a partnership that should unlock funding for the country's green economy (including on critical minerals). The funding associated with these EU-South Africa partnerships is, inter alia, earmarked for the extraction, processing, and development of critical mineral supply chains at source.⁵

In 2025, on the sidelines of the G20 Leaders' Summit, Pretoria and Brussels concluded a memorandum of understanding on the development of critical minerals.⁶ These agreements include a value chain development component, with the twin economies aiming to leverage each other's strengths and comparative advantages to ensure security of the critical minerals supply chain. The EU has, in its Critical Raw Materials Act, set out a programme in which the bloc will source critical minerals from countries that adhere to environmental, social and governance (ESG) standards for processing within its market. There are certain materials that can be processed outside the EU, and, in this context, South Africa offers an attractive proposition to Brussels, as the country has normative convergence with the bloc in the mining sector.

However, without structural reforms, South Africa risks failing to achieve concrete outcomes from its critical minerals endowment, regional locational advantages, and sustainable partnerships with key international trade and investment partners, such as the EU.⁷

While South Africa has a mining history dating back to 1870, the industry, despite its significant contribution to GDP, has not been spared from the country's exclusive development. Since attaining democratic rule in 1994, South Africa has made efforts to build a more inclusive economy. Consequently, starting in 2002, South Africa introduced a comprehensive regulatory framework for the mining sector, including the Mineral and Petroleum Resources Development Act (MPRDA),⁸ and the Precious Metals Act.⁹ These regulatory instruments were, in the main, aimed at

1 Department of Mineral and Petroleum Resources. 'Critical Minerals and Metals Strategy', South Africa, 2025.
2 Supra note 1, above.

3 Ibid.
4 EU-South Africa. 'Clean Trade and Investment Partnership', Fact-sheet, 2025.
5 Directorate General for International Partnerships. 'Global Gateway Forum: Team Europe and South Africa mobilise an investment package for inclusive prosperity worth nearly EUR12bn', Brussels, 09 October 2025 (accessed at: [Global Gateway Forum: Team Europe and South Africa mobilise an investment package for inclusive prosperity, worth nearly €12 billion - Global Gateway Forum](#)).
6 See Memorandum of Understanding for the Establishment of a Strategic Partnership on Minerals and Metals Value Chains, (42965/EU XXVIII. GP).
7 PricewaterhouseCoopers. 'Mining Value Chains and the Energy Transition', SA Mine, 2023.
8 Minerals and Petroleum Resources Development Act 28 of 2002 (as amended).
9 Precious Metals Act of 37 of 2005.

aligning the country's minerals ownership and control with constitutionally mandated transformation laws.

At an industrial policy level, South Africa has introduced a raft of policy instruments focused on the exploitation, processing, and value addition of minerals more broadly, and now specifically on critical minerals. Such policy iterations include the Beneficiation Strategy for the Minerals Industry¹⁰ and the recently published Critical Minerals and Metals Strategy of 2025.¹¹

South Africa has also sought to develop a sectoral policy. This is in response to the emergence of new economies around the green energy transition. In this regard, government policy has aligned mineral development with a just energy transition (JET),¹² recognising the dual imperatives of decarbonisation and socio-economic justice. The JET Implementation Plan further complements this by seeking to advance renewable energy, electric mobility, and green hydrogen, while creating jobs and protecting communities reliant on fossil fuels. As indicated, these have been complemented by the Critical Minerals and Metals Strategy published in 2025. This policy brief, therefore, seeks to analyse how South Africa's mineral policies and the JET agenda intersect. It highlights opportunities and gaps in current frameworks and offers recommendations to ensure CETMs contribute to sustainable growth, industrialisation, and an equitable low-carbon transition.

While critical minerals have since become strategic in other sectors of the economy, such as defence and artificial intelligence (AI), Pretoria has thus far emphasised value chain development in the green economy. This is notwithstanding that South Africa has a relatively developed defence manufacturing industry.

The policy brief notes that, while critical minerals have since become strategic in other sectors of the economy, such as defence and artificial intelligence (AI), Pretoria has thus far emphasised value chain development in the green economy. This is notwithstanding that South Africa has a relatively developed defence manufacturing industry. The country's defence industry is classified as second-tier, having peaked in the 2010s with considerable research and development, supplying essential needs for the country's defence force, while maintaining a healthy export sales log.¹³ However, the industry was weakened by poor management, corruption, and unethical sales practices.¹⁴ According to the National Conventional Arms Control Committee, South Africa's military exports have doubled year-on-year since 2020.¹⁵ Most exports are driven by private-sector players, with the state-owned Denel also showing signs of recovery. Most of the exports are destined for the European Union (56%),

Africa (20%), and the Middle East (8%).

The emergence of critical minerals presents an opportunity to recapacitate and resuscitate the industry, and to develop a defence technology value chain. South Africa already has electronic warfare equipment in its export basket, reflecting a base for potential value addition and expansion. The country's adherence to NATO certification standards bodes well for the EU market, which is currently expanding amid rearmament policies in Germany and across the continent's eastern flank. In addition, this is an area where South Africa could collaborate with the United States, a country that has placed the development of critical mineral technologies within the recently renamed Department of War.

3. SOUTH AFRICA'S CRITICAL MINERALS LANDSCAPE

As already highlighted, South Africa possesses a globally significant share of critical minerals, holding significant deposits of critical and strategic minerals, including rare earth elements.¹⁶ This unique endowment makes the country a strategic supplier of inputs essential for clean technologies, including batteries, green hydrogen systems, fuel cells, electric vehicles (EVs), wind turbines, and aerospace alloys. The Critical Minerals and Metals Strategy reflects this realisation and ambition. It is also significant that the strategy proposes developing regional value chains in various areas, including hydrogen, batteries, and catalytic converters.

