

Business model innovation towards energy transition in emerging markets: The case of
South African coal industry

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ABSTRACT

The global commitment to mitigate climate change necessitates the decarbonisation of the energy sector, presenting a profound dilemma for coal-dependent firms regarding business survival and the execution of fundamental resources reconfiguration and business model innovation (BMI). This exploratory cross-sectional qualitative study addresses the critical gap by empirically detailing the actionable frameworks decision-makers use to overcome deep-seated financial, operational and cognitive barriers within the constrained context of the South African coal industry. The study utilises the resource-based view (RBV) and dynamic capabilities (DC) as its theoretical lens to explore how decision-makers allocate resources and adapt capabilities to enact BMI. The South African context acts as a critical proxy for other emerging markets facing analogous multifaceted challenges.

This research employed an exploratory cross-sectional qualitative study design. Data was collected via semi-structured interviews, from a non-probability sample of 14 executive and senior managers. Participants were drawn from three distinct firm classification in the coal value chain: Emerging Coal Miners (ECM), Major Coal Producer (MCP) and Coal-fired Utility (CFU). Findings were systematically analysed using thematic analysis. Results reveal that external financial and geopolitical limitations, such as financial institutions turning away from coal, paralyse BMI adoption. Decision-makers understand the morality of the change but argue that base load limits make coal important for energy security for 20–30 years. The main strategy is progressive organisational transformation. Due to external financial exclusion, internal optimisation (maximising coal cash flow) is the major internal cross-funding mechanism, which funds measured diversification into renewables and critical minerals.

The findings provide critical, actionable frameworks and detailed empirical validation for policymakers and decision-makers in high-carbon industries globally. Recommendations include adopting a dual strategy of intense internal cost optimisation and simultaneous strategic narrative management to secure policy and financial viability for diversification venture.

Keywords: business model innovation, energy transition, resource-based view, dynamic capabilities, emerging markets.

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Philosophy in Corporate Strategy at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Captain Sebothoma

23 November 2025

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1. CHAPTER 1: INTRODUCTION

1.1. Background to the research problem

1.1.1. Commitment to low-carbon electricity

The Paris Climate Agreement, adopted in 2015 (Liu et al., 2020), necessitates a move towards a low-carbon economy and the decarbonisation of the energy sector (Xaba, 2023). As a signatory, South Africa acknowledges the necessity of moving towards a climate resilient society (Xaba, 2023). This global transition, intended to stabilise greenhouse gas (GHG) emissions and prevent disastrous climate change, presents a profound theoretical dilemma for coal-dependent firms: how to ensure business survival and execute fundamental resource reconfiguration and business model innovation (BMI) despite being locked into centralised, high-carbon assets. South Africa has voluntarily committed to international measures intended as reducing GHGs, which influences government policy regarding energy. This objective can be achieved by enforcing the usage of renewable energy sources for electricity generation, as demonstrated in the Integrated Resource Plan (Department of Mineral Resources, 2025). Reducing the use of coal and reliance on this energy source has significant positive environmental effects.

1.1.2. The importance of coal in South Africa

Coal is a vital resource that supports economic growth in important areas including industry and investment (Erdogan et al., 2025). South Africa's coal reserves are estimated at 53 billion tonnes and satisfies approximately 72.1% of the country's primary energy requirements (Eskom, n.d). Coal is commonly used because it is inexpensive and conveniently accessible (Erdogan et al., 2025). Steenkamp (2024) estimations indicate that coal is directly and indirectly linked to about 106,887 jobs in the mining and power generation sectors.

1.1.3. A sustainable strategy for coal utilisation

Emerging markets are experiencing expanding electricity demands, and coal may be required in the short term to meet this growing demand (Zhao & Alexandroff, 2019). However, a responsible solution to satisfy the electricity demand entails using the cleanest, most efficient technology available in order to decrease the harm caused by the expansion of coal-fired power plant capacity (Zhao & Alexandroff, 2019). Li (2021) argue that clean coal utilisation should prioritise the next generation of clean, safe, low-carbon, efficient, flexible and smart coal-fired power generation technologies by significantly increasing coal utilisation efficiency, efficiently facilitating a substantial online share of renewable energy for electricity generation

while reducing carbon emissions. For the attainment of low-carbon development, coal must be produced and utilised in a clean and efficient manner (Jie et al., 2021). The progression of coal technology enables growing economies to provide cleaner energy alternatives while still utilising coal to satisfy their energy requirements (Zhao & Alexandroff, 2019). The primary technologies facilitating a more environmentally friendly utilisation of coal remain expensive, and most are not yet globally commercially accessible (Banks et al., 2015). According to Banks et al. (2015), clean coal technologies will require supplementary time and governmental assistance, encompassing financial incentives and research and development (R&D), to attain extensive deployment and reduce costs.

1.1.4. Challenges arising from the energy transition (ET)

Transition away from fossil fuel production constitutes a primary challenge for coal-dependent firms (Wang & Lo, 2021). According to research, the ET would result in greater inequality and an uneven allocation of advantages and impacts for both source and user firms (Chipangamate & Nwaila, 2024). Chipangamate and Nwaila (2024) identify five obstacles that emerging economies must cope with, which include the lock-in problem, energy security, structural rigidities, technological stunting, and social dilemmas. The coal mining sector and its proponents of coal-based energy generation will experience a decline in market share (Carley & Konisky, 2020). To ensure the coal sector's viability throughout ET and market contraction, Brandcodax (2023) recommends exploring new coal export markets. Exporters can broaden their consumer base and minimise reliance on traditional markets by focussing on Southeast Asia and Africa, which present rising electricity demands. Brandcodax (2023) emphasised that innovation in coal exports necessitates collaboration among government, business, and research entities, and in addition, R&D could enhance coal extraction techniques, greener coal technologies, logistics, and supply chain efficacy.

1.1.5. Motivation for the study

The global commitment to mitigate climate change necessitates the decarbonisation of the energy sector (Xaba, 2023). In addition, California Management Review (2025) in their “Call for Paper” argue that firms across many industries and sectors are encountering a pivotal moment where radical change is both necessary and imperative as global disruptions from climate change are compelling firms to reevaluate their methods of value creation, delivery, and capture. For emerging economies such as South Africa, this transition presents a profound challenges (Eskom, n.d.). Firms’ dependent on fossil fuels face market decline and disruption (Carley & Konisky, 2020). To survive and adapt in this volatile economic landscape, firms in the coal value chain are strategically compelled to reconfigure their business models

(BMs) (Carley & Konisky, 2020), urging firms to reconfigure their BMs through BMI, which is defined as a reconfiguration of the entire BM or its specific components (Geissdoerfer et al., 2018). BMI activities require decision-makers to redefine essential resources and determine how value will be created, and profit will be derived (Sletten et al., 2023).

1.2. Research problem

BMI is a crucial concept for firms facing declining competitiveness such as ET (Rabetino et al., 2023). The strategic success of the ET is strongly tied to a firm's ability to rapidly identify, mobilise, and reconfigure resources in alignment with evolving environmental and external regulatory pressures (Mori & Zhang, 2024). Coal-dependent firms possess existing resources and capabilities (e.g., historical knowledge, sunk investments) rooted in fossil fuel-based production (Mori & Zhang, 2024), which are often not easily transferable to new areas, such as widespread renewables deployment (Erin Bass & Grøgaard, 2021). This challenges results in the theoretical dilemma of overcoming deep-seated constraints, such as path dependency and cognitive barriers to execute BMI successfully (Bryant et al., 2024; Mori & Zhang, 2024; Araújo, 2014; Richter, 2013).

The research problem derived from the literature is, "how do coal-dependent firms effectively overcome deep-seated financial, operational, and cognitive barriers, and leverage or acquire the necessary resources and capabilities to successfully execute BMI in response to the rapid demands of the ET?

In summary, the research problem focuses on bridging the gap between the theoretical necessity of BMI and resource reconfiguration for coal-dependent firms and the empirical reality that overwhelming internal and external constraints make such change incredibly difficult for coal-dependent firms. The South African context is justifiable as a site of study not merely as a convenience sample, but because it acts as a critical proxy for other emerging markets that face similar multifaceted challenges, thereby ensuring the findings have transferability to a broader scholarly discourse on global ET trends.

1.3. Research objective

The following research objectives were derived from the identified research problem and knowledge gap:

1. To explore how decision-makers in the coal industry understand the ET and how that understanding influences strategic or BM adaptation.

2. To explore how the ET influences the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained and acquired.
3. To explore why coal-dependent firms struggle to adapt their BMs to the ET, and how these challenges (barriers) are mitigated.

1.4. Research purpose and research questions (RQ)

The purpose of this exploratory cross-sectional qualitative study is to use and extend existing theory, specifically the Resource-Based View (RBV) and Dynamic Capabilities (DC), by exploring how decision-makers allocate resources and adapt capabilities to enact BMI for coal-dependent firms in South Africa. Further, this research aims to bridge a critical knowledge gap by moving beyond the identification of necessary changes and struggles to empirically and conceptually detail the actionable frameworks decision-makers use to construct and implement BMI within the thermal coal value chain. The study's research questions are designed to be explicitly informed by the knowledge gaps in the literature:

Table 1: Research questions and their explicit knowledge gaps in the literature

Research question (RQ)	The explicit knowledge gap in the literature guiding the RQ
Main RQ: How do coal-dependent firms effectively overcome deep-seated financial, operational, and cognitive barriers, and leverage or acquire the necessary resources and capabilities to successfully execute BMI in response to the rapid demands of the ET	The research question focuses on bridging the gap between the theoretical necessity of BMI and resource reconfiguration for coal-dependent firms and the empirical reality that overwhelming internal and external constraints make such change incredibly difficult for coal-dependent firms (Rafique et al., 2025; Bohnsack et al., 2021).
RQ 1: How do decision-makers in the coal sector understand the ET and how that understanding influences strategic or BM adaptation?	The gap is the lack of specific insights into the content and structure of decision-maker's understanding, their mental models, perceptions or framings of the ET, beyond generic cognitive barriers, and how this specific understanding positively or negatively influences strategic adaptations (Rafique et al., 2025; Bohnsack et al., 2021).

RQ2: How does the ET influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?	The existing literature provides unclear conceptual foundations and examples of resource reconfiguration and acquisition necessitated by the transition. This RQ seeks to explore the contextual details on how coal-dependent firms in South Africa are utilising RBV and DC to implement BM adaption or respond to the ET (Rafique et al., 2025; Bohnsack et al., 2021).
RQ3: Why do coal-dependent firms struggle to adapt their BMs to the ET, and how may these challenges be mitigated?	The literature provides comprehensive categories for both the struggles and the conceptual mitigation strategies. The RQ seeks to explore the contextual detail within the coal industry regarding these established challenges and solutions (Rafique et al., 2025; Bohnsack et al., 2021).

1.5. The scope and delimitations

The scope and delimitations of this research study define the boundaries of the investigation, specifying what the study focuses on, where it is conducted, who participates, and the methodological limits imposed by the design.

1.5.1. Research scope and core focus

The fundamental scope of the research is to investigate BMI towards the ET in emerging markets, specifically using the case of the South African coal industry. The purpose of the study is explicitly set as an exploratory cross-sectional qualitative study. Further, the study aims to empirically and conceptually detail the actionable framework decision-makers use to construct and implement BMI within the internal coal value chain. the research intends to use and extend theory, particularly the RBV and DC, by exploring how decision-makers allocate resources and adapt capabilities to enact BMI for coal-dependent firms in South Africa. the scope is centred on bridging the gap between the theoretical necessity of BMI and resource reconfiguration and the empirical reality of how firms overcome overwhelming internal and external constraints. The core focus is delimited to the measures and approaches employed by these firms related to the ET in South Africa.

1.5.2. Contextual and geographical delimitations

The study established strict boundaries regarding the industry and geography under investigation. The research is strictly delimited to the South African coal industry. Further, the study focuses on firms operating within the coal value chain. The specific entities targeted include coal producers (an emerging miner and a major producer) and a utility or electricity supplier dependent on coal-fired power stations for national energy generation. Although focused on South Africa, the context is delimited specifically because it provides a convenience for sampling and acts as a critical proxy for other emerging markets facing analogous complex difficulties, thereby ensuring the findings have transferability to a broader scholarly discourse on global ET trends.

1.5.3. Population and sampling delimitations

The boundaries of who provided data and the scale of that data collection were clearly defined: the population is limited to individuals or decision makers who hold executive or senior management positions within the South African coal industry. These individuals must have experience related to BMI and strategic resource allocation in response to the ET. The sample size was intentionally delimited to 14 participants. These participants were drawn from approximately three distinct firms operating within the coal industry or coal value chain, particularly coal-fired utilities. The sampling further specified a maximum of five decision-makers sampled per coal producer and four decision-makers from the coal-dependent electricity firm. The methodological design delimits the subject of the study from the source of the data: the unit of analysis is the firm (operating in the coal value chain), but the unit of observation or sampling element is the individual decision-maker employed by that firm.

1.5.4. Methodological delimitations

The research was confined by specific methodological choice: the study is delimited to a qualitative, exploratory cross-sectional study design. The study is cross-sectional, meaning data is collected at a single, brief period of time, and the information collected primarily refers to the time at or around the data collection (Kesmodel, 2018). This limitation means the study provides a snapshot of conditions and does not track changes over time, making it inferior to a longitudinal design for observing changes in resource allocation. The study is delimited by the adoption of the RBV and DC theory as the underpinning theoretical lens. The study utilised semi-structured interviews for data collection, and the data analysis was delimited to thematic analysis.

These delimitations collectively ensure the research maintains a sharp focus on the specific strategic and operational responses of South African coal decision-makers to the ET, allowing for a deep qualitative analysis within a defined industrial and geographical boundary.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This section establishes the theoretical lens through which the research problem is viewed. It proceeds by first grounding the study in the broad global ET context and then narrowing the focus to the South African electricity context and South African coal industry review. It then establishes the theoretical foundation using RBV and DC, followed by defining the core constructs: BMI and decision-maker cognition and adaptation. The review continues by detailing necessary resources and capabilities , concluding with an analysis of industry and firm-specific barriers and mitigation strategies to identify the knowledge gaps that underpin the research questions.

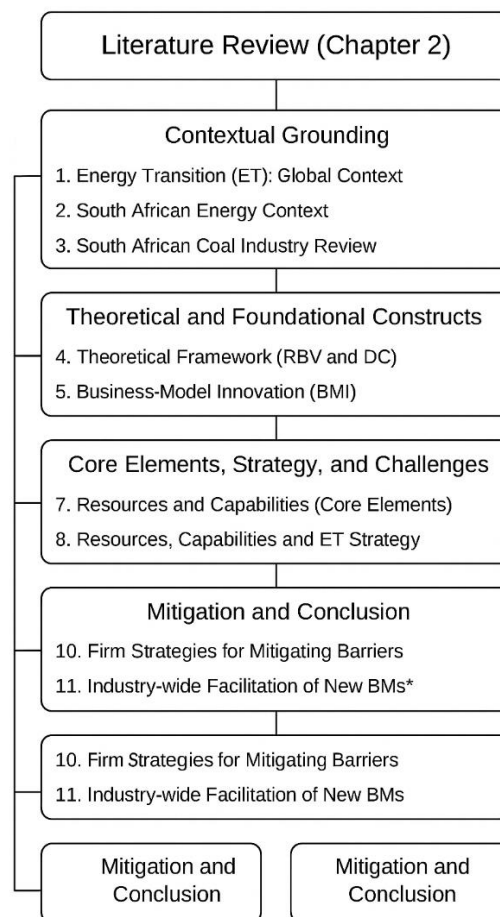


Figure 1: The structure of the literature review: Source: Author's own

2.2. Energy transition (ET): global context

Fundamental changes are occurring in the electricity sectors. This transition is influenced by various factors, particularly sustainability concerns, which include the goal of addressing

climate change as outlined in the 2015 Paris Agreement (Markard, 2018). Markard (2018) highlights that a crucial aspect of the current transition involves the growth of new renewable energy sources, including biomass, wind, and solar which are partially replacing electricity generated from fossil or nuclear fuels. Bakhsh et al. (2024) argue that the ET encompasses the decarbonisation of the energy sector through the reduction or eradication of dependence on carbon-intensive energy sources, including natural gas, oil, and coal. A transition to clean energy sources is essential to minimise the country's dependency on fossil fuels, which significantly contribute to carbon emissions and climate change (Bakhsh et al., 2024).

Environmentally, ET involves switching from coal and petroleum to renewable energy (Chipangamate & Nwaila, 2024). Chipangamate and Nwaila (2024) suggest that this objective demands the mining of vast amounts of clean ET minerals to support varied technologies including solar photovoltaics (PV), storage facilities, wind turbines, and others. According to Bakhsh et al. (2024), with the shift towards cleaner production processes and refined commodities, higher income levels were achieved, leading to a gradual transition from higher-carbon-intensive to lower-carbon-intensive sectors, resulting in reduced carbon dioxide emissions. According to Doh et al. (2021), ETs necessitate collaborative and diverse approaches, engaging various stakeholders and interests across public and private sectors. In addition, it demands advancements in technology, political compromise, economic trade-offs, and efforts to address social impacts. Doh et al. (2021) indicate that renewables naturally facilitate more distributed energy systems, suggesting that countries, regions, and individual firms could reduce their dependence on national grids and energy supplies from other countries. The expansion of decentralised battery storage further strengthens the ET (Doh et al., 2021). Carley and Konisky (2020) suggest that the transition to lower-carbon energy will create and perpetuate pre-existing winners and losers. Winners will gain from cleaner energy, lower fossil fuel emissions, and job and innovation prospects (Carley & Konisky, 2020). Losers may face hardships or lack of opportunities (Carley & Konisky, 2020).