However, the current minerals value chains remain largely upstream, dominated by extraction and bulk exports. They also remain narrowly focused on developing renewable technologies, with little regard for other emerging economic sectors, such as armaments and artificial intelligence. Beneficiation and midstream industrial activities are underdeveloped, limiting South Africa's ability to capture greater value from its resources.¹⁷ Scaling value addition could enable the country to strengthen domestic manufacturing capacity, develop regional value chains under the African Continental Free Trade Area (AfCFTA), and integrate into global supply chains for energy-transition technologies.

The AU Green Minerals Strategy refocuses the continent on shifting from the 'pit to port' strategy to local processing and value addition to achieve Equitable Resource-Based Industrialisation.

South Africa has demonstrated its interest in continental critical minerals value chain development by being a party to various continental initiatives and frameworks, such as the African Union (AU) Minerals Strategy,¹⁸ the African Commodity Strategy,¹⁹ the African Mining Vision,²⁰ and the African Green Minerals Strategy, which all advance the development of downstream value chains. The AU Green

10 Department of Minerals Resources and Energy. 'A Beneficiation Strategy for the Minerals Industry of South Africa', Pretoria, South Africa, 2011.

11 Supra note 3, above.

12 Presidential Climate Commission. 'A Framework for a Just Transition in South Africa', Pretoria, 2022.

13 Kevin Gopaul, Elma Van der Lingen & Rudolph Ousthuizen. 'The South African Defence Industry: A contemporary comparative analysis of its second-tier nature', African Security Review, Vol.34, No.2, 168-187, 2025.

14 Ibid.

15 Armand Liebenberg. 'Mapping South Africa's Arms Exports: Trends, Key Markets, and Regional Demand', DefenceWeb, 14 February 2025. (accessed at: [Mapping South Africa's arms exports: trends, key markets, and regional demand - DefenceWeb](#))

16 Supra note 2, above.

17 Makgatho, M. and Simelane, T. 'Critical Minerals and Renewable Energy in South Africa'. African Journal of Energy Policy, 2021,7(1), 75-93.

18 African Union. 'Minerals Resources Strategy for the Just Transition and Decarbonising Future', December 2024.

19 African Union. 'African Union Commodity Strategy', Addis Ababa, 2022.

20 African Union. 'Africa Mining Vision', Addis Ababa, 2009.

Minerals Strategy refocuses the continent on shifting from the ‘pit to port’ strategy to local processing and value addition, while the AU Commodity Strategy calls for transforming the continent’s economy from a raw-material-based one to industrialisation through value addition.

The AfCFTA is poised to promote regional value chain development by eliminating over 90% of tariffs and non-tariff barriers. In addition, the AfCFTA, once fully operationalised, will attract foreign investment, with investors taking advantage of lower trade barriers to expand production networks across multiple countries.²¹ As a result, South Africa will be able to take advantage of the AfCFTA to source critical mineral components from different regions, both within SADC and in the broader continent.

It is within this context that South Africa’s own unique endowment of critical minerals underscores its potential to shape regional, continental and global value chains in the green transition. The country holds a large share of the world’s PGMs and significant reserves of manganese, vanadium, and chromium, positioning it as a strategic supplier of essential inputs for renewable energy technologies, electric vehicles, and hydrogen production.²²

South Africa has developed numerous policies and plans to manage its mineral resources, promote beneficiation, and ensure sustainable development of the mining sector. While these policies present significant economic opportunities, they also face challenges related to environmental sustainability, regulatory complexity, and global competitiveness.

3.1 Policy and legislative framework

South Africa’s minerals governance framework is anchored in the Mineral and Petroleum Resources Development Act (MPRDA), which governs the exploration and exploitation of mineral resources. The MPRDA was designed to redress historical inequalities in the sector, but it has faced criticism for bureaucratic inefficiencies, regulatory uncertainty, and licensing delays that deter investment.²³ The country has not modernised its cadastral system, adversely affecting mining exploration.

Attendant to the MPRDA is the Mining Charter,²⁴ a binding code of good practice between the state, mining companies, and local communities. The Charter mandates local content through local procurement, employment equity, and skills development. This code has since been amended multiple times, with the 2018 revision tightening requirements for black ownership and participation to promote inclusive growth.²⁵

The MPRDA and the Mining Charter combined encapsulate the country’s local content requirements. Investors have found these local content requirements onerous and cite them as a barrier to capital investment in the critical min-

erals sector. The Critical Minerals and Metals Strategy is silent on investors’ perennial discomfort with local content requirements. Despite that, South Africa could be banking on the fact that the link to critical mineral exploitation lies in industrial policy and state-centric industrialisation. South Africa’s development of critical minerals value chains will inevitably entail local-content and technology-transfer requirements. This will be in line with the country’s own industrial policy, encapsulated in the Reimagined Industrial Strategy, under which South Africa has sectoral master plans, such as the Automotive Industry Master Plan to 2035 and the South African Steel and Metal Fabrication Master Plan 1.0. These two master plans aim to develop manufacturing capacity in the automotive and steel sectors. South Africa already has a significant automotive value chain, with potential for consolidation as further processing and value addition of PGMs take place.

3.2 The national critical minerals strategy and critical minerals list

Regarding value chains, the Critical Minerals and Metals Strategy notes that South Africa captures less than 1% of mining exploration investment, with only 12 junior miners listed on the Johannesburg Stock Exchange, compared with over 500 in comparable stock markets. To address this challenge, the Department of Trade and Industry has established a ZAR400 million fund to support junior and emerging miners and exploration in the copper, lithium, rare earths and graphite sectors.

South Africa adopted a subjective approach to criticality, based primarily on its economic needs. Coal is classified as a highly critical mineral because the country’s energy needs depend on it. As a result, coal is key in driving the country’s mining and processing of other critical minerals, as part of the country’s industrialisation drive.

Table 1 below lists minerals and metals that South Africa deems highly critical. The inclusion of coal and iron ore may seem unusual on the list. However, South Africa adopted a subjective approach to criticality, based primarily on its particular economic needs. Coal is classified as a highly critical mineral because the country’s energy needs depend on it. As a result, coal is key in driving the country’s mining and processing of other critical minerals, as part of the country’s industrialisation drive.

South Africa’s three-tier critical minerals list reflects the geoeconomic and geopolitical nature of approaches to critical minerals.

21 African Import Export Bank. ‘Regional Value Chains and Intra-African Trade Promotion’, Cairo, 2024.

22 United States Geological Survey. ‘Mineral Commodity Summaries’, Reston, VA, 2024.

23 Cawood, F. and Oshokoya P.O. ‘Resource Nationalism in the South African Mineral Sector: Sanity through Stability’, *Journal of the Southern African Institute of Mining and Metallurgy*, 2012 112(6), 419–425.

24 Department of Mineral Resources and Energy. ‘Mining Charter III’, Pretoria, 2022.

25 Rogerson, C. ‘Mining enterprise, regulatory frameworks and local economic development in South Africa’, *African Journal of Business Management*, 5(35), 2011, 13373–13382.

Table 1: South Africa's Critical Minerals List

High Criticality Minerals	Minerals and Metals
	Platinum
	Manganese
	Iron ore
	Coal
	Chrome ore

Source: South Africa Critical Minerals and Metals Strategy

Table 2 below lists minerals that South Africa has classified as moderately critical. These are minerals that South Africa considers important for driving the critical minerals economy, but are not in short supply for the domestic economy. The minerals are in overall supply in South Africa and are of high importance.

Table 2: Moderate to High Critical Minerals

Moderate to High Critical	Minerals and Metals
	Gold
	Vanadium
	Palladium
	Rhodium
	Rare earth elements

Source: South Africa Critical Minerals and Metals Strategy

Much more interesting is the list of minerals that South Africa accords the least criticality. The list in Table 3 below comprises minerals that most countries would generally assign the highest level of criticality. This is because these minerals are vital to the development of new technologies across sectors such as defence, healthcare, and artificial intelligence.

Table 3: Moderately Critical Minerals

Moderate Criticality	Minerals and Metals
	Copper
	Cobalt
	Lithium
	Graphite
	Nickel
	Titanium
	Phosphate
	Fluorspar
	Zirconium
	Uranium
	Aluminium

South Africa's three-tier critical minerals list reflects the geoeconomic and geopolitical nature of approaches to critical minerals. The debate around critical minerals has, in the main, been driven by consumer countries. These are usually developed economies that require critical minerals to develop their industrialisation and security. In that regard, criticality is mainly driven by supply vulnerabilities, as those countries do not produce the minerals. South Africa has instead adopted an approach that caters for its own economic and industrial policy needs.

3.3 Energy transition and green economy linkages

The Integrated Resource Plan (IRP) of 2025 highlights the role of critical minerals in enabling renewable energy technologies, such as batteries and solar panels. It calls for developing local manufacturing capacity to leverage mineral wealth. Similarly, the Green Economy Accord of 2011 promotes investment in green industries, carbon reduction, and job creation, underscoring the role of critical minerals in enabling sustainable industrialisation.

Despite these advances, persistent challenges remain. Infrastructure deficits hinder efficient extraction and processing, while regulatory inconsistency deters long-term investment. Greater investment in research, development, and innovation (RDI) is also required, particularly through collaboration with institutions such as the Council for Scientific and Industrial Research (CSIR), which is pioneering battery storage systems (BSS) to enhance energy storage and address intermittency associated with solar and wind energy. Sustained research and development (R&D) is vital to developing sustainable processing technologies and ensuring international competitiveness. Government, in its Critical Minerals Strategy's Pillar III, acknowledges and undertakes to ramp up investment in research and development, especially in the battery sector, to ignite local, regional, and international value chains. South Africa must pursue deeper regional energy integration through the Southern African Power Pool and strategic investment, including offtake agreements, in major hydropower projects such as the Grand Inga Dam and the Cahora Bassa Dam, to secure reliable and competitively priced electricity for industrial development.

3.4 Just Energy Transition (JET) and critical minerals

As highlighted, critical minerals underpin South Africa's Just Energy Transition (JET). The Presidential Climate Commission's Just Transition Framework identifies coal, automotive, agriculture, and tourism as vulnerable sectors, and emphasises economic diversification, skills development, and social protection.

The JET Implementation Plan operationalises these priorities through six focus areas: electricity, the Mpumalanga just transition, new energy vehicles (NEVs), green hydrogen (GH2), skills development, and municipal capacity building. Key JET interventions include repurposing coal plants, expanding renewable energy and transmission infrastructure, and attracting funding through the JET Partnership and JET Financing Platform launched in 2024. Importantly, the plan prioritises upskilling and social inclusion to ensure that vulnerable workers and communities benefit from the transition. However, despite the detailed and ambitious transition priorities, limited access to funds has been evident, and promised international funding has not materialised. Grid constraints: Is South Africa performing optimally?

South Africa's energy transition is pivotal for its long-term economic resilience and environmental sustainability. However, the policy framework exhibits critical gaps that undermine its effectiveness. A central challenge is the misalignment

between renewable energy objectives and broader industrial and developmental strategies. While programmes such as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) have successfully increased renewable capacity, expansion is constrained by outdated and limited grid infrastructure, requiring urgent investment in transmission and distribution networks.

Another key weakness is the absence of a robust industrial policy linking renewable energy deployment to domestic supply chains. This disconnect has resulted in limited local content development and missed opportunities to build competitive manufacturing industries in renewable energy components, such as solar panels, wind turbines, and battery systems. Strengthening backward and forward linkages would ensure that South Africa captures more value from the transition, rather than primarily importing technology.