South Africa prioritises a low-carbon economy and a climate-resilient society, which is why it embraced the Paris Agreement (Xaba, 2023). National ET is directed by the Just Transition Framework drafted by the Presidential Climate Commission (PCC) and adopted by parliament (Xaba, 2023). South Africa has changed key policies to respond to climate change (Xaba, 2023).

2.3. South African energy context

Energy regulations from the late 1990s facilitated the significant liberalisation of energy markets and the disaggregation of monopolies (Constantinides & Slavova, 2020). The energy

sector of South Africa, led by CFU , has mostly remained excepted to these developments. Folly (2021) argues that the government has suggested unbundling CFU into generation, transmission, and distribution sectors. Folly (2021) asserted that the objective was to divest a portion of the energy plants to private firms. The restructuring aimed to reduce costs, enhance debt transparency, and improve efficiencies, particularly if competition is permitted.

De Vos (2019) argues that CFU 's unbundling will not resolve its escalating financial, operational, and environmental challenges. CFU initiated this action upon recognising its impending failure to meet its debts and the necessity for a further bailout. However, it is necessary. Todd & McCauley (2021) state that CFU holds the dual responsibility of power generation and grid transmission in South Africa. However, discussions regarding its unbundling have been ongoing since 1995, yet no progress has been made. A significant deficit in generation capacity has resulted in prolonged rolling blackouts. Constantinides and Slavova (2020) attribute the postponement of the utility unbundling to a national discourse initiated by experts, economists, and unions. Certain stakeholders, including unions, oppose the privatisation of CFU due to concerns over potential job losses.

South Africa, similar to other countries, has increasing energy consumption, declining generation capacity, and deteriorating infrastructure (Constantinides & Slavova, 2020). CFU 's immediate strategy has involved significant electricity outages, whilst its long-term approach has been characterised by delayed and high capital investments in generation capacity (Constantinides & Slavova, 2020). Following South Africa's initial energy crisis in 2007– 2008, Constantinides and Slavova (2020) indicate that the government has pursued Independent Power Producers (IPPs) to enhance generation capacity and diversify the energy mix with renewables. However, as emphasised in the research of Ting and Byrne (2020), CFU attempted to oppose amendments to the system's institutional frameworks that would facilitate renewable energy generation, so threatening its coal-based interests. From 1998 to 2018, CFU revised its resistance strategy in reaction to the successful challenges posed by renewable energy stakeholders. CFU 's resistance strategy commenced with the dismissal of electricity market reforms that would have diminished its market supremacy. Further, in response to renewables' incremental gains from adding rules to existing institutions, CFU expanded its opposition approach to more selection environment factors. Ting and Byrne (2020) added that CFU used information asymmetries to influence public debate and miners to strike as part of its campaign to resist renewables.

Today coal continues to be the predominant technology, representing around 72.1% of the total CFU fleet capacity (Sigwebela, 2025). On the other hand, Constantinides and Slavova (2020) argue that since its inception in 2011, the Renewable Energy Independent Power

Producer (REIPP) program has worked to increase the country's generating capacity by promoting innovation in renewable energy generation. According to Lawrence (2020), renewable energy sources offer a practical substitute, as the wind and solar resources in South Africa could produce more electricity than the country needs. The findings of Msimango et al. (2023) suggest that the policy framework must align with the market's demands for (i) competition to mitigate rising tariffs and the expanding capacity deficit, and (ii) an enhanced role of renewable energy to support the country's ET and climate targets. Msimango et al. (2023) emphasise that inadequate and delayed integration of renewable energy sources, coupled with a lack of market competition, has resulted in an excessive dependence on ageing coal-fired power plants, thereby compromising South Africa's energy security at a significant cost to the entire country. However, according to Msimango et al. (2023) the energy sector has experienced rapid restructuring in recent years.

The Medium-Term System Adequacy Outlook report for 2025-2029 drafted by Sigwebela (2025) state that in South Africa, several utility-scale private renewable energy power facilities are being planned for connection to the national grid. These initiatives attempt to either provide power for self-consumption, lowering consumers' energy prices, or to promote wheeling agreements, in which energy is transported over the grid to private users. On the other hand, CFU 's coal fleet capacity is projected to decline in 2029, resulting from the decommissioning of units at five power stations, with the residual capacity from these facilities set for shutdown by March 2030 (Sigwebela, 2025). Furthermore, CFU 's open cycle gas turbine fleet will incur a decrease in 2026 owing to the closure of the two facilities (Sigwebela, 2025). In April 2025, the South African cabinet authorised its first Renewable Energy Masterplan to establish solar panel, wind turbine, and battery manufacturing firms (SG Editor, 2025). The policy encourages 3-5 gigawatts of renewable energy each year through 2030, bringing \$784 million and 25,000 employments. Black-owned firms and coal-dependent communities are supported by inclusive growth (SG Editor, 2025). Despite manufacturing capability and abundant mineral reserves, grid restrictions and past implementation failures threaten the idea. Expanding grid capacity costs CFU \$21 billion. Implementation requires coordinated governance and integration with national energy strategies (SG Editor, 2025).

On the 22 October 2025, the government of South Africa approved the Integrated Resource Plan (IRP) 2025. The IRP 2025 establishes significant goals that balance supply security, economic viability, and environmental sustainability (Department of Mineral Resources, 2025). Ensuring electricity supply security necessitates strategic planning for sufficient capacity to satisfy demand and a robust power infrastructure capable of withstanding disruptions. The strategy aims for cost-effective power system planning to minimise electricity expenses for the

economy, while adhering to environmental regulations and timelines (Department of Mineral Resources, 2025). The IRP mandates the formulation of strategies to mitigate both global and local emissions while achieving security and cost objectives. South Africa's dedication to a varied energy mix that fulfils its emissions reduction goals is consistent with global energy security and emissions trends (Department of Mineral Resources, 2025). The IRP 2025 anticipates a significant augmentation of the generation fleet, aiming to incorporate over 105,000 MW of new generation capacity by 2039. The plan predominantly depends on renewable and flexible resources (Department of Mineral Resources, 2025).

2.4. South African coal industry review

Eskom (n.d) indicates that South Africa's coal reserves are estimated at 53 billion tonnes, suggesting approximately 200 years of supply at current production levels. Furthermore, South Africa produces 224 million tonnes of marketable coal annually, placing it fifth globally. Additionally, South Africa ranks as the third largest exporter of coal, with a significant 25% of its production being distributed worldwide. According to Hanto et al. (2022) the South African coal sector has a significant impact on South Africa's socio-economic landscape. The impact of the coal sector on the South African economy based on the Official World Bank data indicates that South Africa's GDP was worth 377.78 billion US dollars in 2023 and 405.87 billion US dollars in 2022 (Trading Economics, n.d.). The mining sector directly contributed 7.53% of the GDP in 2022, which translate to R494 billion (Mineral Council South Africa, 2023). Mining's percentage contribution to South Africa's GDP decreased from 7.3% to 6.2%, while its direct contribution to GDP decreased by 12% to R425.6 billion (Mineral Council South Africa, 2024). The total growth rate of value-added GDP has been trending downward in recent years due to a number of factors, including the general difficulties the mining sector faces globally and the added weight of failing infrastructure, port congestion, and illicit mining activities (Statista, 2024).

Coal consumers in sectors including agricultural, brick and tile, cement and lime, Arcelor Mittal steel, metallurgical, chemical, iron and steel, and gold and uranium mining are the target market for domestic products (Hancox & Götz, 2014). The report from the Department Mineral Resource and Energy (n.d.) shows that 62% percent of South Africa's coal production is used to generate electricity, 23% percent is used for petrochemical industries (Sasol), 8% is used for general sector, 4% is used for metallurgical industries (Mittal), and 4% is bought by merchants and sold domestically or abroad. Hanto et al. (2022) state that coal's dominant role in the energy sector has influenced policy-making interests in all countries' energy and mining sectors. Zhao and Alexandroff (2019) propose that political incentives to retain coal use in domestically-oriented markets will be the biggest obstacle to reducing coal consumption for

electricity generation to almost zero by 2050. At present, coal consumption is limited to a few countries and mostly domestic. On the other hand, Shahnazari et al. (2014) state that policies aimed at mitigating climate change pose a systematic risk to investments in coal and energy generation assets. The implementation of stricter emissions regulations on various pollutants, along with the introduction of a carbon price, renders coal a more unsafe investment and diminishes its competitiveness relative to alternative fuels (Banks et al., 2015). According to Banks et al. (2015), ultimately, the primary technologies that facilitate a more environmentally friendly approach to coal utilisation remain expensive, and most are not yet accessible on a global commercial scale. Additional time and governmental support will be necessary, including financial incentives and R&D, to achieve widespread deployment and reduce costs (Banks et al., 2015).

2.5. Theoretical Framework (RBV and DC)

BMI cannot serve simultaneously as a construct and the theoretical lens. This study is therefore underpinned by the RBV and DC theory. The RBV suggests that a firm's sustained competitive advantage is derived from the unique, valuable, rare, and non-replaceable resources and capabilities it controls. The strongest rationale for selecting this framework is its ability in examining strategic adaptation to systemic change. For instance, the combination of RBV and DC allows for analysis of both the firm's internal asset base and its capacity to integrate and reconfigure these assets to address external environmental challenges and opportunities, such as implementing green technologies sustainability practices. Given that the ET is a constantly evolving environment, the DC perspective is essential, as it highlights the capacity of decision-makers to recognise possibilities, allocate resources to new strategies, or reverse ineffective resource allocation. This theoretical lens allows the study to explore how decision-makers adjust their configurations of "resource in use" in the face of systemic policy and market disruptions (Kunc & O'Brien, 2017, p.16).

2.6. Business model innovation (BMI)

BM is a crucial concept in understanding how companies create, capture, and deliver value to their customers (Laur & Berntzen, 2023). It consists of four main components: target customer segments, value proposition, value creation and delivery process, and financial model for value capture (Rabetino et al., 2023). According to Snihur and Markman (2023), well-defined BMs help a firm generate and capture value, prioritise resource allocation, clarify decision making, and innovate. A BM can be modified or replaced when a firm faces declining competitiveness (i.e. ET) or increasing competition (Rabetino et al., 2023). According to Rabetino et al. (2023) this process, known as BMI, involves experimentation and exploration

to change the activity system. Rabetino et al. (2023) argue that BMI typically follows three phases: opportunity search, BM generation, and implementation and resource reconfiguration. Geissdoerfer et al. (2018) define BMI as a reconfiguration of the entire BM or its specific components (i.e. resource reallocation), prompted by opportunities or problems in the organisational environment, or as a strategy for diversification and innovation. Mori and Zhang (2024) argue that it involves establishing legitimacy and mobilising resources.

(Sletten et al., 2023) BMI can provide a framework that enables companies to adapt to changing market conditions and gain competitive advantages. Rabetino et al. (2023) stated that the importance of BMI is reconfiguring organisational structures, culture, and resources to create a dynamic consistency between strategy and environment. BMI assists organisations in redefining what important resources are, how these resources should be deployed, how they will build their value offer, and how to profit from it (Sletten et al., 2023). In their study Rabetino et al. (2023) also emphasises the need for companies to redefine their value-creation processes, customer relations, and innovation to adapt to changing environmental conditions. The literature identifies resource configuration in BMI as a common theme; therefore, the study adopts the Sletten et al. (2023) definition of BMI, that it assists organisations in redefining what important resources are, how these resources should be deployed, how they will build their value offer, and how to profit from it.

Bock et al. (2012) argue that in BMI, research suggests that decision-makers change organisational structures to initiate innovation and address new opportunities but are limited by their control and access to resources. However, Sletten et al. (2023) study identified three key areas for BMI: emphasising the right BM elements, addressing external challenges, and overcoming internal barriers such as dominant logic and lack of decision-makers capabilities. Laur & Berntzen (2023) identifies the influence of forces such as service diversity, regulations, and managerial capabilities on BMI in the energy value chain. Richter (2013) identifies two primary reasons for a firm's failure to innovate its value proposition. The first is a cognitive barrier to BMI, which significantly affects the information utilised in corporate decision-making. The capabilities of decision-makers to comprehend the diverse needs of various firms is essential for simultaneous success in multiple domains (Richter, 2013). The principal reason a firm fails to sustain its leading position in rapidly evolving environments is its inability to commit adequate resources to new technologies or the development of new BMs for these technologies (Richter, 2013). To et al. (2020) argue that the management literature assumes that the firm's resources and capabilities influence BMI, and the study literature also emphasises decision-makers' capabilities as an important subject for BMI. This is also supported by Bock et al. (2012) argument that the organisations strive for strategic flexibility,

which is commonly characterised as the capability to recognise possibilities for innovation, allocate resources to novel strategies, or reverse ineffective resource allocation.

2.7. Decision-maker cognition and adaptation

Decision-maker limitations, distinct from systemic organisational inertia, primarily revolve around cognitive biases, risk aversion, and resource allocation constraints

2.7.1. Cognitive bias and limitations

Decision-makers face cognitive barriers which restrict new ideas that do not fit with the firm's current profitable BM (Richter, 2011). Managers are found to struggle to develop radically new BMs while the existing one is still generating revenue (Richter, 2011). Decision-makers may suffer from a historical bias, leading them to try and stick to the traditional BM for too long (Bürer et al., 2021). They may neglect potentially different performance measures required by new decentralised technologies compared to centralised generation, reinforcing the cognitive barrier (Richter, 2011). The high complexity and uncertainty surrounding the transition often result in a "wait and see" approach from businesses (Bryant et al., 2024, p.7).

2.7.2. Resource constraints and risk aversion

A primary reason leading to the decline of coal-dependent firms is the inability to allocate sufficient resources to new technologies that initially cannot find market application but may later disrupt the market (Richter, 2011). Decision-makers are often reluctant to engage in innovative market frameworks due to uncertain and evolving regulatory conditions (Bürer et al., 2021). A fear of how innovation may impact a business that has historically been stable and lucrative due to supportive regulations also limits decision-makers (Bürer et al., 2021). In the context of energy efficiency, decision-makers (including consumers like private homeowners) might be unwilling or unable to make large upfront investments (Bürer et al., 2021).

2.8. Resources and capabilities (core elements)

The RBV suggests that a firm's success is determined by the strategic decisions responsible for developing a system of resources and capabilities over time. Resources are assets (tangible or intangible) (Kunc & O'Brien, 2017). Capabilities are complex assemblages of skills and collective knowledge embedded within organisational processes (Rosati et al., 2023). Decision-makers define the strategic intent, which is necessary to align operations, strategies and resources toward reducing carbon emissions and achieving sustainability targets (Shaik et al., 2024). This construct is explored specifically as it influences resources allocation and

investments decisions concerning the defined scope and boundaries established in Chapter 1 (Delimitations).

2.8.1. Identifying core resources and capabilities

The RBV of the company suggests that a company's success is determined by the strategic decisions responsible for developing a system of resources and capabilities over time (Kunc & O'Brien, 2017). According to Kunc & O'Brien (2017) resources may be classified as tangible (such as consumers, production capacity, or personnel) and intangible (including intellectual property, firm culture, and reputation) productive components. Resources are the assets that a firm owns, has access to, or controls (Kunc & O'Brien, 2017). According to Singh et al. (2021), there are other sophisticated resources available, such as practice-based knowledge. Since workforce skills are learnt via education and experience and are not readily apparent, they are considered tacit resources (Singh et al., 2021). Effective use of these resources, which are uncommon, valuable, one-of-a-kind, and non-replaceable, can provide a firm with a sustainable competitive advantage in the marketplace (Varadarajan, 2020). Singh et al. (2021) argue that there are particular materials that can be easily replicated by competitors. As a result of this, firms are required to make thoughtful choices and select resources that are difficult for their competitors to replicate. A prevalent belief is that complementarities among resources should be leveraged, and by recognising and utilising these, decision-makers may enhance the firm's value (Huesch, 2013).

Najafi-Tavani et al. (2023) argue that to effectively utilise and transform available resources into favourable market outcomes, research grounded in the RBV suggests that resources should be merged with capabilities, which are complex assemblages of skills and collective knowledge embedded within organisational processes and routines. Bag et al. (2021) emphasise that within the RBV paradigm, various assets constitute subsets of resources, and the combination of these resources enhances the creation of capabilities. Kunc and O'Brien (2017) suggest that capabilities are activities executed by a firm, typically arising from the interaction of resources coupled with knowledge regarding their combination. Makadok (2001) defines capabilities as inherent, non-transferable organisational resources that enable a firm to boost the output of its other resources. In addition, a firm's assets are the resource endowments that the firm has amassed, and its skills are the resources that enable it to combine its assets and use them to its advantage.

Shan et al. (2014) argue that for coal and energy firms to succeed and remain competitive during the ET, a firm must have unique resource stocks. In addition, the process of using resources and turning them into earnings is quite complex. Further, by all circumstances, it is

advantageous for a firm to seek certain capabilities by combining various types of resources. A firm is required to identify resources, purchase them, and integrate them into its capabilities (Shan et al., 2014). The capabilities should be used to address consumer needs while also adding value to the firm. From this perspective, resources and capacities are regarded distinctly. Capabilities are the results of synergising the resources; capabilities in turn should be used to enrich the resources of organisations (Shan et al., 2014). According to Shan et al. (2014), in an organisation, it is essential to effectively manage resources and capabilities to adapt to the evolving business environment. To et al. (2020) argue that the management literature suggests that the firm's resources and capabilities are assumed to have an influence on BMI. Therefore, in ever-changing organisational environments, it is logical that innovation must efficiently utilise and reorganise distinct resources (To et al., 2020).

To provide a few examples, the existing resources and capabilities of traditional energy and coal firms, particularly coal-dependent, are rooted in their historical operations.

- The existing capabilities in a coal-dependent firm typically include historically accumulated capabilities such as existing knowledge, prior experience, organisational culture, and asset positions (Mori & Zhang, 2024). Chinese coal-dependent power generation equipment manufacturers, for example, relied on long-term experience in manufacturing steam and hydro turbine generators to compensate for gaps in wind turbine technology (Mori & Zhang, 2024).
- Mori and Zhang (2024) state that as key resources in traditional energy market, the coal-dependent firm possess sunk investments and long operating lifetimes of assets, often tied to centralised, fossil fuel-based production. While coal mining firms also possess core assets related to extraction, processing, and transportation infrastructure (Bohnsack et al., 2021).
- To develop a competitive advantage in a traditional setting, coal-dependent firms are often characterised by BMs with complex value creation structures and high capital intensity (Mori & Zhang, 2024).

2.8.2. Resource and capabilities criticality for competitive advantage

Effective use of core resources, which are uncommon, valuable, one-of-a-kind, and non-replaceable, can provide a firm with a sustainable competitive advantage in the marketplace (Varadarajan, 2020). Firms are required to make thoughtful choices and select resources that are difficult for their competitors to replicate (Singh et al. 2021).

The critical capabilities for competitive advantage are those enabling adaptation and sustainability, often requiring a shift away from traditional resource-based logic toward

strategic agility and innovation architecture. A firm with DC is able to exploit existing capabilities while simultaneously developing new competencies as this is crucial for sustained performance during technological change (Richter, 2011). This capability is explicitly linked to sustaining a competitive advantage (Rosati et al., 2023). In the innovation space, Shaik et al. (2024) argue that a firm must have Green Technology Innovation and Green Innovation Capabilities as these are essential capabilities to move toward carbon neutrality, enabling firms to implement eco-friendly procedures, cut carbon emissions, and develop cutting-edge solutions (Shaik et al., 2024). Business Model-Related Specific Advantages (BMSAs) are defined as advantages derived from the specific configuration of value creation and capture components in a firm's BM (Bohnsack et al., 2021). According to Bohnsack et al. (2021) to achieve competitive advantage in the new energy world, firms must determine which components of their BMSA are non-location bound and transferable, versus those that are location-bound. A firm must have digital and AI capabilities, as utilising digital technologies and AI for optimising energy utilisation, tracking emissions, and improving process efficiency is central to achieving organisational goals in the green future (Abdulghani & Winkler, 2025).

2.8.3. Necessity of acquisition and development

Acquiring new resources and capabilities is seen as an imperative, necessary for survival in the face of transition pressures. The overarching view is that "you've got to self-cannibalise, right. You have to eat your existing BM, otherwise, you just die" (Bryant et al., 2024, p.7). The current design approaches are inadequate to adapt to and facilitate the sectoral transition (Bryant et al., 2024). Firms must overcome core rigidities, the flip side of core capabilities which limit a firm's capacity to innovate and shift focus (Mori & Zhang, 2024). New BMs often require new capabilities like sales and marketing skills and employing knowledgeable workers (Sulek & Borowski, 2024). Specifically, for decarbonisation, employees need specialised know-how and involvement, requiring investment in skills development and fostering a culture of innovation (Abdulghani & Winkler, 2025). Mergers and acquisitions (M&A) are noted as a means of quickly enhancing skill sets and hedging in new environments (Mori & Zhang, 2024).

2.8.4. Strategic resource reallocation

Reallocation involves a fundamental transformation of the operational architecture, shifting focus from core commodity sales to customer-centric, service-based, and digitally enabled solutions.

Transformation involves leveraging existing capabilities to reorient innovation to capture value in new niche sectors (Mori & Zhang, 2024). Coal-dependent firms expand business

boundaries through diversification (e.g., into manufacturing nuclear, wind, and solar power technologies) (Mori & Zhang, 2024). Coal-related firms, particularly equipment manufacturers for coal firms, may expand into providing sophisticated maintenance, retrofit, and refurbishment services for installed plants, developing service capabilities, and offering technical support such as remote-control systems (Mori & Zhang, 2024). This moves the value proposition from simply selling a commodity (electricity or coal) to offering "energy as a service" (p.11) (Bryant et al., 2024). Resources and capabilities should be reallocated by integrating them into the strategic architecture. Strategic architecture is crucial for incorporating sustainable practices into business processes and prioritising investments in green technologies and energy-efficient infrastructure (Shaik et al., 2024). Organisations can reallocate resources to maximise the life cycle of products, reducing waste, minimising environmental impact, and improving economic return through implementing a circular economy approach (Abdulghani & Winkler, 2025) .

2.8.5. Decision-maker involvement in resource mobilisation

Decision-makers are central to establishing the strategic direction, tackling cognitive barriers, managing organisational structure, and overseeing resource allocation.

Decision-makers define the strategic intent, which is necessary to align operations, strategies, and resources toward reducing carbon emissions and achieving sustainability targets (Shaik et al., 2024). Strategic intent influences resource allocation and investment decisions (Shaik et al., 2024). Managers are often hindered by cognitive barriers and tend to stick to the traditional BM for too long (Bürer et al., 2021; Richter, 2011). Decision-makers must lead the effort to develop radically new BMs even while the old one is still generating revenue, addressing the difficulty in allocating sufficient resources to initially non-mainstream technologies (Richter, 2011). Decision-makers are involved in establishing the organisational structure (Richter, 2011). For coal-dependent firms, this typically involves setting up separate ventures or business units for renewable energy activities, as this structure is considered vital for balancing the exploitation of the current BM with the exploration of new opportunities (Richter, 2011). Establishing clear decarbonisation goals provides a crucial roadmap, helping decision-makers adapt approaches, investments, and activities to reduce emissions (Bürer et al., 2021; Rosati et al., 2023). Decision-makers are critical in building "smart partnerships" with suppliers of knowledge-intensive solutions, and with research institutions and universities, to secure necessary intellectual and technological resources (Gitelman & Kozhevnikov, 2023, p.17; Richter, 2011).

2.9. Resources, capabilities and ET strategy

The strategic success in the ET is strongly tied not only to the internal resources (RBV) a firm possesses but also to its ability (DC) to rapidly identify, mobilise, and reconfigure those resources in alignment with evolving environmental imperatives and external regulatory pressures.

2.9.1. Conceptual foundations of RBV, DC, and ET strategy

The strategic success in the ET is strongly tied not only to the internal resources (RBV) a firm possesses but also to its ability (DC) to rapidly identify, mobilise and reconfigure those resources. The Natural Resources-Based View (NRBV) posits that capabilities rooted in pollution prevention and sustainable development can be a source of competitive advantage. DC enable firms to transition effectively to sustainable energy practices.

2.9.2. The pivotal role of green dynamic capabilities (GDCs) in Just Energy Transition (JET)

Green dynamic capabilities (GDCs) are the application of DC within the green context (Rafique et al., 2025). GDCs enable firms to implement eco-friendly procedures, cut carbon emissions, and develop advanced solutions (Rafique et al., 2025). GDCs enables firms to identify (sense) emerging sustainability opportunities, such as technological advancements , adopt (seize) green technologies and mobilise resources to implement sustainable business practices and modify (reconfigure) their internal resources and processes to align with sustainable energy goals (Rafique et al., 2025).

Rafique et al. (2025) showed that GDC's micro-foundations, which are sensing, seizing, and reconfiguring, are essential for identifying social risks, mobilising resources for inclusive innovation, and restructuring operations for equitable outcomes.

The three core dimensions of GDCs and their role in JET are:

1. **Sensing capability** – sensing recognises energy sector trends like renewable energy technology or customer sustainability preferences (Rafique et al., 2025). Firms with strong sensing capabilities can better comprehend marginalised populations' demands and predict ET social concerns such as fossil fuel employment losses and unequal access to affordable clean energy (Rafique et al., 2025). This flexibility allows firms to innovate to ensure equitable access to green energy and spread its benefits. GDCs

assist firms get first-mover advantages in sustainability marketplaces by providing new industry data (Rafique et al., 2025).(Rafique et al., 2025).

2. **Seizing capability** – seizing refers to the firm's capacity to identify and act upon opportunities, mobilising resources to implement green technologies and sustainable business practices (Rafique et al., 2025). Seizing captures the firm's ability to act on sensed opportunities in ways that support social equity, for instance, by investing in technologies that generate local employment or retraining workers displaced by ET (Rafique et al., 2025).
3. **Reconfiguring capability** – reconfiguring enables firms to adapt their internal resources and processes to align with sustainable energy goals while ensuring social fairness (Rafique et al., 2025). This may involve reorganising supply chains to support local communities, creating green jobs targeted at displaced workers, or ensuring that clean energy solutions are accessible to marginalised and low-income groups (Rafique et al., 2025).

2.9.3. External institutions and firm type

The effectiveness of GDCs in driving JET is contingent on external institutional frameworks, particularly the Paris Agreement (Rafique et al., 2025).

Institutional Amplification – regulatory and policy frameworks act as amplifiers, strengthening the legitimacy and strategic relevance of GDCs (Rafique et al., 2025). Firms that align internal capabilities with these institutional pressures are better able to achieve low-carbon transitions while safeguarding inclusivity and fairness (Rafique et al., 2025). The Paris Agreement served as a legitimising shock that significantly enhanced the value of GDCs for green firms, thereby amplifying their performance advantage over non-green firms (Rafique et al., 2025).

The impact of GDCs on the JET varies between green and non-green firms in the post-Paris Agreement era.

- **Green Firms** – green firms, which already possess superior GDCs, are well-positioned to respond to these institutional signals by swiftly integrating renewable technologies, innovating in sustainable products, and embedding social justice considerations into their operations. This alignment allows them not only to comply with international norms but also to lead in reshaping energy systems in ways that are equitable and environmentally sound. Further, Green firms, with pre-existing maturity in GDCs, are significantly more responsive to institutional pressures and better equipped to

operationalise inclusive and sustainable practices. Their capacity to integrate renewable technologies and embed social equity into strategic decision-making allows them to be leaders in the JET.

- **Non-Green Firms** – non-green firms exhibit a lag in both capability deployment and responsiveness to policy signals, often due to a lack of embedded sustainability orientation. Non-green firms, lack such capabilities as the green-firms, and are less responsive to these external pressures and thus less influential in driving a JET. The absence of robust capabilities in non-green firms, limits their ability to leverage institutional momentum, widening the performance gap in driving inclusive ETs.

2.9.4. DC in coal-dependent industry diversification

The existing capabilities of major fossil fuel firms, are central to their strategic decisions regarding the ET:

- 1) **Transferable capabilities** – fossil fuel firms, such as oil and gas producers, have accrued extensive DCs through years of operating in complex and volatile markets (Erin Bass & Grøgaard, 2021). These transferable skills include engineering expertise for large-scale energy projects, risk management, and experience building relationships with governments and local partners across diverse regulatory environments (Halttunen et al., 2023).
- 2) **Strategic fit** – these existing capabilities create a strong strategic fit for diversification into specific low-carbon solutions, such as leveraging offshore experience for offshore wind projects (Erin Bass & Grøgaard, 2021). They also align well with technologies like Carbon Capture and Storage (CCS) and hydrogen, which require technical expertise and infrastructure similar to traditional oil and gas operations (Halttunen et al., 2023).
- 3) **Limitations** – these capabilities are not universally transferable; for instance, the capabilities of fossil fuel firms may not be easily applied to solar energy manufacturing or widespread renewables deployment, a field already dominated by established renewable energy firms (Erin Bass & Grøgaard, 2021).

In essence, the relationship between RBV or DC and the ET is that a firm's internal strengths (resources and capabilities) determine its strategic pathway in the transition, but the ultimate success of that pathway, especially regarding achieving inclusive and equitable outcomes. JET depends heavily on how those capabilities are directed and amplified by the external institutional environment. JET necessitates the displacement of current processes and the implementation of innovative strategies. Decision-makers in the energy sector must leverage

present capabilities while creating new competencies. However, firms in the coal sector are often unable to deal efficiently with the fundamental changes due to a lack of BMI capabilities. The literature specifically highlights that a major roadblock is the massive existing infrastructure (a resource constraint) and the financial resources needed to dismantle or replace it, contributing to the lock-in problem (Chipangamate & Nwaila, 2024).

2.10. Industry and firm-specific barriers

The literature has revealed that firms operating within the broader energy system, which includes the coal industry, face a convergence of financial, socioeconomic, regulatory, and organisational barriers when attempting to innovate their BMs in response to the ET

2.10.1. Financial and market barriers

Chipangamate and Nwaila (2024) argue that a major roadblock for the coal-dependent firms to switching to greener, more sustainable solutions is this existing massive infrastructure and the financial resources needed to dismantle or replace it. Further, actors are afraid of stranded assets and economic losses, which causes the lock-in problem. However, the influx of renewable energy capacity has increased market price volatility, leading to increasing difficulty for traditional energy utility BMs (commodity sales) to remain financially viable (Bryant et al., 2024). Transitions often "destroy the traditional BM," resulting in the financial destruction of these models (Bryant et al., 2024, p.5). Traditional utility models face "major wealth destruction" and are left with legacy assets (Bryant et al., 2024, p.7). Firms in coal mine and energy face considerable investment risks due to uncertainty from policy changes, market demand fluctuations (coal prices), technological updates, and natural disasters (Ren et al., 2024). New BMs often face a low return on investment (Bürer et al., 2021).

2.10.2. Firm and operational inertia

Araújo (2014) defines path dependency as the inertia of prior choices that limit future pathways due to self-reinforcing factors such as sunk investment costs, growing returns, technological interdependence, and network effects. The study by Araújo (2014) shows that even if new energy technology is superior and economically possible, it may not be implemented due to a phenomenon known as 'lock-in'. According to Sánchez and Leadem (2018), technological lock-in occurs when a given trajectory is a result of a set of acts in the past that cannot be changed, even when better alternatives are available. Therefore, existing BMs hamper transitions by reinforcing the current regime's stability (lock-in) (Mori & Zhang, 2024).

Coal-dependent firms are described as "like deer caught in the headlights" to some extent, unable to prioritise necessary actions (Bryant et al., 2024, p.8). Firms tend to adhere to their

core businesses due to characteristics like sunk investments, long operating lifetimes, and complementary capital investments (Mori & Zhang, 2024). For example, there are usually large investments and infrastructures in place for established energy systems that rely largely on fossil fuels (Sánchez & Leadem, 2018). Firms are stuck because the current BM is still working and changing appears risky (Bryant et al., 2024). There is often a focus on tweaking around the edges of business as usual, rather than fundamentally innovating new approaches (Bryant et al., 2024). Internal management structures can create divisions and hinder implementation, particularly between those who focus on core operations versus innovation (BM, technology or investment decision-maker) (Bürer et al., 2021).

2.10.3. Systemic and regulatory barriers

The success of new BMs is "dictated by the regulatory environment and market structure" (Bryant et al., 2024, p.7). Bryant et al. (2024) argue that the transitional requirements result in a situation where "some of these kinds of value streams don't have a clear market" (p.5). Therefore, the coal dependent firms (energy utilities) may suffer from "regulatory capture," successfully demanding the tide be held back to allow them time to respond (Bryant et al., 2024, p.5).

Zhao and Alexandroff (2019) argue that, despite coal's inability to sustain itself independently, political interests may utilise policy measures to maintain the viability of coal power generation even in adverse market conditions, as evidenced by China's retention of underutilised capacity and Germany's preferential treatment within its emissions trading plan. This is supported by Jakob et al. (2020) argument which state that, in general, the coal sector is a strong stakeholder with a vested interest in postponing the phase-out of coal. In addition, the decrease in coal's financial viability won't be sufficient to make coal use obsolete.

According to Zhao and Alexandroff (2019), the United States and China devised measures to scale down coal production, which were eventually overturned due to political motives. Further, the United States and the United Kingdom implemented a number of protectionist policies to preserve the uncompetitive coal and local petroleum industries when the world market was oversupplied with cheap Middle Eastern oil in the 1950s.

2.10.4. Socioeconomic, vested interests and stakeholder influence

Chipangamate and Nwaila (2024) argue that the adoption of innovative energy technologies is further hindered by vested interests and dependency on existing systems. This is once again supported by Jakob et al. (2020) argument which state that, in general, the coal sector is a strong stakeholder with a vested interest in postponing the phase-out of coal. In addition,

political concerns about social welfare for communities and commercial interests that rely on coal assured its continued use (Jakob et al., 2020).