Skills development remains under-prioritised, despite recent interventions such as the 2023 Energy Skills Roadmap. Although the roadmap emphasises training in renewable energy, grid maintenance, and STEM-related fields, implementation is fragmented. Without well-structured vocational and technical training in specialised renewable energy technologies, South Africa risks becoming dependent on foreign expertise, thereby constraining job creation and limiting the competitiveness of its workforce in global renewable energy markets. Unsurprisingly, South Africa has, in recent years, made efforts to engage with partner countries that have more advanced vocational education and training systems, such as Germany and Switzerland.

The Skills Development Act mandates firms, including foreign investors, to transfer skills to their local workforce. During the last decade and a half, South Africa initiated and implemented the Hydrogen South Africa programme, which sought to develop skills and expertise in the sector. Such proactivity has ensured that South Africa is able to consolidate expertise in the envisaged value chain corridors, such as the Mogalakwena Durban Hydrogen Corridor.

Research, development, and innovation remain underfunded and fragmented. Although centres such as the CSIR are pioneering research into battery storage and smart grid solutions, South Africa lacks coherent policies and sustained investment in RDI. This gap undermines the country's ability to develop locally adapted technologies and commercialise innovations that address specific challenges such as energy intermittency.

Regulatory uncertainty compounds these challenges. Frequent policy changes, overlapping regulations, and slow bureaucratic processes discourage investment and delay project implementation. Investors face an unpredictable policy environment, while outdated grid infrastructure, originally designed for centralised coal-based generation, cannot efficiently integrate decentralised renewable energy projects.

The recently concluded EU-South Africa Clean Trade and Investment Partnership (CTIP) undertake to provide funding for renewable energy infrastructure projects. Such funding will enhance South Africa's efforts to establish green critical minerals value chains. Cooperation between South Africa and the EU is necessitated by the latter's objectives to acquire critical minerals and associated components from green-source countries. This will align with the production methods embedded in the EU's Carbon Border Adjustment

Mechanism.

The grid's inadequacy is one of the most significant barriers to scaling renewables. Ageing infrastructure has limited capacity to integrate variable sources, such as solar and wind, thereby exacerbating load-shedding and slowing project connections. Although initiatives, such as utility-scale battery storage, offer potential solutions, insufficient investment in grid upgrades threatens to stall South Africa's renewable transition.

Taken together, these challenges highlight the urgent need for a comprehensive and integrated energy policy framework. Such a framework must align renewable expansion with industrialisation, skills development, and innovation, underpinned by predictable regulation and large-scale grid investment. This is not to underestimate the false dichotomy in the renewable energy dilemma, where there is an expectation that energy must reach a certain scale before investors can commit. There is an argument for developing critical-mineral value chains from the current grid configuration and for addressing energy limitations over time.

3.5 Social and environmental justice

South Africa's just energy transition aims to shift from coal-based energy to renewable energy to reduce carbon emissions and mitigate climate change. However, this transition raises critical social and environmental justice concerns. Many communities depend on coal mining for livelihoods, yet current policies inadequately address the socio-economic impacts of mine closures and energy restructuring, generating resistance in affected regions. South Africa's efforts towards a just energy transition have been further undermined by the failure of developed countries to fulfil their pledge to contribute to the programme. This was after the USA pulled out when President Trump assumed his second term. The EU has sought to fill that gap through the CTIP and the Global Gateway programme.

Environmental considerations, including land-use changes, biodiversity loss, and ecosystem degradation, are often insufficiently integrated into planning. Comprehensive environmental assessments and deliberate attention to environmental justice are essential to ensure that the energy transition is equitable, inclusive, and sustainable.

The South African Constitution provides for the protection of environmental and human rights, while the Mining Charter speaks to community and social rights. A combination of these provides a solid bedrock for South Africa's environmental, sustainability, and governance standards, which are key to building legitimate and resilient critical minerals supply chains.

3.6 Opportunities to strengthen policy coordination

South Africa has opportunities to improve coordination between renewable energy policy and broader economic development strategies. Aligning renewable energy initiatives with industrial policies can create a cohesive

framework that promotes economic growth, job creation, and sustainable industrialisation. The outdated 2011 Beneficiation Strategy does not adequately address the renewable energy sector's infrastructure needs, particularly for local manufacturing of solar panels, wind turbines, and related components. Therefore, strengthening collaboration between government departments, industry stakeholders, and educational institutions can streamline regulatory processes, reduce policy fragmentation, and enhance the effectiveness of JET-related initiatives.

3.7 Skills development and workforce training

Investing in workforce skills is critical for the growth of South Africa's renewable energy sector. Targeted technical, managerial, and entrepreneurial training programmes can develop a workforce capable of driving innovation and competitiveness in clean energy technologies. Programmes such as the JET Skilling for Employment Programme (JET SEP) aim to create 150,000–200,000 jobs by 2025, and up to 400,000 jobs in the renewable energy sector by 2050. These initiatives not only expand employment opportunities but also build the human capital necessary to sustain the country's low-carbon energy transition.

3.8 Research, development, and innovation

Enhancing R&D is a strategic opportunity for South Africa to strengthen its renewable energy sector. Greater investment in R&D, coupled with collaboration among government, industry, and academic institutions, can accelerate the development of locally adapted technologies. Establishing dedicated funding mechanisms and supporting centres of excellence (such as the Microgrid Centre of Excellence at the CSIR, and research units at Stellenbosch University and the University of Pretoria) can enable South Africa to become a global leader in renewable energy innovation, while fostering sustainable economic growth and industrial capacity.