Chipangamate and Nwaila (2024) state that the decommissioning of the coal-fired plants results in significant burdens for emerging markets countries due to the loss of employment, social networks, and livelihoods for host communities. In addition, local communities near renewable energy facilities are more susceptible to adverse effects, including noise pollution, alterations to the landscape, and the risk of accidents, while communities that utilise the same electricity but are distanced from the plants are less likely to encounter these impacts. Furthermore, this unequal distribution of benefits and costs discourages individuals from supporting or investing in the renewable energy firm.

2.11. Firm strategies for mitigating barriers

Coal-dependent firms, particularly firms in the energy sector, are employing a mix of strategic and organisational responses to counter these innovation barriers.

2.11.1. Strategic repositioning and diversification

Forward-thinking firms are adopting innovation by developing new digital solutions or products that align with a carbon-neutral future, leveraging existing resources and digital technologies (Abdulghani & Winkler, 2025). Firms are utilising strategies of transformation, diversification, and acquisition to expand their business boundaries (Mori & Zhang, 2024). Transformation involves leveraging existing capabilities to reorient innovation toward new market segments, sometimes through servitization (Mori & Zhang, 2024). Some coal-dependent power generation equipment manufacturers created subsidiaries for manufacturing wind power equipment and solar PV, despite lacking prior experience, relying on their long-term experience in manufacturing steam and hydro turbine generators (Mori & Zhang, 2024). A necessary approach involves the concept of self-cannibalisation, where businesses have to "eat your existing BM, otherwise, you just die" (Bryant et al., 2024, p.7).

2.11.2. Organisational adaptation

Coal-dependent firms often create separate ventures or business units to manage renewable energy activities, utilising this approach to explore and commercialise new technologies independently from the traditional ways of doing business (Richter, 2011). New approaches are often motivated by the realisation that if they continue to do the same things, they will tend to get the same answers, especially as traditional BMs are under attack (Bryant et al., 2024).

2.11.3. Technological integration

Coal-dependent power generation equipment manufacturers upgraded in-house technological capabilities and fostered technological collaboration with coal-fired power generators (Mori & Zhang, 2024). Firms embedded in the traditional fossil fuel system sometimes use pragmatic blending and appropriate clean rhetoric associated with emerging technologies to meet policy targets, although this may strengthen lock-ins to mature technologies (Mori & Zhang, 2024).

2.12. Industry-wide facilitation of new BMs

Addressing barriers requires coordinated action primarily focused on governance, strategic commitment, and a fundamental shift in business design logic.

2.12.1. Clear regulatory frameworks and governance

The ET necessitates the expedited decommissioning of coal-fired power plants (Chipangamate & Nwaila, 2024). Therefore, there is a serious need for government direction and planning to guide sectoral transitions and reduce uncertainty (Bryant et al., 2024). The belief exists among businesses that the government needs to break the deadlock hindering change (Bryant et al., 2024). Regulatory drivers are necessary for high penetrations of renewables to occur, as BMs depend heavily on the regulatory environment (Bryant et al., 2024). Governments must formulate more reasonable energy investment policies and guide capital towards more efficient and environmentally friendly energy projects (Ren et al., 2024). The need for clear policy frameworks is paramount, especially those that support BM reconfiguration among coal-dependent firms and innovation among new entrants, enabling synergy between the two (Bürer et al., 2021).

2.12.2. Strategic and internal changes

Firms must adopt the necessary design approach by understanding the likely end state of the sectoral transition and designing their BMs accordingly (Bryant et al., 2024). They need to prioritise a mindset open to BMI and secure adequate organisational structures and employees capable of fostering this change. They must shift their focus toward new value propositions, such as those emphasising energy independence or a green lifestyle (Richter, 2011). The coal industry, along with other conventional energy sectors, should consider the strategies of oil and gas firms, where innovation includes capturing value by switching to a services model (e.g., charging customers per kilometre rather than selling commodity fuel) (Bürer et al., 2021).

2.12.3. Alternative paths for coal-dependent firms

Some views suggest that for coal, the "best option is perhaps not to innovate the BM that makes coal investments work but to rather slowly phase out of coal" (Bürer et al., 2021, p.208). Others might choose relocation of their current BMs to regions with less strict environmental regulations (Abdulghani & Winkler, 2025).

2.13. Conclusion: Literature review

The conclusion of the literature review summarises the scope of the foundational knowledge established and identifies the critical gaps the research aims to address:

The formulation of the research questions was systematically derived through a comprehensive review of relevant academic literature. The preceding analysis synthesised knowledge across several critical theoretical domains. The key areas included: ET, the concepts of resources and capabilities, and the domain of BMI. Crucially, the literature review also focused on identifying and understanding the encompassing barriers that firms in the coal industry confront during the complex transition process. The central purpose of constructing the research questions, grounded in this extensive review, was to ensure a precise alignment between the practical problem being investigated and its requisite grounding in theory. Based on the literature reviewed, a significant gap remains: the specific resource and capability configurations necessary for BMI adoption within highly path-dependent, legacy, high-carbon industries facing existential market decline are largely untested in academic literature. The review confirms that South Africa serves as an exemplary study site. Its context is justified because it acts as a critical proxy for other emerging markets facing analogous complex difficulties. This selection ensures that the findings will have transferability to a broader scholarly discourse on global ET trends research.

In essence, the literature review confirms that while the theoretical necessity of BMI and resource reconfiguration for coal-dependent firms is established, the empirical reality of how firms overcome overwhelming internal and external constraints remains unclear (Rafique et al., 2025; Bohnsack et al., 2021). The study uses the South African coal industry to empirically explore, validate and conceptually detail the actionable frameworks decision-makers use in this unique, constrained context.

3. CHAPTER 3: RESEARCH QUESTIONS

3.1. Introduction

The formulation of the research questions was systematically derived through a comprehensive review of the relevant academic literature, as detailed in Chapter 2. This preparatory analysis synthesised knowledge across several critical theoretical domains, including ET, the concepts of resources (RBV) and capabilities (DC) and the domain of BMI.

Crucially, the literature review also focused on identifying and understanding the encompassing barriers that firms in the coal industry confront during the complex transition process. The central purpose of constructing the research questions was to ensure a precise alignment between the practical research problem being investigated and its requisite grounding in theory. Based on the literature reviewed, a significant gap remains regarding the specific resource and capability configurations necessary for BMI adoption within highly path-dependent, legacy, high-carbon industries facing existential market decline (Rafique et al., 2025; Bohnsack et al., 2021). Further, California Management Review (2025) in their “Call for Paper” argue that firms across many industries and sectors are encountering a pivotal moment where radical change is both necessary and imperative as global disruptions from climate change are compelling firms to reevaluate their methods of value creation, delivery, and capture. The study utilises the South African context because it a convenience and act as a critical proxy for other emerging markets that face analogous complex difficulties, thereby ensuring the findings have transferability to broader scholar discourse on global ET trends.

3.2. Main research problem and theoretical foundation

The main research problem guiding the entire study, derived directly from the theoretical knowledge gap in the literature, is:

How do coal-dependent firms effectively overcome deep-seated financial, operational and cognitive barriers and leverage or acquire the necessary resources and resources to successfully execute BMI in response to the rapid demands of the ET?

This research problem focuses on bridging the gap between the theoretical necessity of BMI and resource reconfiguration for coal-dependent firms and the empirical reality that overwhelming internal and external constraints make such change incredibly difficult for these firms. The theoretical lens underpinning the study is the RBV and DC theories. This frameworks is essential as it allows for the analysis of the firm’s internal asset base (RBV) and its capacity to integrate and reconfigure these assets (DC) to address external environmental

challenges, such as the ET. BMI is crucial because it requires decision-makers to redefine essential resources and determine how value will be created.

The following three sub-research questions systematically decompose this complex problem into measurable exploratory objectives:

3.3. Research question 1 (RQ1)

How do decision-makers in the coal industry understand the ET and how that understanding influences strategic or BM adaptation?

The literature notes that decision-makers often face cognitive barriers which restrict new ideas that do not fit with the firm's current profitable BM (Richter, 2011). Managers may suffer from historical bias and tend to stick to the traditional BM for too long (Bürer et al., 2021) or may adopt a "wait and see") approach due to high complexity and uncertainty surrounding the transition (Bryant et al., 2024, p.7).

The knowledge gap addressed by this RQ is the lack of specific insights into the content and structure of decision-makers' understanding, particularly their mental models, perceptions or framings of the ET, beyond generic cognitive barriers. Literature suggests that understanding the ET requires acknowledgment that it results in the destruction of old values, and the creation of new ones (Carley & Konisky, 2020), and demands advancements in technology, political compromise, economic trade-offs and efforts to address social impacts (Doh et al., 2021). This RQ explores how this complex understanding positively or negatively influences strategic adaptations.

3.4. Research question 2 (RQ2)

How does the ET influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?

The strategic success of the ET is strongly tied to a firm's ability to rapidly identify, mobilise and reconfigure its internal resources (RBV) in alignment with evolving environmental pressures (Rabetino et al., 2023). For coal and energy firms, success requires possessing unique resource stocks (Shan et al., 2014). The transition necessitates a strategic resource allocation that fundamentally transforms the operational architecture (Shaik et al., 2024). This involves leveraging existing capabilities to reorient innovation toward capturing value in a new niche sectors (Mori & Zhang, 2024).

The management literature suggests that a firm's resources and capabilities influence BMI (To et al., 2020), and the acquisition of new capabilities, such as the ability to exploit existing capabilities while developing new ones (DC), is crucial for sustained performance during technological change (Richter, 2011).

The knowledge gap is that the existing literature provides unclear conceptual foundations and examples of resource reconfiguration and acquisition necessitated by the transition (Rafique et al., 2025; Bohnsack et al., 2021). Therefore, this RQ seeks to explore the contextual details on how coal-dependent firms in South Africa are practically utilising the RBV and DC to implement BM adaptation or respond to the ET.

3.5. Research question 3 (RQ3)

Why do coal-dependent firms struggle to adapt their BMs to the ET, and how may these challenges be mitigated?

The literature has extensively documented the difficulties faced by coal-dependent firms in adapting their BMs, attributing struggles to deeply embedded challenges:

- Financial and operational barriers – theses include the lock-in problem, fear of stranded assets and the massive existing infrastructure requiring significant financial resources to dismantle or replace (Chipangamate & Nwaila, 2024). Operational barriers are characterised by path dependency, where prior choices limit future pathways due to self-reinforcing factors (Araújo, 2014).
- Systemic and regulatory barriers – the success of new BMs is significantly “dictated by the regulatory environment and market structure” (Bryant et al., 2024, p.7). Political interests may utilise policy to maintain the viability of coal power generation (Zhao & Alexandroff, 2019), and decommissioning leads to significant burdens for emerging market through the loss of employment and livelihoods (Jakob et al., 2020; Chipangamate & Nwaila, 2024).

The literature provides comprehensive categories for both the struggles and the conceptual mitigation strategies. This RQ1 therefore seeks to explore the contextual detail within the coal industry regarding these established challenges and solutions.

4. CHAPTER 4: RESEARCH METHODOLOGY

4.1. Introduction

This chapter delineates the research strategy employed to conduct the study and discusses the research methods and study design. The exploratory research design was deemed suitable for the study and effective in addressing the formulated research questions throughout data collection, analysis, and discussion of the findings. The chapter also delineates the study's limitations and offers a comprehensive explanation of the data collection and analysis approach.

4.2. Purpose of the research design

The study aimed to reveal essential insights into proactive measures, or the absence thereof, by examining how decision-makers redistributed resources or adapted capabilities to implement BMI within coal-dependent firms. This investigation utilised an exploratory study design, a methodology that aligned specifically with the stated purpose of the research. According to Al-Ababneh (2020), exploratory studies were defined as those that looked into prevailing circumstances, posed specific questions, sought fresh perspectives, evaluated occurrences from alternative angles, and developed foundational concepts and hypotheses for further investigation. Moreover, the concept of exploration itself was characterised by attributes such as search, creativity, flexibility, discovery, experimentation, and risk-taking. The main objectives of exploration were focused on establishing unique competency and opening up new opportunities, as detailed by Huber & Helm (2020) and Gu et al. (2021). It was also noted that qualitative methods proved crucial for exploratory research, as they provided vital insight into quantitative findings and assisted in better comprehending the existing state of events (Huber & Helm, 2020).

4.3. Research philosophy

The research adopted the interpretivist philosophy, consistent with the work of Bohnsack et al. (2020) and Arbale & Mutisya (2024). Darby et al. (2019) stated that reality is more than the sum of its parts; it is a dynamic, ever-changing framework that individuals use to make sense of the world. Through a thorough reflective inquiry process, interpretivists seek to understand the meaning that a lived experience hold for the individual (Peat et al., 2019). According to Zeng et al. (2020), the interpretivist approach promotes exploration of the individual experience, as well as how that experience is framed by society, history, and prevailing cultural influences. The interpretivist technique enhances the data extraction process because the researcher takes an empathetic perspective during interviews. This approach allowed

participants to articulate their experiences and ideas from a human standpoint. Ultimately, this methodology enabled the researcher to develop constructs aligned with the research objectives through a comprehensive analysis of the viewpoints of decision-makers (participants) in the coal-dependent firms.

4.4. Research and philosophical assumptions

The assumptions of both ontology and epistemology theories serve as the guide for this study.

- *Ontology*: Focuses on relativism. The nature of reality is where positivism and interpretivism diverge most significantly. According to interpretivists, reality has a relativist ontology, meaning that it can be understood as a variety of intangible mental constructs that are local, specific, and based on social and experiential factors, even though many people and even cultures share some similar characteristics (Zeng et al., 2020). This implies that an individual's or a group's mental constructs determine reality. Only by human senses, impressions, and perceptions can reality be understood (Zeng et al., 2020). From an ontological approach, the researcher acknowledges that various individuals will hold diverse viewpoints regarding the research questions. Each individual brings a unique perspective, set of experiences, and set of beliefs to the research. Consequently, in order to have a deeper understanding of the population's perspectives, the researcher will do in-depth interviews.
- *Epistemology*: Focuses on subjectivism. According to interpretivists, there is a relationship between research objects (like customers) and subjects (like researchers) (Zeng et al., 2020). Instead of establishing a common rule, researchers typically establish a level of societal consensus about the interpretations of theories and empirical observations (Zeng et al., 2020). The study will be underpinned by the existing theories to make sense of the data collected about the coal sector and its relationship with ET.

The interpretivist research paradigm necessitates that researchers maintain acute self-awareness concerning the potential impact of their personal experiences and viewpoints on the research study (Zeng et al., 2020). A core component of this methodology involves the frequent application of reflective techniques specifically designed to analyse and critically evaluate the researcher's inherent preconceptions and existing prejudices. Interpretivists operate upon the epistemological assumption that multiple realities exist. Consequently, the same empirical experience may be interpreted divergently by different individuals or groups. The primary scholarly objective is not to locate a singular, objective truth, but rather to systematically investigate these varied and complex points of view (Zeng et al., 2020). The participant and researcher relationship in interpretivist studies is often characterised by a more actively engaged and cooperative dynamic. Researchers strive to establish both rapport and

trust with participants, a crucial step enabling them to achieve a deeper and more nuanced comprehension of the participants' experiences (Zeng et al., 2020). In this specific research context, the researcher's established positionality is significant. The researcher possesses substantial professional expertise within the coal mining sector and frequently engages with individuals from the broader energy sector. This deep sectoral immersion carries the inherent potential to influence both the processes of data collection and the subsequent interpretation of findings. Crucially, the defined researcher role facilitates key access to decision-makers or senior managers operating within the coal value chain, thereby enabling the requisite collection of pertinent data.

4.5. Research Strategy and Methodological Approach

The research employs a qualitative, exploratory cross-sectional study design. This design is fundamentally characterised by collecting relevant information (data) at a single, given point in time, meaning there is no inherent time dimension involved in the data collection itself (Kesmodel, 2018). The time dimension, though defined as a "point in time," must be clearly established for participant selection and data gathering (Kesmodel, 2018). The cross-sectional approach is highly relevant because the primary objective is to assess the prevalence of traits, attitudes, knowledge, or behaviours within a population (Kesmodel, 2018). Specifically, the strategy aims to understand how decision-makers in coal-dependent firms are currently altering their BMs in response to the ET. This allows for the estimation of the prevalence of adopted strategies and prevailing opinions at a specific moment in time. Kesmodel (2018) argue that while cross-sectional studies can be either descriptive or analytical, this exploratory study is primarily descriptive, designed to uncover the breadth and nature of responses, attitudes, and knowledge among the target population of decision-makers. Data will be collected from a sample of decision-makers or senior managers in coal-dependent firms. According to Kesmodel (2018), it is crucial that authors and readers exercise caution regarding selection bias to ensure the sample is representative of the population under study, particularly since selection bias is an obvious issue in studies of prevalence. Furthermore, because there is no time interval between exposure and outcome in this design, caution must be exercised not to make causal inferences, even if associations between different parameters are assessed for analytical purposes.

The chosen methodology is qualitative research, which aligns perfectly with the study's objective to gain a deeper understanding of the adaptive strategies being employed. Qualitative research is defined as an iterative process intended to enhance the scientific community's understanding by uncovering new and significant distinctions that emerge from a thorough investigation of the phenomenon (Aspers & Corte, 2019). This approach is

particularly suitable for investigating uncharted ground, exploring novel or complicated phenomena, and learning about people's experiences and perspectives within their context (Peterson, 2019). Drawing on similar precedents, this exploratory cross-sectional qualitative study utilises semi-structured interviews (Cooper et al., 2017). Qualitative methods, such as interviews, are frequently employed in interpretive research because they allow for the collection of rich, in-depth information regarding individual perspectives and experiences (Aspers & Corte, 2019). According to Cooper et al. (2017), the data collected via interviews can be analysed using a rigorous approach, specifically framework analysis. Framework analysis involves several systematic stages: Familiarisation with the data, Identifying a thematic framework (guided by literature and emerging issues), Indexing, Charting, and mapping and interpretation. This rigorous method facilitates the uncovering of social processes, opinions, and experiences, ensuring a thorough understanding of both internal feelings and externally observable behaviour within the organisational context (Cooper et al., 2017). In summary, the cross-sectional qualitative method is appropriate as it seeks to gain a thorough understanding of the strategies and experiences of decision-makers in the coal sector, who are using coal in various ways and implementing different BMs at a specific moment in time concerning the complex environment of the ET.

4.6. Time horizon

Since time plays a significant role in the fifth layer of study, data can only be collected once over a brief period of time, which is a process known as "cross-sectional" (Al-Ababneh, 2020). According to Al-Ababneh (2020), cross-sectional studies are observational research approaches that examine data at one particular moment from a population or a representative subgroup, without suggesting causation, these investigations are meant to help find and comprehend correlations between factors (Al-Ababneh, 2020). This study is mostly descriptive in nature, seeking to characterise a population's traits, behaviours, or circumstances. Therefore, cross-sectional studies can also investigate correlations between variables, but it is unable to establish causation (Al-Ababneh, 2020). In addition, studies that are cross-sectional offer a snapshot of a population at a particular moment. The purpose of this study is to interview participants just once at a specific time.

4.7. Population and Target Sample

4.7.1. Population

According to Casteel and Bridier (2021) the primary group that the research is concerned with is the population of interest, which is made up of the people, couples, groups, organisations, or other things that one is interested in understanding and to whom the study's findings may

be applied or transferred. Further, populations give readers context and contextual signals and define the parameters of a study, and these restrictions give the research a natural focus, preventing the researcher from presenting a set of results that are one-size-fits-all (Casteel & Bridier, 2021). The population of interest for the study is limited to individual or decision-makers who hold an executive or senior management positions within the South African coal industry. These individuals must have experience related to BMI and strategic resource in response to the ET. The research is strictly delimited to firms operating within the coal value chain, specifically including coal producers (an emerging miners and a major producer) and a utility or electricity provider reliant on coal-fired power plants for national energy generation. The South African context is a convenient and acts as a critical proxy for other emerging markets facing analogous complex difficulties.

4.7.2. Target Sample

Saunders and Townsend (2016) argue that this sample size (N=14 to N=16) is defended on the basis of achieving data saturation within a reasonably homogeneous population. The sample size was intentionally delimited to 14 participants. These participants were drawn from three distinct firms operating within the coal industry or coal value chain, particularly coal-fired utilities.

The sampling specified the following distribution of decision-makers across the three firms' classification

Table 2: Classification of participating firms and participants

Firm classification	Number of participants	Source function within coal industry
Emerging coal miner (ECM)	5	Coal producer
Major coal producer (MCP)	5	Coal producer
Coal-fired Utility (CFU)	4	Coal-dependent electricity firm

Source: Author's own

The final sample of 14 participants was achieved. The categorisation of these groups was utilised facilitate the triangulation of findings during the analytical process.

4.8. Unit of analysis

The unit of analysis is defined as the inquiry about what is being explored, or what the objects or actor of the research are (Yurdusev, 1993), and in qualitative data analysis, a unit is a single

undivided entity around which you may focus your research and explain the characteristics of that element (Chenail, 2012). The unit of analysis is defined as the firm. These are specifically identified as firms operating within the South African coal value chain. The core focus of the research, or the phenomenon under investigation, consists of the measures and approaches employed by these firms related to the ET in South Africa. The conclusions and findings are aimed at describing the phenomena attributed to this larger entity (the firm). The study strictly delimited the investigation to specific entities operating within the coal value chain, including coal producers (an emerging miner and a major producer) and a utility or electricity provider reliant on coal-fired power plants for national energy generation. It is crucial for methodological clarity to distinguish the unit of analysis (the firm) from the unit of observation or sampling element, which is the individual decision-maker employed by that firm. Data was gathered from these decision-makers because they are tasked with determining, influencing, or managing the necessary resources and capabilities vital for aligning the firm's BM in relation to the ET.

4.9. Sampling techniques, criteria and size

The researcher employed a non-probability sampling technique. This method was intentionally chosen because the objective of the research was to reveal understanding and insights by providing information-rich explanations rather than statistical explanations or generalisations (Cassell et al., 2017). Saunders and Twonsend (2018) and Cassell et al. (2017) agree that this qualitative approach utilises effective reasoned judgements to generalise to theory, allowing for the development of theoretical generalisations based on analytic generalisability. A key characteristic of this non-probability approach is that the likelihood of each potential case being selected from the target population is unknown.

The sample selection criteria defined clear criteria for both the firms (the unit of analysis) and the individuals (the unit of observation) that provided data. Unit of analysis vs. Observation:

- The unit of analysis is defined as the firm operating within coal value chain.
- The unit of observation or sampling element is the individual or decision-maker employed by that firm.

The participants eligibility, the participants were limited to individuals or decision-makers who hold an executive or senior management role within the South African coal industry. These has to processes experience related to BMI and strategic resources allocation in response to the ET. All the participants satisfied the eligibility criteria defined for the study. Data was specifically gathered from these decision-makers because they are tasked with determining,

influencing or managing the necessary resources and capabilities vital for aligning the firm's BM in relation to ET.

The sample size was intentionally delimited to 14 participants, though the original target range was 14 to 16 participants. The sample size (N=14) was defended on the basis of achieving data saturation within a reasonably homogeneous population. The 14 participants were distributed across the three distinct firms (Table 3).

Table 3: Sample homogeneity

#	Unique identifier	Group of participants	Size of firm	Department
1	ECM 1	Coal	Emerging Coal Miner	Finance
2	ECM 2	Coal	Emerging Coal Miner	Technical
3	ECM 3	Coal	Emerging Coal Miner	Business Development
4	ECM 4	Coal	Emerging Coal Miner	Operations
5	ECM 5	Coal	Emerging Coal Miner	Operations
6	MCP 1	Coal	Major Producer	Operations
7	MCP 2	Coal	Major Producer	Operations
8	MCP 3	Coal	Major Producer	Operations
9	MCP 4	Coal	Major Producer	Operations
10	MCP 5	Coal	Major Producer	Operations
11	CFU 1	Energy	Major Utility	Energy
12	CFU 2	Energy	Major Utility	Coal Operations
13	CFU 3	Energy	Major Utility	Group Generation
14	CFU 4	Energy	Major Utility	R&D

Source: Author's own

4.10. Research instrument

Oerther (2021) sees the semi-structured interview guide as a tool to facilitate semi-structured interviews that will enable participants to tell their stories. The guide is not rigid but does not dictate the interview and the questions are built in advance based on the research aim (Oerther, 2021). The research instrument utilised was a semi-structured interview guide. Given the exploratory nature of the study, the guide was adapted from established theoretical literature on BMI, resources management and organisational change to ensure construct validity. The questions were designed to solicit practical experiences relevant to the theoretically formulated RQs.

A pilot study was conducted prior to the main data collection, and the interview guide was deemed adequate and suited for collecting data relevant to answering the research questions. The 14 questions were organised to address three core themes.

- 1) RQ1 (5 questions) – focused on decision-maker understanding of the ET and cognitive influences on strategic adaptation
- 2) RQ2 (5 questions) – focused on resources allocation, maintenance and acquisition, applying the RBV and DC lenses.
- 3) RQ3 (4 questions) – focused on barriers to BMI and potential mitigation strategies

Table 4: Research instrument

Research questions (RQ)	Literature	Interview guide
1. RQ1 How do decision-makers in the coal industry understand the ET and how that understanding influences strategic or BM adaptation?	Key theme: Decision-maker understanding and cognitive influence	1. Can you please introduce and describe your role in the organisation? 2. What do you understand about the JET? 3. What do you think are the most factors that affect the coal industry, or your firm in relation to the ET? 4. In your opinion, what is your primary role as a decision-maker in your firm in relation to BMI and ET? 5. What BM initiatives have you proposed or initiated in response to the ET?
2. RQ2 How does the ET influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?	Key theme: Resources allocation, maintenance and acquisition	6. What do you consider as key resources and capabilities that exists in your organisation? 7. Which of these key resources and capabilities do you consider critical for your organisation in creating a competitive advantage in the new energy world? 8. To what extent do you think your organisation must acquire new resources and build new capabilities? 9. How should the identified resources and capabilities be reallocated to create value for the organisation?

		10. How are you involved as a decision-maker in identifying and introducing resources and capabilities that help the organisation respond to the ET?
3. RQ 3 Why do coal-dependent firms struggle to adapt their BMs to the ET, and how may these challenges be mitigated?	Key theme: Barriers to BMI and mitigation strategies	11. What do you consider as barriers for your firm or organisations in the coal industry to innovate their BMs? 12. How is your organisation dealing with the barriers that hinders innovation for value creation in relation to ET? 13. In your opinion, what should be done to allow the coal industry to build new BMs or enter new markets in response to the ET? 14. What do you think are your limitations, different to organisational barriers, as a decision-maker to introduce innovative solutions in response to the ET?

Source: Author's own

4.11. Data collection

The data collection was executed as an exploratory qualitative cross-sectional study. The time horizon was cross-sectional, meaning data was collected as a single point in time (Kesmodel, 2018). This approach provided a snapshot of prevailing strategies and opinions (Kesmodel, 2018). The researcher utilised a non-probability sampling method (Cassell et al., 2017). This method was chosen because the objective was to reveal insights by providing information-rich explanations rather than statistical generalisations (Cassell et al., 2017). The population was limited to individuals or decision-makers who hold executive or senior management positions within the South African coal industry, specifically those with experience related to BMI and strategic resource allocation in response to the ET.

Prior acquiring ethical clearance from the Gordon Institute of Business Science' ethical committee, organisational permission was secured from three firms. The study gathered data from 14 participants. The sample was strategically drawn from three distinct groups operating within the coal value chain to facilitate the triangulation of findings.

Table 5: Sample classification

Firm classification	Number of participants
Emerging coal miner (ECM)	5
Major coal producer (MCP)	5
Coal-fired utility (CFU)	4

Source: Author's own

This sample size was defended on the basis of achieving data saturation within a reasonable homogeneous population.

Participants were approached through various platforms, including professional networks, cold calls, and referrals. All interviews were scheduled for a minimum of 45 minutes and were conducted using Microsoft Teams. Prior to starting data collection, permission from the participants firms was obtained, and consent forms were provided to and signed by each participant to verify their agreement. All interviews were recorded using the built-in Microsoft Teams recording application.

Table 6: Interview duration summary

Participant	Duration (minutes)
ECM 1	31
ECM 2	40
ECM 3	56
ECM 4	33
ECM 5	45
MCP 1	38
MCP 2	33
MCP 3	31
MCP 4	28
MCP 5	27
CFU 1	23
CFU 2	18
CFU 3	38
CFU 4	37

Source: Author's own

Table 6 illustrate the recorded duration across three distinct groups, with one participant from ECM group exhibiting the highest duration (56 minutes) and a participant from CFU group exhibiting the lowest duration (18 minutes). The total duration was 478 minutes, with an average duration of 34.14 minutes.

4.12. Data preparation

Following each interview, the recordings and videos were transcribed using an automated AI transcription software. To ensure data quality and validity, the researcher followed a rigorous review process, as suggested by Moon et al. (2016):

1. The AI-generated Microsoft Teams video and Microsoft Word document was promptly downloaded and stored.
2. The researcher replayed the recordings, and concurrently reviewing the transcripts to rectify errors.
3. The authenticated transcripts were then used to anonymise and conceal the records before proceeding to the analytical phase.

4.13. Data analysis

The qualitative data collection in natural setting is anticipated to encompass a rich array of contextual insights (Braun & Clarke, 2006). An inductive technique was deemed appropriate and ideal for this study, as inductive theorising is essential to qualitative research, frequently producing new insights that can inform the creation of totally new theoretical frameworks (Bansal et al., 2018). Thematic analysis was employed, which Braun and Clarke (2006) define as the method of categorising qualitative data via coding to identify themes or patterns pertinent to the research problem for future research.

The analysis process commenced after the data was collected from the 14 participants and organised into three distinct groups: decision-makers from Emerging Coal Miners (ECM), a Major Coal Producer (MCP) and a Coal-fired Utility (CFU). The analysis utilised Atlas.ti software for the formation and categorisation of the three participating groups.

The systematic classification and analysis of the data followed these key steps, incorporating both mechanical processing and conceptual synthesis:

- 1) Data (transcripts) organisation and triangulation – the three groups (ECM, MCP, CFU) were categorised according to their functions within the coal sector to facilitate the triangulation of findings.
- 2) Narrative discovery – the researcher commenced the analytical process by discovering the fundamental narratives from the interviews.
- 3) Initial coding and categorisation – the systematic process involved coding and categorising the qualitative data. The researcher started by engaging deeply with the

data and performing initial coding, looking for patterns and meaning in transcripts (data), as suggested by Braun and Clarke (2006). This initial stage generated 213 codes.

- 4) Grouping into subthemes or categories – the codes served as a foundation for building higher-order concepts (Braun & Clarke, 2006). These were organised into 28 subthemes (categories).
- 5) Theme generation and comparison – the subthemes (categories) were subsequently utilised to build overarching theoretical themes for each research question. The final step involved organising these codes into meaningful groupings, resulting in 11 final themes.
 - For RQ1, sixteen subthemes were examined, leading to the generation of four themes.
 - For RQ2, eight subthemes were examined, leading to the generation of four themes.
 - For RQ3, four subthemes were examined, leading to the generation of three themes.
- 6) Comparative analysis – the themes were subsequently analysed among participants (ECM, MCP, CFU) to identify both similarities and differences. The investigation specifically entailed comparing these similarities and differences to outline three key areas: individually or firm level decision-makers cognitive barriers and strategic adaptations, the extent of strategic resources allocation, and distinctive barriers for innovation and mitigation.

The approach confirms that the qualitative analysis of the firms' responses to the ET resulting in the themes and supporting conceptual frameworks derived from the codes and categories. The process involved moving from the initial discovery of fundamental narratives to systematic coding and categorisation to identify the final theoretical themes, as suggested by Braun and Clarke (2006).

Table 7: Data analysis outcomes

Steps	Classification	Outcome
1	First-order codes	213
2	Subthemes (Categories or Clusters)	28
3	Themes	11

Source: Author's own

4.14. Quality controls

This study draws on parallel criteria from interpretivist methods of inquiry, such as dependability, credibility, and transferability as suggested by Yin (2018) and highlighted by Arbale and Mutisya (2024).

- Dependability: Recording all evolving changes to the study focus.
- Credibility: Ensuring participants' realities are accurately represented through member validation (reviewing transcripts) (Yin, 2018; Arbale & Mutisya, 2024).
- Transferability: Providing a thorough explanation of the study's design and context so the reader may assess its applicability elsewhere.
- Confirmability: Ensuring that the findings are explicitly grounded in the data, tracking interpretations back to participant responses.

In addition, for a better interview practice, the researcher avoided taking charge of the discussion by regulating the volume or content of the words that were said, sharing personal experiences, thoughts, or opinions with participants, as well as influencing their responses with the wording of the questions (Arbale & Mutisya, 2024). Create an environment where participants were excited to answer or elaborate on the questions (Arbale & Mutisya, 2024). Further, the researcher will implement strong researcher reflexivity measures by routinely documenting and questioning their own biases, assumptions, and preconceptions. This is critical for mitigating the risk of researcher bias and potential data contamination from social desirability or organisational power dynamics influencing respondent answers.

4.15. Ethical considerations

As per the ethical clearance, this research will fully comply with the MPhil Research Ethics Committee of GIBS' ethical conduct criteria. After ethical clearance is received, data collection will begin, and an Appendix will contain the ethical clearance. Wolgemuth & Agosto (2019) state that a narrative study incorporates personal stories, and the researcher must address the ethical implications of each participant's narrative. Thus, participant and firm identities will be erased before storage and project completion to ensure confidentiality and anonymity. The study will gather qualitative data from human subjects; therefore, no data will be gathered from any inherently susceptible participants. Moreover, no incentives would be provided to the study participants. A consent letter, detailing informed participation, will be supplied to each participant for signature, and these letters will be stored separately from the collected data. An unsigned version of the consent letter will be included as an Appendix. Participation in the study will not be mandatory for any firms, hence a consent letter to conduct a study will be

provided to the participating firm and a signed copy will be stored separately from the collected data.