It is therefore encouraging that South Africa has prioritised research and development in the critical minerals sector to drive innovation and strengthen value chain development. In this regard, Pillar III of the country's Critical Minerals Strategy establishes a couple of key research and development institutes. These include the National Critical Minerals Research, Development and Innovation hubs, which feed into a Critical Minerals Testing and Certification Centre. The government also establishes a Research and Development Commercialisation Fund to bolster start-up development and the uptake of innovation projects.

South Africa's ageing rail networks, port congestion, and electricity supply deficits undermine the competitiveness of the mining sector.

citing instances in which permits for aggregate mining were issued on land already covered by coal-mining licences. Such incidents undermine regulatory certainty and investor confidence. The Department of Mineral Resources and Energy (DMRE) acknowledged that this should not occur and said it would investigate such cases.

Investors have consistently raised concerns about delays and uncertainties in the licensing process under the Mineral and Petroleum Resources Development Act (MPRDA), which affect exploration and project implementation. These challenges could be mitigated through streamlined licensing procedures, reduced bureaucratic overlap, and better alignment of mining legislation with associated codes. The government would best expedite the operationalisation of a digitised cadastral and exploration regime. The government itself is aware of these challenges and concedes that a harmonised mining regime will lead to policy certainty. A predictable regulatory environment would not only reduce confusion but also create a more favourable climate for both local and foreign investment. As a young democracy, South Africa engages in extensive experimental policy-making, leading to inherent policy uncertainty. However, as indicated, measures have been taken to minimise this uncertainty and improve regulatory and policy certainty. Infrastructure development is another pressing challenge. The extraction, processing, and export of critical minerals depend heavily on reliable transport and energy systems. South Africa's ageing rail networks, port congestion, and electricity supply deficits undermine the competitiveness of the mining sector. Prioritising investment in transport corridors that link mining provinces to processing hubs and ports, such as Mpumalanga and Limpopo, could significantly enhance efficiency.

Internal transport hubs should be linked to regional corridors, such as the North-South Corridor, to develop critical-minerals value chains with wider reach. Border-based Special Economic Zones, such as the Musina Makhado Special Economic Zone, are key to developing critical minerals value chains. Developing infrastructure around these zones and streamlining border procedures would help unlock the potential of the regional critical minerals value chain.

At the same time, integrating renewable energy into mining operations would lower costs and reduce the sector's carbon footprint, positioning South Africa as a global leader in sustainable mining.

4.2 Electricity costs and infrastructure bottlenecks

Industry stakeholders have warned that high electricity tariffs are eroding the competitiveness of energy-intensive sectors, particularly ferroalloys. They note that, while beneficiation is central to South Africa's industrialisation goals, persistently high power costs threaten the viability of local smelting and processing. The government has reportedly approved an intervention plan for smelters, with the National Treasury exploring financial instruments to support a preferential electricity pricing framework for energy-intensive sectors.

Beneficiation and green manufacturing remain underdeveloped, despite South Africa's resource en-

dowment. Currently, the country exports much of its critical minerals in raw or semi-processed form, foregoing opportunities for industrialisation and value addition. Incentivising local beneficiation through targeted tax breaks, subsidies, and infrastructure support could stimulate domestic processing industries. Establishing green technology clusters that are focused on renewable energy technologies, such as electric vehicle (EV) batteries and solar panels, would not only advance industrial diversification but also support South Africa's ambition to participate in global clean energy value chains.

This is in line with the Critical Minerals Strategy, which highlights the successes of the Hydrogen South Africa programme, as reflected in the Hydrogen Society Road Map, and the government's intention to build on them as it seeks to establish a hydrogen-dependent battery and fuel cell manufacturing hub.

Investment in research and development is vital. South Africa can position itself as a pioneer in environmentally sustainable mining technologies, but current innovation funding remains limited. Prioritising clean technologies and environmentally friendly beneficiation methods would align the sector with JET goals, while building local technological capabilities. Public-private partnerships in RDI, along with international collaborations, could accelerate the development of advanced beneficiation techniques adapted to South Africa's unique mineral profile (World Bank, 2023).

Equipping the workforce for the green economy is another strategic priority. The shift from carbon-intensive sectors, such as coal, to renewable energy and mineral beneficiation threatens to displace many workers. To mitigate this risk, South Africa must expand reskilling and upskilling programmes in renewable energy, advanced manufacturing, and green technologies. Investing in vocational education and technical training would not only ensure a smooth labour market transition but also reduce unemployment by creating a pipeline of skilled workers who can support the green industrialisation agenda.

South Africa's engagement in international trade and investment partnerships is vital. Strengthening trade agreements and securing funding from global climate initiatives can expand the country's competitiveness in supplying critical minerals. For instance, the Just Energy Transition Partnership (JETP) has pledged \$8.5 billion to support South Africa's transition, although this falls far short of the estimated \$98.7 billion required between 2023 and 2027. Mobilising additional international funding and leveraging bilateral agreements with key markets, such as the European Union and China, will be essential for scaling up the country's role in global value chains.

4.3 Formalisation of Artisanal and small-scale mining and governance reforms

The Just Energy Transition Partnership (JETP) has pledged \$8.5 billion to support South Africa's transition, although this falls far short of the estimated \$98.7 billion required between 2023 and 2027.

third-largest employer after agriculture and retail trade (World Bank 2024). In South Africa, artisanal miners—commonly referred to as Zama Zamas (a Zulu phrase meaning “those who try” or “those who take a chance”)—are often treated as informal or illegal operators rather than as legitimate participants in the mineral economy, despite their contribution to local livelihoods and their potential role in discovering and supplying strategic minerals (Carry and Jall 2024). Formalising ASM through the Mineral Resources Development Bill, 2025, therefore, represents an important policy shift. The proposed legislation introduces a dedicated permitting regime, designated mining zones, and stronger provisions for occupational health and safety, environmental management, and responsible mining practices. These reforms can help transform ASM from a marginalised survival activity into a recognised contributor to South Africa's critical minerals strategy, green industrialisation agenda, and Just Energy Transition. Artisanal mining could also play a pivotal role in strengthening regional value chains, given that the Southern African Development Community (SADC) hosts a substantial ASM ecosystem involved in the production of strategic and industrial minerals.

South Africa should move beyond the criminalisation of Zama Zamas and adopt a comprehensive support framework that treats artisanal miners as valued economic actors and future entrepreneurs. This requires dedicated public funding to strengthen the Department of Mineral and Petroleum Resources' capacity to legalise operations, provide geological information, conduct inspections, and deliver technical assistance for safer, cleaner mining methods. Access to affordable finance, appropriate equipment, and cooperative business models is equally important for improving productivity and incomes, reducing child labour and gender-based violence, and enabling miners to meet environmental, social, and governance (ESG) standards (Hilson 2020). A small portion of fiscal revenues generated from large-scale mining should be earmarked to finance ASM formalisation and support programmes. South Africa has already taken important steps through the Artisanal and Small-Scale Mining Policy of 2022, the Mining Resettlement Guidelines, and the Department's Small-Scale Mining Support Programme, which seeks to integrate previously disadvantaged individuals into the sector. If properly regulated and supported, Zama Zamas can become an important source of responsibly produced minerals, contribute to local beneficiation and regional value chains, and evolve into the medium-sized mining enterprises of the future.

These reforms must be accompanied by broader governance improvements. Studies have shown that some illegal mining syndicates exploit vulnerable Zama Zamas and are linked to forced labour and other social ills, underscoring the urgent need for stronger law enforcement and institutional coordination (Carry and Jall 2024). In response, the review of the Mineral and Petroleum Resources Development Act aims to increase penalties and to classify unauthorised mining as a distinct criminal offence. Formalisation is therefore not only a governance reform; it is also a strategic investment in inclusive development, poverty reduction, responsible critical mineral supply chains, and a more equitable and sustainable mining sector in South Africa.

4.4 Alignment of policies, plans, and strategies with South Africa's jet plans

South Africa's JET initiative is a comprehensive national effort to shift away from a coal-dominated energy system, towards a low-carbon economy that prioritises renewable energy, environmental sustainability, and social equity.

GRANT FINANCE AND THE JET FUNDING PLATFORM

Financing the transition must prioritise the needs of affected workers and communities, ensuring that the shift to a sustainable economy is equitable and socially responsible. Since 2023, a JET Funding Platform has been created to connect grant-makers with JET projects in need of financial or technical assistance. By providing project-preparation support to help initiatives become 'grant-ready', the Platform aims to close systemic gaps and link initiatives that cannot access commercial finance. Its focus areas align with core just transition priorities, including reskilling and capacity building for workers in coal-dependent communities, economic diversification, and testing community-owned renewable energy models. The facility includes support for projects such as the Komati Training Facility, which is based at the decommissioned Komati coal power station in Mpumalanga. The training facility delivers reskilling programmes for former Eskom employees and surrounding communities, with training centred on solar energy and electric vehicle maintenance. The Platform also commits to providing regular updates on grant deployment and offering project-preparation assistance to help project originators meet grant requirements.

Source: Just Energy Transition Project Management Unit, South African Presidency

Given the country's heavy dependence on coal, the JET is not only about reducing greenhouse gas emissions, but also about mitigating the socioeconomic risks of transition for workers and communities.

Policies and legislation such as the MPRDA, the Mining Charter, the Beneficiation Strategy, the REIPPPP, and the National Development Plan (NDP) play central roles in shaping how South Africa navigates this transition. However, gaps in alignment between these policies and JET objectives remain.

The MPRDA is the cornerstone legislation regulating the mining and petroleum sectors in South Africa. It aims to promote equitable access to resources, sustainable development, and broad-based economic participation.²⁶ As South Africa is a major producer of critical energy transition minerals, the legislation is central to ensuring that these resources are utilised to support renewable energy technologies, including hydrogen fuel cells and battery storage.²⁷ While the MPRDA aligns with JET goals by mandating

sustainable development, its original design was oriented toward traditional extractives, including coal, rather than critical minerals. Furthermore, it has been criticised for weak environmental enforcement, which risks undermining South Africa's decarbonisation goals.²⁸ Amending the MPRDA to prioritise critical minerals and strengthen environmental safeguards explicitly is underway, and there is a need to ensure that the outcomes include provisions that advance the imperatives of a just transition.

The Mining Charter seeks to transform the industry by promoting equitable access, broad-based ownership, and socioeconomic development. It includes provisions for local employment, skills development, and community benefits, which align with JET principles of equity and inclusion.²⁹ The Charter complements the social justice dimension of the energy transition by ensuring that vulnerable communities and historically marginalised groups benefit from mineral wealth.

However, enforcement of the Charter has been inconsistent, thus limiting its effectiveness. It has yet to fully address the requirements of the renewable energy sector, such as prioritising critical minerals and integrating local manufacturing of green technologies.³⁰

South Africa's Beneficiation Strategy is another critical policy tool that supports the JET by aiming to increase domestic value addition from mineral resources. By promoting downstream industries in renewable energy infrastructure, electric vehicle components, and other clean technologies, the strategy provides a pathway for green industrialisation and job creation.³¹ Yet, implementation has been slow due to regulatory bottlenecks, infrastructure deficits, and limited investment incentives. Strengthening beneficiation policies could help replace jobs lost in coal mining with sustainable employment opportunities in emerging clean-energy industries.