In retaining confidentiality in close-knit relationships, the researcher will ensure that there is mindful communication, establish clear boundaries, and uphold respect for privacy. In addition, the researcher will ensure that there is a clear comprehension of the information shared with various parties and the approach to managing sensitive topics with care, all while fostering trust and encouraging open dialogue. Further, the researcher will ensure confidentiality of all participants and firms, noting that anonymity is impossible as participant identities will be known to the researcher. All collected data will be secured with a password on a personal computer with backups maintained on a secure iCloud and retained for a minimum of 10 years, as required by GIBS

4.16. Study's limitations

The study acknowledges several limitations primarily stemming from its chosen methodology and data approach, which are detailed below:

4.16.1. Methodological limitations (interpretivist and cross-sectional)

Interpretivists research is inherently subjective because it relies heavily on the researcher's interpretation of the facts, which may generate bias (Saunders et al., 2003). The same data may be interpreted differently by different researchers, which could result in discrepancies (Saunders et al., 2003). This limitation was addressed by the researcher reflecting on their biases and preconceptions (reflexivity) to explore how their perspective might influence the interpretation of participant's view. The cross-sectional time horizon means that the data collected at one specific moment provides only a snapshot (van Rijnsoever, 2017). This approach is considered inferior to a longitudinal design for tracking changes in resource allocation and capabilities over time (van Rijnsoever, 2017). Further, caution must be exercised not to make causal inferences because there is no time interval between exposure and outcome in this design (van Rijnsoever, 2017).

4.16.2. Sampling and generalisability limitations

Interpretivist studies generally use small sample sizes (Saunders et al., 2003). This small size and the nature of the purposive sampling technique employed limit the ability to extrapolate findings to different groups or environments in a broader statistical framework (Saunders et al., 2003). The findings are context-specific and limited by the emphasis on in-depth

comprehension of particular cases (Saunders et al., 2003). The study's findings enhance theoretical understanding rather than reflect a wider population (Saunders et al., 2003).

The selection of only three firms could lead to biased insights. Decision-maker's responses might be influenced by factors like power dynamic or social desirability (Saunders et al., 2003). While qualitative studies sometimes achieve saturation with small samples, 14 participants may or may not be enough to depending on the complexity of the topic, potentially limiting depth (Young & Casey, 2019). Themes and patterns may be less stable because they are drawn from fewer data sources, increasing the risk that themes are influenced disproportionately by certain participants (Guest et al., 2020). The characteristics of a few participants may strongly shape the overall findings, if the sample lacks diversity (Squire et al., 2024).

The reliance on individual consent from decision-makers means that the findings reflect their personal perspective rather than verified organisational strategy. This requires careful interpretation at the level of analysis. Further, a small size of 14 participants limits how confidently the findings can be transferred to broader populations or different contexts (Vasileiou et al., 2018).

5. CHAPTER 5: RESEARCH FINDINGS

5.1. Presentation of findings

The main research of the study is focused on how coal-dependent firms effectively overcoming deep-seated financial, operational, and cognitive barriers, and leverage or acquire the necessary resources and capabilities to successfully execute BMI in response to the rapid demands of the ET.

The study findings are a summary of the data collected from 14 participants through a semi-structured interviews as highlighted in Chapter 4. The data was organised into three groups as highlighted in Table 8, and the groups consists of decision-makers from an emerging coal miner (ECM), a major coal producer (MCP) and a coal-fired utility (CFU). This allowed for a diversification of the participants as this is an exploratory study.

Table 8: classification of the participants groups

Firm Classification	Number of participants
Emerging coal miner (ECM)	5
Major coal producer (MCP)	5
Coal-fired utility (CFU)	4

Source: Author's own

The research entailed the formation and categorisation of three participating groups utilising Atlas.ti. The groups were categorised according to their functions within the coal value chain to facilitate the triangulation of findings. The researcher commenced the analytical process by discovering the fundamental narratives from the interviews. Subsequently, the themes were analysed among participants to identify both similarities and differences. The investigation specifically entailed comparing the similarities and differences of the findings. The purpose of examining these similarities and differences from each group was to outline three key areas: individually or firm level decision-makers cognitive barriers and strategic adaptation, the extent of strategic resources allocation, and distinctive barriers for innovation and mitigation.

5.2. RQ1: How do decision-makers in the coal industry understand the energy transition and how that understanding influences strategic or BM adaptation?

The research question is aimed at exploring specific insights into the content and structure of decision-maker's understanding, their mental models, perceptions or framings of the ET, beyond generic cognitive barriers, and how this specific understanding positively or negatively

influences strategic adaptations. The participants were posed five questions, the initial inquiry designed to ascertain their eligibility for participation in the study. All participants satisfied the eligibility criteria, including those included in the pilot trial. The other four questions were created to gain insight into how decision-makers understand the ET and how such understanding translates into practical BM efforts executed by the participants or their organisations. Four study themes were extracted from the participants' insights or comments, and these themes are analysed in this section of the study. The systematic classification and analysis of the participant's insights reveal distinct, yet often overlapping, perspectives and strategies across the three groups (ECM, MCP and CFU) regarding the ET

5.2.1. RQ1 Theme 1: JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints

5.2.1.1. *Evidence of findings on JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints*

The respondents were asked to provide their understanding of ET, and this theme captures the participant's complex understanding of the JET, acknowledging the shift to cleaner resources and the necessity of considering affected stakeholders, but asserting that this is constrained by technical limitations, such as the inability of renewables to provide base load.

The CFU decision-makers views JET as a necessary move towards cleaner energy that must be accomplished “in a just way” ensuring “security of energy” and not leaving communities or other industries stranded.

CFU 1:

“what we understand about the just energy transition is to have a transition between utilising the fossil fuels and move on into new technologies in a just way. That is considering the sustainability and the impact on the society and mainly on the sustainability. We can say that how will it impact the society? How will it sustain the livelihoods of people and also making sure that we still have the security of energy”

CFU 3

"How do we shift from producing power with the high carbon intensive resources to a cleaner and more sustainable with less impact on the ecosystems which is the environment in this context." "how do we make sure that you don't leave communities and other industries stranded as you transition? That's why it just comes in into that."

CFU 4

"The transition has to be just so that we don't leave the people in those communities behind while we transition to a low carbon economy."

The ECM decision-makers emphasise the technical constraints, noting that renewable energy sources alone are “not sufficient to give the required base load”. The participants focus heavily on the human and economic cost, including the “livelihoods at stake” and the high costs of renewables.

ECM 1

"the issue with transition is that these renewable energy sources, they alone are not sufficient to give the required base load, and it still requires coal as part of the energy mix." "It's not that easy in this current environment, given how expensive renewable energy is and the capacity really to be able to store and transmit renewable energy."

ECM 2

"the one part that people tend to neglect is the people aspect of it, how and under consideration." "they are individuals, they are livelihoods at stake."

ECM 4

"just transition, you know it means that as we as we slowly moving away from you know this non renewables, you know we need to do it in a manner that takes into account you know the negative impact that this transition may have, you know, on the stakeholders in the industry, you know, labour, communities, etc, you know, making sure that we prepare them,"

ECM 5

"It's basically a gradual switch from fossil fuel generated electricity to renewable electricity with due consideration to the people affected by it, be it employees, communities and to some extent suppliers that depend on the coal business"

The MCP decision-makers focuses on the definitive time constraint, asserting that coal will still form the base load for the next 20 to 30 years. Participants view the idea of an immediate switch (“stop everything”) as “not the right framework of doing things”, underlining the need for coal as a base.

<i>MCP 1</i> <i>"I'm of the opinion that for the next 20 to 30 years, coal will still form the base load." "we still need coal for the next at least 20 years to allow just energy transition to happen and to be in position to replace coal."</i>
<i>MCP 3</i> <i>"Just transition means now we stop everything. We switch all the generation or the power generation and we move on to the next level, which is renewable energy. You still need a base, and coal provides for that base. Up front, I can tell you that is not the right framework of doing things."</i>
<i>MCP 4</i> <i>"Just Energy Transition is a programme that aims at moving away from burning of fossil fuel, including coal in a responsible manner." "the base load for CFU as an example still comes primarily from coal. So, the renewable energy as we speak to develop renewable energy or any, you know, solar and stuff, you're still depending on base load for you to get that right."</i>
<i>MCP 5</i> <i>"how do we manage the transition to renewables or other energy sources and take the people along?"</i>

5.2.1.2. Conclusion on JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints

The core conclusion for this theme is that decision-makers hold a complex, often conflicted understanding of the JET, characterised by cognitive dissonance in transition adoption. While stakeholders intellectually accept the moral and social necessity of transitioning to cleaner resources, especially ensuring that affected employees and communities are not stranded and that livelihoods are sustained, this acceptance is strongly constrained by immediate technical and resource constraints. Critically, decision-makers assert that renewables alone are not sufficient to provide the required base load and that coal remains essential for energy security for the next 20 to 30 years. This practical reality leads to a critical perspective that both the current international ET or national JET framework is often misdiagnosed, inappropriate, or misunderstood as requiring an immediate switch, given the country's developing economy and coal abundance.

5.2.2. RQ1 Theme 2: The dominance of financial and geopolitical pressure as existential threats to coal viability

5.2.2.1. Evidence of findings on the dominance of financial and geopolitical pressure as existential threats to coal viability

The decision-makers were asked to provide insights on what they consider as the most important factors that affect the coal industry or their firm in relation to ET. This theme highlights that the most impactful factors affecting the coal industry are external, such as difficulty securing finance, rapid changes in investment priorities, and international regulations.

The CFU decision-makers identifies threats driven by external finance (moving away from financing coal projects) and global regulations, specifically mentioning the potential for penalties due to initiatives like the Carbon Border Adjustment Mechanism (CBAM).

<i>CFU 2</i> <i>"because of the outside influence, the financers and contributors, people are moving away from financing coal projects. To more cleaner energy"</i>
<i>CFU 4</i> <i>"The coal industry is basically affected by the global initiatives of decarbonisation and the global initiatives and directives. That indicates that anything that is produced from coal intensive industries will be subject to some sort of penalties." "there's something called the CBEM, which is the carbon border adjustment mechanism if I'm not mistaken, which basically looks at products that are exported or, and how carbon intensive where was their manufacturing process."</i>

ECM's decision-makers highlights the speed of the investment community moving faster than energy innovation, which makes securing necessary funds difficult. The participants also acknowledge reduced markets and customers appetite, leading to capital reduction and price pressures.

<i>ECM 1</i> <i>"Coal is a cheaper form of energy and coal is a large supplier of employment in South Africa." "a further loss of jobs in an already in a country that is already suffering from high unemployment. And also, the higher cost of living affordability for electricity for the average person in South Africa."</i>

<i>ECM 2</i> <i>"the overarching factor captain is, is people's perception of coal... Legislation is a big factor. The people element, what will happen to the people that are in the coal industry, the workforce? The other one is that what will happen to the actual mines, the actual infrastructure during this transition?"</i>
<i>ECM 4</i> <i>"will have reduced markets and less customers to sell coal to. There will be in a reduced capital with reduced, well, you can say reduced appetite in funding coal projects." "prices. Also, there might be some price pressures there, especially if they still excess supply in the market."</i>
<i>ECM 5</i> <i>"The investment community has moved faster than the innovation in the energy space to take a position on the viability of fossil fuels" and "it is difficult for the coal industry in this case to secure the necessary fund and to continue the business"</i>

Decision-makers for a MCP emphasise the severe impact of geopolitics and perception, with one participant calling the green movement “a scam” and pointing out that politics play a major role in impacting the coal industry through perception. The decision-makers also highlight the difficulty and high cost of obtaining capital and insurance.

<i>MCP 2</i> <i>"what would impact the, I think the export side of the business is insurance, if you are not compliant with various regulations. We found that various insurance companies are making it more difficult for you to be able to be insured,"</i>
<i>MCP 3</i> <i>"Politics plays a major role here. That is the major factor. That is affecting coal industry recently, where the greenies, the environmentalists, they are singing the song of clean energy, clean space. But like President Trump is saying, it's a scam." "that political space is still impacting coal mining industry quite severely because it's about perception."</i>
<i>MCP 5</i> <i>"The first one is the capital and insurance, it's very difficult to get capital in coal mining industry and also insurance is very expensive, it's overpriced." "Some of the Japanese companies don't want the 240 spec and is now forcing us to do more processing. To make up for people who burn the coal. With us, with the stations or not, everything is not working properly as it should." "market is very constrained," "some countries have now got very stringent requirements."</i>

5.2.2.2. *Conclusion on the dominance of financial and geopolitical pressure as existential threats to coal viability*

The conclusion for this theme is that the continued existence and viability of the coal industry are fundamentally determined by exogenous constraints, powerful external pressures rather than purely domestic operational concerns. Decision-makers identify the most impactful threats as the difficulty in securing finance and investment, the speed at which the investment community has moved faster than energy innovation, and the high cost of insurance. Furthermore, geopolitical rhetoric and international regulatory mechanisms, such as the Carbon Border Adjustment Mechanism (CBAM), are viewed as imposing significant penalties and creating market constraints, thereby acting as the dominant drivers threatening firm survival.

5.2.3. RQ1 Theme 3: Strategic adaptation: integrating multi-faceted risk management with future-oriented transition planning

5.2.3.1. *Evidence of findings on strategic adaptation: integrating multi-faceted risk management with future-oriented transition planning*

The participants were asked to describe their primary role in their firms in relation to BMI and ET. Therefore, this theme reflects the decision-makers primary shifting towards strategic influencing, risk mitigation (particularly financial risk), and actively planning for diversification to ensure long-term relevance.

Participants for the CFU sees their primary role as proving strategic advice to the board and country to “measure the problem correctly” (focusing on emissions rather than eliminating coal). The decision-makers focus on research and evaluating technologies to find ways to “continue using coal, but in a more sustainable manner”

CFU 3

"my role is to make sure that I also becomes an adviser to board and the country to say. Let's measure the problem correctly. Engineers and scientists must find solution to solve for the emissions." "if I do not do this right, I would have failed the generation that will come after us."

CFU 4

"My primary role is to find ways that we can continue using coal, but in a more sustainable manner. My role requires me to research technologies that can clean coal and evaluate

them." "We looked at carbon capture and utilisation. We looked at carbon capture and storage, and we compare the techno economic feasibility of these studies and how that would apply in South Africa."

The primary role of the decision-makers working for an ECM stresses risk and financial stewardship as paramount, focusing on managing operational and financial risk to ensure the "credibility and the strength of the firms balance sheet." Their strategic planning involve optimisation to "suit the market that is least affected" by the transition

ECM 1

"mine is firstly to address risk, both operational and financial risk and protect the business from that as well as to ensure the credibility and the strength of our balance sheets... energy transition must make business sense."

ECM 2

"my role in terms of energy transition I think is to try and optimise the reserve to suit or to best suit whatever market is currently available and more specifically the market that is least affected by this transition."

ECM 4

"we need to diversify, change the shape and look of the business to model this imminent reality. We have to responsibly wind down the core operations, but picking up on other areas of business," "Our role is to make sure that we, you know, we diversify,"

ECM 5

"I must communicate a balanced message to make sure that the people that report into my structure understand what the balanced and narrative should be" "I also have programs on our operations to ensure that we reduce our impact on the environment."

MCP senior management focusses on strategic influencing within the industry and management decisions, ensuring that the JET and ESG are considered in strategic planning. Their goal is to "right size the company" and remain relevant long-term.

MCP 1

"my decisions are based on the short-term needs of the company, which is the next 10 years, and I don't think I'm a decision maker at this stage which will take the company in the next at least 10 years. Into a new just transition" "In order to remain relevant in, I believe 30 years from now."

<i>MCP 4</i> <i>"my role is to influence, you know, I think we need to influence the, the, the, the just energy conversations in a positive way to say we know... it's not something we can do overnight," "in the decision-making process to say when we make decisions, we should consider the just energy transition in the conversation." "in our strategic planning, do we include just energy transition or ESG in general"</i>
<i>MCP 5</i> <i>"you must right size your company. You have to review your business model and look at your markets." "set up your mind to do that. And it does not mean some mines must close and some mines must be mined different to what they are mining at the moment."</i>

5.2.3.2. Conclusion on strategic adaptation: integrating multi-faceted risk management with future-oriented transition planning

This theme concludes that the decision-makers' primary role has transformed into one of executive portfolio resiliency, defining their function as systematically creating and preserving strategic options necessary for survival beyond the immediate coal era. The role now requires integrating multi-faceted risk mitigation, protecting the business from both operational and financial risk (including bankruptcy risk), with long-term strategic planning. Decision-makers must simultaneously consolidate and optimise current viable coal assets while ensuring their strategy includes diversification into future minerals and the inclusion of ESG (Environmental, Social, and Governance) and JET considerations in their long-term outlook to remain relevant in 30 years from now.

5.2.4. RQ1 Theme 4: The dual strategy of internal optimisation to fund measured diversification

5.2.4.1. Evidence of findings on the dual strategy of internal optimisation to fund measured diversification

The decision-makers were asked if there is any BM initiatives that they have proposed or initiated in response to the ET. The theme describes the dominant business approach, which involves using a dual strategy: maximising efficiency and reducing costs in current coal operations (internal optimisation) to generate cash flows, which is then used to fund gradual strategic diversification into renewables and future minerals.