Renewable energy policies, particularly the REIPPPP, have played an important role in advancing South Africa's decarbonisation agenda. Since its launch, the REIPPPP has attracted significant private investment in solar and wind power, contributing to the diversification of the energy mix.³² These policies directly support JET goals by promoting decarbonisation and energy security. However, persistent challenges, such as grid capacity constraints, financing shortages, and slow project approvals, have limited their effectiveness.³³ Greater investment in transmission infrastructure and the integration of industrial development strategies into renewable energy planning are necessary to fully align these policies with the JET. Finally, the NDP 2030 provides an overarching vision for sustainable development and economic inclusion in South Africa. It explicitly recognises the importance of transitioning to a low-carbon economy, retraining displaced workers, and ensuring inclusive growth.³⁴ While the NDP aligns conceptually with JET objectives, gaps remain in implementation, particularly in linking critical mineral beneficiation to renewable energy development, ensuring adequate community engagement, and developing regional value chains.

²⁸ Supra, note 56, above.

²⁹ Supra, note 60, above.

³⁰ United Nations Economic Commission for Africa (UNECA). 'Critical minerals and Africa's Green Industrialisation Pathway', 2023.

³¹ Supra, note 59, above.

³² Supra, note 54, above.

³³ Supra, note 59, above.

³⁴ Ibid.

²⁶ Supra, note 51, above.

²⁷ Supra, note 40, above.

4.5 Regional value chains

The distribution of critical mineral deposits across Africa highlights the strategic importance of regional cooperation. Hardly any country has all the mineral resources to complete a value chain domestically. South Africa is a mineral-rich country that is part of a region that includes the Democratic Republic of the Congo (DRC) (first in cobalt, fifth in copper), Zambia (eleventh in copper), Zimbabwe (fifth in lithium), Mozambique (third in graphite), and Madagascar (fourth in graphite, eighth in rare earths). This geographic context underscores the region's pivotal role in supplying the raw materials needed for clean energy technologies globally. This is a factor that has been recognised and made pivotal in the South African Critical Minerals and Metals Strategy.

It is therefore compelling to establish a regional critical minerals value chain within the SADC and AfCFTA regions to maximise economies of scale and increase both competitive and comparative advantages. Practical efforts to follow up on continental initiatives, such as the African Continental Free Trade Area (AfCFTA), African Mining Vision (AMV), and Africa's Green Mineral Strategy (AGMS), could also strengthen regional cooperation across critical minerals and renewable-energy value chains. In addition, such an alignment should include SADC's Regional Indicative Strategic Development Plan, which would ensure that the regional critical minerals value chains are building blocks to the continental initiatives, provided for in the AfCFTA and other policy iterations.

South Africa's G20 presidency has provided a basis for consolidating existing international partnerships with like-minded partners, both on the continent and abroad. The Critical Minerals Strategy recognises this and offers viable pathways linking the country's domestic agenda to that of key economies, such as the EU.

5. POLICY RECOMMENDATIONS FOR ADVANCING GREEN INDUSTRIALISATION IN SOUTH AFRICA

5.1 Integrated policy and governance

South Africa should establish a unified industrial–energy–climate policy framework that links mineral beneficiation to renewable-energy value chains, such as EV batteries, solar panels, and wind turbines. This requires aligning the Department of Trade, Industry and Competition's Industrial Policy Action Plan (IPAP) with the Integrated Resource Plan (IRP) and national climate strategies to ensure coherence and prevent fragmented implementation.³⁵ Anchoring the just energy transition within broader industrialisation and climate resilience goals will be essential. Encouragingly, the Critical Minerals Strategy establishes a framework to secure the country's position in global clean energy supply chains.

³⁵ Supra. Note 43, above. See also: United Nations Economic Commission for Africa. 'Critical Minerals and Africa's Green Industrialisation Pathway', Addis Ababa, 2023.

The Critical Minerals Strategy rightly draws lessons from other mineral-rich economies in the region and abroad, including Zambia, Canada, Australia, the EU and the United States. The strategy is focused on attracting investment, improving governance, and ensuring sustainable resource management. The Critical Minerals Strategy is located within a broadly shifting geoeconomic and geopolitically contentious environment, driven by a minerals race.

5.2 Inclusive social and environmental transition

To ensure justice, the JET must embed strong social and environmental safeguards. This includes prioritising vulnerable coal-dependent communities through social protection measures, job retraining programmes, and inclusive consultations.³⁶ Environmental regulations should be strengthened, with strict enforcement of environmental impact assessments (EIAs) and safeguards that address land-use change, biodiversity loss, water use, waste management, and community rights.³⁷ This will also align with the country's partners, of which the envisaged critical minerals value chains will be a part. These include the EU's Due Diligence Directive,³⁸ which focuses on environmental sustainability standards, including corporate social responsibility.

In addition, innovative models should be implemented to mitigate post-closure job losses and community disruption by converting marginal mine shafts into small-scale, employee-run enterprises that incorporate profit-sharing and discourage illegal mining.³⁹

5.3 Economic and industrial development

Expanding financial incentives, as provided for in the Critical Minerals Strategy's Pillar V, will be critical to fostering beneficiation and green technology industries. Financial interventions proposed in the strategy include tax incentives, subsidies, low-interest loans, and access to climate finance, as well as the establishment of special economic zones (SEZs) with targeted research and development grants, streamlined regulations, and advanced infrastructure. The Critical Minerals Strategy calls for reducing dependence on foreign funding and instead supporting small, medium, and micro enterprises (SMMEs) through instruments such as funding schemes, incubators, and technical assistance, while mandating local content requirements to stimulate domestic demand for processed minerals. Another area of focus for the Critical Minerals Strategy concerns infrastructure for transport, logistics, and energy across the entire critical minerals value chain. In this regard, the Critical Minerals Strategy establishes a Green Mining Infrastructure Support Initiative to promote infrastructure investments. Integrating renewable energy into beneficiation processes will reduce production costs and decarbonise

³⁶ Supra, note 28, above.

³⁷ Supra, note 44, above.