CFU decision-makers primarily uses a strategy of technological retrofit and modernisation to extent the lifespan of existing coal-fired power plants and burn coal more cleanly. Senior management is focusing on advanced technologies like ultra supercritical boilers, battery energy storage and hydrogen and are discussing manufacturing their own batteries.

<i>CFU 1</i> <i>"We have stressed the utilisation of renewable energies that is coming from sun, that is coming from wind, use of battery energy storage. As well as utilisation of hydrogen as an energy source and gas as an energy source."</i>
<i>CFU 2</i> <i>"We are proposing to the industry that lets beneficiate the coal that we have."; "we need to find innovative ways to say how do we mine, how do we produce cleaner coal? By producing cleaner coal is beneficiated coal,"</i>
<i>CFU 3</i> <i>"we need to invest more into research, applied research in this country that will assist the country to utilise all its resources," "we are already talking about manufacturing our own batteries,"</i>
<i>CFU 4</i> <i>"some of the business models that we are looking into is retrofit right. Developed countries have extended the lifespan of each power plant because what is important is energy security." "they've built power plants with ultra supercritical boilers that allow for coal to be burnt efficient. Efficiently."</i>

ECM decision-makers emphasise diversification into critical minerals (such as copper and lithium) to model the "imminent reality". The firm is also implementing internal optimisation measures like reducing electricity consumption using devices that regulate usage during peak hours.

<i>ECM 1</i> <i>"we are investing money into renewable energy, things like solar, which is partly meant to support or power into our mines and partly meant to go into the grid." "We are looking at other forms business outside of coal. Which is what is called critical minerals," "The business models are meant to diversify into other commodities and also bring in solar to support the current and new operations."</i>

ECM 3

"last year we started with this diversification side of the business where we we're looking specifically at green energy metals. Specifically copper... there's a lithium project to that we're looking at as well" "we have partnered with a certain entity to build solar panels to generate electricity for some of our operations," "we have sort of reduced the consumption by these devices... pick hours they would just regulate the energy consumption and pick hours they would switch off the geysers," "We are looking at introducing sensor lightings,"

ECM 4

"we are partnering with an entity into that is looking into wind and solar energy... So basically, what we are doing there is to reduce our reliance on CFU for as long as our coal operations are still in business" "we could diversify into renewables, and you know energy space, and you could we could be into solar. I mean you could play into wind energy; we've got a land to do that."

ECM 5

"My initial role in the company was to look at opportunities to diversify from coal in a just way... You already have. You know inherent mining skills within the company which should be easy you know to plug and play in another commodity," "I have got consideration for all the things that I said above, you know about reducing diesel usage, electricity usage, water intensity"

MCP decision-makers concentrates on aggressive internal optimisation to drive down operational costs and mine coal “as effective, productive and cost effective as possible” to survive the current market. The firm is also actively diversifying into solar farms and wind farms, often using rehabilitated land for these projects.

MCP 1

"Our company forms part of the energy transition with wind farms that we're installing." "my business model initiatives are around extracting coal as effective, productive and cost effective as possible." "Our current view is to look at coal resources, which can be mined within the current cost structures. To mine low strip ratio coal to effectively mind us within a competitive cost environment,"

MCP 2

"it's influencing in terms of Seriti Green with the solar panels," "it's solar farms on rehabilitated land."

<i>MCP 4</i> <i>"we've got the, the solar systems, we've got two little solar farms." "we have got the motion sensors for lights." "Got energy efficient air cons" "we can also look at how do we best. Produce the qualities that are most suitable for low energy. I mean for low emissions like in the case of CFU ; we're talking about like a 240 spec"</i>
<i>MCP 5</i> <i>"where you where you can typically where you can use renewable energy... The reason is that you want energy security on your mind. So, where it's practical install solar, install wind" "we had the right size, basically went through three iterations of it to make it a much smaller mine with very, very much smaller fixed, fixed costs to make sure that we can survive in this environment."</i>

5.2.4.2. Conclusion on the dual strategy of internal optimisation to fund measured diversification

The dominant strategy response is characterised by a theory of staged organisational transformation. The conclusion is that decision-makers rely on a dual strategy: first, maximising cash flow by focusing intensely on internal optimisation (such as reducing diesel, electricity, and water usage intensity, reducing fixed costs, and improving coal quality or beneficiation). This cost-conservative approach provides the resources to fund the second, measured stage of diversification. Strategic initiatives include leveraging inherent mining skills for diversification for diversification into critical minerals (like copper or lithium) and developing renewable energy business model (solar and wind farms) to achieve energy security and self-sufficiency, reducing reliance on external power suppliers.

5.2.5. Conclusion on RQ1 findings

The overarching conclusion for RQ1 is that decision-makers manage the ET through a strategy of executive portfolio resiliency, driven by the necessity of adapting to powerful external financial constraints while funding a staged internal transformation.

Decision-makers hold a complex, often conflicted understanding of the JET. They intellectually accept the moral and social necessity of transitioning to cleaner resources and ensuring that affected communities are not stranded. However, this acceptance is heavily constrained by immediate technical and resource constraints. They assert that renewable energy sources alone are not sufficient to provide the required base load, maintaining that coal remains essential for energy security for the next 20 to 30 years. This perspective often leads to them

to view the current international ET or national JET framework as inappropriate or misunderstood if it requires an immediate switch away from coal.

The continued existence and viability of the coal industry are fundamentally determined by exogenous constraints, powerful external pressures rather than purely domestic operational concerns. The most impactful threats identified are the difficulty in securing finance and investment, the speed at which the investment community has moved faster than energy innovation, and the high cost of insurance. Further, international regulatory mechanisms, such as the CBAM, are viewed as imposing significant penalties and creating market constraints that act as dominant drivers threatening firm survival.

The primary role of decision-makers has transformed into one of executive portfolio resiliency, tasked with systematically creating and preserving strategic options necessary for survival beyond the immediate coal era. This function requires integrating multi-faceted risk mitigation, including protecting the business from both operational and financial risk (such as bankruptcy risk), with long-term strategic planning. They must simultaneously consolidate and optimise current viable coal assets while ensuring their strategy includes diversification into future minerals and the inclusion of ESG and JET considerations to remain relevant in the long term.

The dominant strategy response is characterised by a theory of staged organisational transformation, relying on a dual approach:

1. Internal optimisation – maximising cash flow by intensely focusing on internal efficiency measures (such as reducing fixed costs, improving coal quality or beneficiation, and reducing diesel, electricity and water usage intensity)
2. Measured diversification – using the cash flow generated by internal optimisation to fund the measured stage of diversification. This includes leveraging inherent mining skills for diversification into critical minerals (like copper or lithium) and developing renewable energy BMs (solar and wind farms) to achieve energy security and self-sufficiency.

5.3. RQ2: How does the energy transition influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?

The existing literature provides unclear conceptual foundations and examples of resource reconfiguration and acquisition necessitated by the transition, and this research question is aimed at exploring how coal-dependent firms in South Africa are applying RBV and DC to enact BM adaptation or respond to the ET. Five questions were posed to the research

participant to gain insights into the resources and capabilities deemed essential for the organisation, as well as those that offer a competitive advantage. Further, the inquiry was aimed to reveal insights regarding the extent to which resources and capabilities should be sustained, acquired, or developed. The objective was to understand the reallocation of resources and capabilities inside the firm for value creation and to establish the role of decision-makers in identifying and integrating resources and skills that facilitate value generation for the firm.

The qualitative analysis of the firms' responses to ET resulted in four overarching themes, which serves as the conceptual framework derived from the codes and categories.

5.3.1. RQ 2 Theme 1: Sustaining foundation capacity through core asset utilisation and financial leverage

5.3.1.1. *Evidence of findings on sustaining foundation capacity through core asset utilisation and financial leverage*

This theme explores how coal-dependent firms rely on and optimise their existing core assets and financial strategies (often leveraging current coal operations) to fund and manage the transition.

CFU focuses on leveraging massive existing infrastructure (transmission lines, stations) and decades of experience (100 years of power generation). Funding relies significantly on external sources like donor funding and the state.

CFU 2 <i>"Resources include infrastructure, noting, "we've got the infrastructure, we've got the third infrastructure in there. We've got our stations that will contribute the infrastructure, your transmission line." It is asserted that the existing "infrastructure, like I said, is there" and, along with expertise and knowledge, allows them to "still maintain the infrastructure that you have and that gives us the competitiveness"</i>
CFU 2 <i>Experience and infrastructure provide a substantial base, stating, "we've got 100 years of experience in power generation. So, we've seen it all over the years. They highlight the completion of major projects: "we just finished a big program of building infrastructure"</i>

CFU 4

Funding resources rely on external sources: "we get donor funding from institutions because our organisations look at. All types of energy, right? Especially renewable energy"

ECM critically relies on optimally mining existing coal assets (including key resources like metallurgical coal) to generate internal capital. The firm struggle with financial exclusion from traditional markets, making internal funding vital. Uses current coal mining profits as the primary internal cross-funding mechanism due to lack of external capital access.

ECM 1

The primary critical resource for new endeavours is capital: "the capital is absolutely critical because you require it to start, and you require it to sustain those endeavours, both as a component of the business, but also for them to be sustainable"

ECM 2

The fundamental starting point for the business is the resource itself: "The first key resource is obviously the coal resource itself. I mean we all know in every mining industry everything starts with the resource"

ECM 3

They are accessing key metallurgical coal resources: "What we do know for definite is that the Makhado project will break ground this November" The inherent capability for strategic agility is critical: "the inherent ability for the organisation to be agile, it's adaptable and very quick in decision making, I think that will be critical going into the future" They rely on internal generation for funding: "We will need to make sure that we raise enough money within our coal operations so as to fund these other resources (projects)"

ECM 5

The firm possess world-class infrastructure: "We have got world-class infrastructures. If there's a technology that avails itself together with the skills that we've got, we are able to pluck it in and then make the necessary adjustments without building from scratch" A key reallocation strategy is optimal asset utilisation: "we are now looking at you know optimal asset utilisation and that comes with the realisation that you do not have to look at the capacity of the infrastructure versus you know the capability to fill it from the value chain"

MCP acknowledges that coal operations must form the financial base for the next 20 years to fund the transition. The decision-makers focuses on maintaining a strong financial base from

coal to attract external funds and emphasise asset utilisation through leveraging existing land rights.

<i>MCP 1</i> <i>Coal operations are the financial base: "coal will form the base for the next 20 years. So, you will actually transition. You will keep your current company very well resourced"</i> <i>Having a good balance sheet allows easier access to capital: "I think the company through their current endeavours, has resource them financially to fund what they intend doing, and also with a good balance sheet. You know you can actually get easier access to funds via banks or other corporations to fund your newly envisage business"</i>
<i>MCP 2</i> <i>The firm leverage land and capital access: "it's the luxury of having the land available. So, in some instances Seriti has surface rights, mining rights, so they have that available already. Usually that's the most difficult to obtain" Flexibility due to smaller size aids capital acquisition: "access to capital and that flexibility because it's a smaller company decision making can take place very quickly"</i>
<i>MCP 5</i> <i>The outlook on reserves has changed due to uncertainty: "You don't. Leave your best coal reserves for later. You have to basically find your best coal reserves now because it might not be competitive advantage later"</i>

5.3.1.2. Conclusion on sustaining foundation capacity through core asset utilisation and financial leverage

This theme serves as the financial base for the entire transition. The imperative for change (strategic agility and acquisition) must be internally funded through the financial leverage derived from existing operational and core assets. For the coal miners, this means that optimally mining coal assets is critical for generating internal capital due to external funding constraints. For CFU, this means leveraging existing, often massive, infrastructure and external and donor funding.

5.3.2. RQ 2 Theme 2: Strategic investment in human capital and R&D for future competitiveness

5.3.2.1. Evidence of findings on strategic investment in human capital and R&D for future competitiveness

Theme focuses on the imperative to acquire new skills (human capital), establish dedicated innovation or R&D functions and use these investments to build strategic agility necessary for future competitive advantage.

The CFU is highly proactive in human capital R&D. decision-makers are actively recruiting new specialised talent (e.g., computer science and AI) and blending them with old skills. The firms aim drive changes in the national education curriculum (TVETs, nuclear technicians) and invest heavily in research.

CFU 1 <i>New skills must be blended with existing operational knowledge: "We needed resources of new people who will be able to adapt easily. And also get those that understand the old system and regime so that we can be able to mix the two and be able to match them and move forward" The firm is actively recruiting talent: "We're inquiring, we're getting new people, we're getting new students as well, people who are familiar with new tools that are being currently being used all over the world"</i>
CFU 2 <i>The firm recognise the need to invest in research and global know-how: "We need to spend more money on research. We need to attend conferences so that we can have the know how we can be competitive, we can know what is out there in the world"</i>
CFU 3 <i>The organisation drives changes in the national education curriculum: "we were talking to the universities with the Department of Higher Education to say we want colleges, TV colleges to train nuclear technicians which are different" The skills challenge extends beyond immediate hiring: "the education system need to change to say the child in Limpopo or in Eastern Cape. The child must know about this nuclear, it started that level for me, it started different approach as well"</i>
CFU 4 <i>The division define themselves as an R&D division: "we're a research and development division. They emphasise that R&D funding must be substantial: "research doesn't just start. Desktop and end there. It requires you to go out to your stakeholders"</i>

ECM decision-makers acknowledges an internal knowledge gap ("all that we know at the moment is coal and coal only"). Decision-maker suggest creating a formal R&D or business optimisation department. Their strategy to acquire capability involves a phased acquisition approach (buying stakes) to learn the new industry.

<i>ECM 1</i> <i>The organisation currently lacks internal capabilities, necessitating partnerships: "we don't have all the full capabilities in house, so we still require certain partnerships to be able to see our projects to completion"</i>
<i>ECM 2</i> <i>Human capital is critical for success in the transition: "people as a resource can make or break a company especially given this transition that is under discussion." They propose a formal R&D function: "the one area I'd like, I'd like the firm to maybe zoom into is ,you know, looking at business optimisation department. More like a research and development"</i>
<i>ECM 4</i> <i>The organisation acknowledges an internal knowledge gap in new energy: "all that we know at the moment is coal and coal only" The suggested strategy involves staged acquisitions to learn: "we buy stake into companies that are well established in the space, in the energy and renewable space... with time increase our stake... we slowly build our footprint, you know, into that, into that space"</i>
<i>ECM 5</i> <i>They highlight the resilience and competence of their people: "The first one is our people, good competent people that are well trained, that are very resilient." They emphasise that this resilience is a competitive differentiator: "the people I spoke about, the people that are still here despite all the difficulties that we've got, I don't believe that our competitors have got that"</i>

MCP management adopts a "follow role" strategy, preferring to acquire proven global technology rather than spending on expensive, original research. The decision-makers focus on acquiring specific subject matter experts (water, energy) but report difficulty attracting talent to the coal industry. The firm lack globally in automation.

<i>MCP 1</i> <i>They advocate for a "follow role" strategy rather than leading global R&D: "I would allow companies to lead and do the research and design and then play a follow role where</i>
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some people do the research. Research is quite expensive once the research is out, quickly introduce that new technology in South Africa." They have already secured necessary expertise: "Seriti has resourced themselves with subject matter experts... in water subject matter experts in energy transition"

MCP 5

They struggle with talent acquisition due to negative perception of coal: "we're struggling to get talent into coal. To quite a large extent, there's very few people writing managers tickets" The firm recognise they are lagging in innovation: "in terms of automation, we are very, very far behind"

5.3.2.2. Conclusion on strategic investment in human capital and R&D for future competitiveness

This theme represents the capability imperative. Realising the potential of the transition requires significant strategic investment in human capital and R&D. This involves actively acquiring new skills, targeting specific fields like computer science (AI and programming), and building formal R&D functions, which are critical because people can make or break a company.

5.3.3. RQ 2 Theme 3: Systemic organisational restructuring and ecosystem integration for value creation

5.3.3.1. Evidence of findings on systemic organisational restructuring and ecosystem integration for value creation

This theme addresses the necessity of structural changes within the organisation (decentralisation, integration, giving resources authority) and leveraging external stakeholders and partners (Ecosystem) to drive value creation.

CFU focuses on ecosystem integration and a “whole-of-government approach”. It views itself as a national enabler, leveraging a broad network of universities, researchers, and dedicated suppliers. Stakeholders’ willingness is a critical resource.

<i>CFU 4</i> <i>Stakeholder willingness is a critical resource: "the third, but not least key resources is the stakeholder willingness of stakeholders, and which is industry, government and so. To participate in this research that we do"</i>
<i>CFU 3</i> <i>They call for a "whole-of-government approach" and ecosystem integration: "Energy transition, it's saying CFU government must use all the resources we have. That's what we've got universities. We should assign universities to some of the key program." They see CFU as a national enabler, leveraging its supplier network: "there's a lot of companies that are not CFU that their job is working for CFU actually"</i>

ECM focusses on internal restructuring, including demanding that new departments (like R&D) be given relevance and authority over entrenched operations. They are also pursuing optimal asset utilisation by treating departments as business centres and fully integrating subsidiaries.