³⁸ European Council and Parliament of the European Union. 'Directive (EU) 2024/1760 of the European Parliament and of the Council', June 2024.

³⁹ Supra, note 64, above.

energy-intensive industries.⁴⁰

5.4 Skills, research, and innovation

Developing a skilled workforce is central to the green transition. A national green skills strategy should be implemented to address the labour needs of emerging industries, with initiatives such as the JET SEP scaled up to include more youth and women. Partnerships between industry, universities, and technical and vocational education and training (TVET) colleges should drive skills development in advanced manufacturing, renewable energy, grid management, and green entrepreneurship.⁴¹

Simultaneously, investment in research, development, and innovation (RDI) must be expanded to create innovation hubs and centres of excellence. Public–private partnerships should be leveraged to develop locally adapted technologies such as microgrids, battery storage, biogas systems, and advanced mineral processing.⁴² The Critical Minerals Strategy maps out ways in which research, development and training can be undertaken to maximise the gains from critical minerals value chains, while contributing to inclusive economic development.

5.5 Formalise and support artisanal and small-scale miners (ASM)

South Africa should formalise and support artisanal and small-scale miners, including Zama Zamas, as legitimate participants in the mining sector and strategic contributors to critical mineral value chains. This requires simplified licensing, designated ASM zones, and stronger occupational health, safety, and environmental standards under the Mineral Resources Development Bill, 2025. The government should allocate dedicated funding to provide geological information, technical assistance, affordable finance, and access to appropriate equipment and markets. If properly regulated and supported, ASM can generate jobs and livelihoods, reduce illegal mining, and contribute to local beneficiation, regional value chains, and inclusive green industrialisation.

5.6 Global and regional trade integration

To build on what the country has already achieved, Pretoria needs to consolidate global and regional trade linkages, towards regional and continental value chains. South Africa should continue forging bilateral and multilateral agreements to secure markets for value-added mineral exports, particularly with the EU, the USA, and China, while leveraging the African Continental Free Trade Area (AfCFTA). Such an integrated approach will enhance the

expansion of intra-African trade and joint Research and Development on green technologies.⁴³ Mobilising climate finance, blended financing models, and public–private partnerships will accelerate the development of renewable energy and green infrastructure, if these financing mechanisms are transparent, socially inclusive, and environmentally responsible.⁴⁴

A welcome response is South Africa’s realisation and commitment to drive an industrial policy agenda that deepens regional integration, both from a policy perspective and through private-sector-led critical-minerals value chains. This approach includes supporting the acquisition of mining operations across the region to ease supply-side challenges, as the country seeks to position itself as a hub for critical minerals value chains. The Critical Minerals Strategy provides a comprehensive response through, inter alia, facilitating regional critical minerals cooperation agreements, co-investing in a South Africa-based regional minerals beneficiation hub, and implementing the UN Panel on Critical Energy Transition Minerals.

For the above strategies and policies to be fully implemented and attain the desired outcomes, the government must employ the trade and industrial policy tools at its disposal. Such tools will enable the government to avert external threats, such as dumping, that can imperil its internal efforts to build a critical-minerals value chain. South Africa will have to, through the International Trade Administration Commission, raise tariffs in sectors that require protection. There is already a surge of cheap imports into South Africa from economies such as China.

6. CONCLUSION

As Gwede Mantashe, South Africa’s Minister of Mineral Resources and Energy, argues in the All-Critical Minerals Required for a Green Economy are in Africa video,⁴⁵ Africa possesses nearly all the critical minerals required for the global transition to a green economy. These include lithium, cobalt, nickel, rare earth elements, and South Africa’s platinum-group metals, which are essential for clean energy systems, electric vehicles, and energy storage technologies.⁴⁶

This mineral endowment places South Africa in a strategic position to become a key player in the global green industrial revolution. However, as Mantashe notes,⁴⁷ Success depends not only on resource extraction but also on moving up the value chain by developing local processing, refining, and manufacturing capacity to capture greater economic value.

Realising this potential requires an integrated framework: aligning policy and regulatory frameworks to attract responsible investment; embedding strong ESG safeguards to address risks such as community land rights, labour conditions, and corruption;⁴⁸ modernising infrastructure

40 Baker, L. and Phillips. ‘Tensions in the Transition: The Politics of Electricity Distribution in South Africa’, 37(1), *Politics and Space*, 177–196.

41 Supra, note 28, above.

42 Council for Scientific and Industrial Research. ‘Just Energy Transition: CSIR and Key Energy Stakeholders Launch Microgrid Centre of Excellence’, Pretoria, 2023.

43 Southern Africa Resource Watch. ‘Leveraging AfCFTA for Critical Minerals Beneficiation’, 2025

44 World Bank. ‘Financing Africa’s Green Industrialisation: Lessons from Global Critical Minerals Strategies’, Washington DC, 2022

45 Mantashe, G. ‘Remarks by the Honourable Minister of Mineral Resources and Energy’, *African Critical Minerals Summit*, Sandton Convention Centre, Johannesburg, August 2023.

46 United Nations Economic Commission for Africa. ‘Critical Minerals and Africa’s Green Industrialisation Pathway’, Addis Ababa, 2023

47 Supra, note 86, above.

48 World Bank. ‘Financing the Just Transition: Policy Pathways for Inclu-

(transport, energy, water); and fostering domestic skills and innovation.⁴⁹

By coupling these measures with deeper regional and global trade integration through the African Continental Free Trade Area, South Africa can leverage its critical mineral wealth to become a competitive supplier of green technologies. If done right, this approach will enable the country to drive inclusive economic growth, support the global clean energy transition, and ensure that the shift to a low-carbon future is both just and sustainable.

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⁴⁹ sive Green Growth', Washington DC, 2022.
⁴⁹ Supra, note 15, above.

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