<i>ECM 1</i> <i>Partnerships are required to complete projects: "we still require certain partnerships to be able to see our projects to completion and to actually operationalise it"</i>
<i>ECM 2</i> <i>New departments (like R&D) need authority over entrenched operations: "they need to be given relevance, a position of authority so that their contribution or their voices are not only heard but are also acted upon" The R&D function must be empowered: "it needs to be empowered. Not reporting to somebody at the operation that will reduce their work or will prioritise operational requirements as opposed to R&D initiatives"</i>
<i>ECM 5</i> <i>The strategy includes treating departments as profit centres and integration: "We need to start looking at every one of the departments that we have as a business centre and see if there is any value offering that can come out of HR, out of engineering" They advocate for full integration of subsidiaries: "We've got subsidiaries in the group that are not speaking to each other, So, if you fully integrate the subsidiaries, and you also run each department as a cost and that create possible income"</i>

MCP links structural changes to external viability, focusing on achieving successful rehabilitation and mine closure (ESG requirements) to improve ESG scoring and enable international expansion. They participate in international committees to "build the future" and leverage OEMs for technical partnerships.

MCP 2

They highlight the competitive advantage of being involved in committees to build the future: "to be part of all of these committees, and it's international, it's not just local, but to be part of that so that you build the future instead of following the future." They focus on ESG requirements like rehabilitation for international expansion: "adequate sustainable rehabilitation that will lead you into a successful mine closure to improve your ESG report. And in turn everything else like your scoring, all of those other types of requirements to expand internationally"

MCP 4

The ecosystem includes external technical partners: "our OEMs that are critical for us and as well as CFU , a stakeholder for this and for this energy world" They plan to leverage these relationships for value: "influence the OEMs to say when you do our rebuilds for the machines, when we purchase new equipment from you consider the energy efficient equipment"

5.3.3.2. Conclusion on systemic organisational restructuring and ecosystem integration for value creation

This theme addresses the need for structural enabling. The investment in new capabilities is often hampered by existing organisational structures. Therefore, the organisation must implement structural mechanisms like optimal asset utilisation, vertical integration of subsidiaries, and empowering new departments with authority over established operations. Further, leveraging the ecosystem and external relations (stakeholders, government, academia, partners) is crucial, as exemplified by CFU 's adoption of a "whole-of-government approach"

5.3.4. RQ2: Theme 4: Dual leadership focus – balancing coal and transition steering

5.3.4.1. Evidence of findings on dual leadership focus – balancing coal and transition steering

This theme examines the role of leadership in defining the strategic vision, allocating capital, and the internal tension between maintaining the profitable core business (coal) and aggressively pursuing the transition.

Decision-makers at CFU express proactive, hands-on leadership in the transition, with CFU 3 stating they are "leading this change, from the front." Their involvement focuses on defining the vision and building external partnerships (e.g., university collaborations)

<i>CFU 3</i> <i>The decision-maker asserts a proactive leadership role: "I'm actually leading this one. That's why I can talk to you like this because I mean, I'm leading this one... for me is to define the vision." This involvement is hands-on: "I'm leading this change. I'm leading it from the front, actually, including at all angles, because that's my job to enable these things to happen"</i>
<i>CFU 4</i> <i>Involvement includes talent management: "we've got a very big internship program. That gets the interns involved in in all the initiatives that we are we are currently doing"</i>

Involvement at ECM is primarily focused on financing, fundraising, and capital allocation for new projects. Some strategic transition efforts are noted as "on ice because of funding," suggesting funding constraints limit leadership involvement in steering the transformation.

<i>ECM 1</i> <i>Involvement is primarily focused on financing and external relations: "For me, my involvement is from a financing point of view, so it's about raising funds, tapping into the different financial resources that are out there and partnering with them to make our project come to life"</i>
<i>ECM 2</i> <i>The decision-maker's role involves risk identification: "So as a decision maker, I highlight potential risks, and I get involved in risk identification, very high-level risk identification"</i>
<i>ECM 3</i> <i>Involvement has expanded from coal to new assets: "My involvement has become very, very key, in a sense that I'm no longer just involved in our coal operations, there is now something else that I must look at." The focus is on capital allocation for new projects: "I'm quite involved in decision making in terms of introducing resources or capital allocation in this stage to determine where would be the best place to allocate capital"</i>
<i>ECM 4</i> <i>Involvement is limited to strategic planning sessions: "it's more the strategic planning sessions, you know, where one gets an opportunity to contribute. It's not more on a day-to-day running of the business"</i>

ECM 5

The decision-maker holds a dual operational/strategic role: "I also play the role of CEO of Katlego Operations. So, you know I have got a responsibility of also accessing market trends and information to make decisions for the subsidiary." He notes that the diversification strategy is currently dormant: "I was leading the diversification strategy. It's on ice because of funding, but it's a hat that I wear from time to time in my thinking"

MCP decision-makers insights shows a clear division of labour: some participants are focused solely on sustaining the profitable coal base ("Our goal and our purpose is to sustain the company") to provide the financial foundation for others to transition. Critically, one participant expressed self-acknowledged insufficient involvement in identifying new resources.

MCP 1

The participant describes their operational role as sustaining the foundation, not driving the transition: "The short answers we are not involved, our goal and our purpose is to sustain the company, the current company." Their function is to ensure the financial foundation for others to transition: "Our function is to provide the solid base financial base to actually allow this transition to occur"

MCP 3

He praises the leadership for balancing the core and the future: "The leadership, they are not solely focusing on coal or focusing on wind. They've managed to find that a fine line between the two." However, he expresses self-doubt regarding personal involvement: "Am I doing enough? Am I doing enough as a decision maker to identify, introduce resources and capabilities that will help organisation to respond to? The answer is no; I'm not doing enough"

MCP 5

Involvement is localised to mining operations: "am I involved as a decision maker? I do get my input into these different areas of decisions, but you know we're involved in making decisions on what happens on the mine"

5.3.4.2. Conclusion on dual leadership focus – balancing coal and transition steering

This theme is the governing mechanism. The entire transition process must be guided by clear executive commitment. If the Leadership fails to ensure effective systemic reallocation, the organisation risks being unable to convert financial leverage into future competitiveness. This requires leaders to actively steer reallocation toward new ventures, even while acknowledging internal constraints or the necessity of focusing on sustaining the profitable core base

5.3.5. Conclusion on RQ2 findings

The overall conclusion for RQ2 is that successful BMI is an exercise in converting existing financial leverage into future competitiveness through structured resource reallocation guided by clear executive commitment, necessitating significant investment in human capital and R&D.

The imperative for change must be internally funded through the financial leverage derived from existing operational and core assets. For coal miners (ECM and MCP), this means optimally mining coal assets to generate internal capital due to external funding constraints. The Coal-fired Utility (CFU) leverage its massive existing infrastructures and relies heavily on external and donor funding for its future projects. The financial base is critical, as capital is absolutely essential to start and sustain new endeavours.

Realising the potential of the transition requires significant strategic investment in human capital and R&D. New capabilities must be actively acquired, often targeting specific fields like computer science, AI and programming. The need to attract highly educated talent, sometimes even for operator roles, is seen as crucial. Some coal miners adopt a “follow role” strategy, preferring to quickly acquire and implement proven global technology rather than incurring the expense of leading original R&D.

The investment in new capabilities is often hampered by existing organisational structures. To overcome this, organisations must implement structural mechanisms. These mechanisms include adopting optimal asset utilisation, vertically integrating subsidiaries, and crucially, empowering new, dedicated departments (like R&D or transition initiatives) with authority over established operations to prevent them from being minimised by entrenched processes. Leveraging the external ecosystem and stakeholder relations (government, academia, partners) is essential, exemplified by the CFU’s adoption of a “whole-of-government approach.”

The transition process must be guided by clear executive commitment. Leadership’s primary function is to serve as the governing mechanism that ensures effective systemic reallocation. This requires leaders to actively steer capital toward new ventures, even while acknowledging the internal tension created by the necessity of focusing on sustaining the profitable coal core.

5.4. RQ3: Why do coal-dependent firms struggle to adapt their BMs to the energy transition, and how may these challenges be mitigated?

The literature provides comprehensive categories for both the struggles and the conceptual mitigation strategies. The RQ seeks to explore the contextual detail within the coal industry regarding these established challenges and solutions. Four questions were posited to the participants to get insights that will assist the researcher in understanding the barriers that hinders the coal-dependent firms from BMI and how are firms navigating the identified barriers. In addition, the questions are drafted to explore the perspectives of the participants on how the coal industry can be enabled to innovate or create a competitive advantage. Further, the questions were aimed to explore if the decision-makers have limitations that prevent them to act on the firms BM adaptation.

The analysis of qualitative data involved the systematic process of coding and categorising to identify three themes.

5.4.1. RQ 3 Theme 1: The dual constraints of financial capital and regulatory uncertainty

5.4.1.1. *Evidence of findings on the dual constraints of financial capital and regulatory uncertainty*

The participants were asked to provide insights on the barriers that hinders innovation in the coal industry. This theme posits that the coal industry's ability to initiate radical BMI is primarily paralysed by the high cost (financial capital) of transition coupled with unpredictable, often hostile, regulatory environment. All three groups recognise lack of funding and access to capital as the primary barriers to innovation.

CFU primarily stresses the difficulty in obtaining financing due to traditional banks moving away from coal, alongside constraints posed by slow regulatory approvals and the limiting nature of existing regulatory framework. The participants from the CFU note that insufficient enforcement of laws allows dirty practices to continue, stifling innovation. Individual limitations also include difficulty accessing proprietary organisations data.

CFU 2

"It's finance. The biggest part is finance because a lot of traditional banks or financials, they're moving away from investing in coal and finance means for exploration, for developing new projects. Running projects, so that's the biggest barrier right now." "Also,

<i>your regulatory approvals, they are not as easy to go through as our neighbours like Botswana or the outside world." "Do I have limitations? Finance is a limitation."</i>
CFU 3 <i>"I think the biggest limitation to any innovative solution is a constraint of what to call regulatory frameworks, because a regulatory framework sometimes the. They can limit innovations, they can limit..."</i>
CFU 4 <i>"So, when you know that you are not going to get that much penalties for producing dirty energy, you continue. You don't innovate. You know, so I think there's lack of enforcement of laws and policies..." "My personal limitations is access to information, access to data. You must remember that these organisations, that is their intellectual property, how they run their business, right?"</i>

ECM centres the constraints on their status as junior miners, who lack the existing large facilities their competitors use of capital access. The participants from this firms feel aggressively applied stringent policies and policy uncertainty make operation extremely difficult. The participants explicitly state the need for government lobbying to negotiate innovative structures with commercial banks.

ECM 1 <i>"our biggest barrier to entry in energy transition and actually being able to scale is funds. I think it purely comes down to funding and having access to funds." "banks have changed their policies so they can only support existing facilities, but they will not issue new facilities. This is a huge barrier to entry because such projects for energy transition. Require extensive capital." "my reservation is around the policies, stringent policies that have already been put in place because it makes it very. Difficult to operate as a coal mining company."</i>
ECM 3 <i>"Innovation needs money. Yeah, innovation needs money. If there's no funding, if there's no funding, you know that you won't find any great ideas out there." "I think the coal industry needs certainty. We need to be certain that for the next 20 or 30 years, coal will form the base load of electricity generation in this country."</i>
ECM 4 <i>"So, yeah, so barriers are funding. So, coal industry is struggling to even fund its current, you know, its current business." "We're in the mood of survival at the moment, even the heavyweights, they're starting to take strain."</i>

ECM 5

"access to capital and policy uncertainty." "The European countries, you know, took a firm decision, but then you know the way the risk is managed is just through basically bulldozing developing countries and think they move too fast."

MCP participants identifies capital access as crucial for flexibility. Their regulatory concern focuses on the difficulty of licensing and other government processes, and the broader external debate (including global political rhetoric) which creates uncertainty about coal's future. The participants acknowledge that current financial strain means they are in a survival mode and are not making money, constraining capital.

MCP 2

"I think access to capital, um, because capital gives you flexibility. So, if you do not have that flexibility, it's difficult for you to be able to change your organisation."

MCP 3

"It should be considered. We they should make it a quite conducive for any coal miner to be able to start a coal mining company and operate in South Africa." "we are divided. We've got someone like Donald Trump, I'm quoting him, coming with a different perspective and to say no, it's a scam, there's no such. So, it puts us at the end to say, really."

MCP 4

"capital, the energy transition type of stuff, they require a lot of capital which is not always readily available."

MCP 5

"So, so firstly barriers are we're not making money, we're not rolling in money. So capital is constrained. We're also not getting money, makes it very difficult to change the business models." "it's difficult to get your licensing. It's hell of a process. Anything in government is a problem in our country." "Carbon taxes is going to be detrimental; it's like a vicious circle. Let's going to. For me, I don't think there's any benefit in having carbon taxes."

5.4.1.2. *Conclusion on the dual constraints of financial capital and regulatory uncertainty*

The central finding of this theme is that radical BMI in the coal industry is fundamentally paralysed by the high cost of transition combined with a challenging and unpredictable regulatory and policy environment. Decision-makers confirm that the scarcity of readily

available capital, due to financial institutions moving away from coal, makes critical investments in new projects difficult, forcing reliance on internal equity. This financial constraint is exacerbated by a hostile external environment marked by policy uncertainty, regulatory complexity (such as difficult licensing processes), and a perceived lack of enforcement or incentives for cleaner operations, undermining the foundation needed for strategic change.

5.4.2. RQ3 Theme 2: Overcoming cultural and organisational inertia through focused talent investment

5.4.2.1. *Evidence of findings on overcoming cultural and organisational inertia through focused talent investment*

The groups struggle with internal resistance and lack of appropriate skills, but approach mitigation differently based on organisational size and structure.

The CFU decision-makers emphasise to change and fear of new technology among staff. Their solution is highly structural; they address inertia by forming new departments specifically focused on innovative tasks to prevent current operations from being burdened. Participants also noted the “mental barrier” of viewing coal as a problem rather than a resource with potential.

CFU 1 <i>"people are fear they are afraid. Or of new technology and new innovation because they've never been there." "resistance to change where people feel that hey, they may not change otherwise they are going to lose, they are going to lose sales." "make sure that we move forward with, we move forward with formation of new departments. So that each task is only really focused on that, otherwise you will have a problem of the people not be able to focus."</i>
CFU 2 <i>"change is always difficult for people. I think one thing that's contributing to the coal industry to move is because people are scared of change."</i>
CFU 3 <i>"People just accepted that coal is a problem. That is a mental barrier in my view." "The scientists and engineers' job is not to see the problem, is to see the potential."</i>

ECM decision-makers highlights unique internal dynamic such as pervasive lack of inclusivity, silo functioning and the detrimental effect of family-based decisions on professional management and strategy. Individual limitations often revolve around a “mindset thing” that leads decision-makers to prioritise immediate operational challenges (“problem of today”) over long-term strategic planning.

ECM 2

"Instead, our firm tends to make decision based on a few individuals' opinions or expertise. So, I mean that's what I mean by lack of inclusivity." "some of the norms or the ways of doing business as a family business. May not necessarily be the best way of running a business." "the company is not integrated and as a result there are a lot of silo functioning." "I tend to prioritise the challenges at hand. So, the problems of today, those are the things that take most of my time as opposed to the problems of tomorrow."

ECM 3

"in the absence of funding, what do people do? They stick to what they know best works. Which is the traditional way of doing things." "my thinking will not always be aligned, be in alignment with what the organisation or the way that I would ordinarily want to do things would be exactly the way that the organisation would like to do things."

ECM 4

"The 2nd barrier can be our understanding of this alternative, you know, industries. I don't think much has really gone into it, be it in the form of understanding of you know of the markets and the models and the margins that are there."

MCP participants acknowledged the legacy barrier of illiterate people in the industry. Their key mitigation strategy is proactively improving human capital by raising entry qualifications and hiring highly educated talent (e.g., Master's degree holders) even for operator roles. Limitations for decision-makers are often related to operating within existing long-term agreements with CFU or being constrained by the leadership vision.

MCP 1

"You need to decide where you're going to be in 20 years from now. What type of company you are going to be or is it the end of the company, and you've reached your useful life." "I made it clear previously that I don't think that we should lead R&D, I think we should be followers."

<i>MCP 3</i> <i>"So, so barriers currently are we're sitting with high illiterate people in the organisation, people that cannot be transformed." "I'm sitting with 57 candidates in my operation, candidates who are currently employed as operators, but in actual fact they are sitting with master's degree."</i>
<i>MCP 4</i> <i>"The third one as a barrier will be the skill set. So, you'll notice that in South Africa we are good at replicating the current engineers, but we're not good at innovating." "You look at the curriculum from all the universities; it remains stagnant for years." "Seriti Green is formed, which is a good response to saying we will contribute to green energy and part of the energy transition."</i>

5.4.2.2. Conclusion on overcoming cultural and organisational inertia through focused talent investment

This theme concludes that deep-seated internal organisational resistance, manifesting as fear of change, traditional reliance on coal, short-term thinking, and significant skill deficits, presents a powerful barrier to transition. Overcoming this inertia requires a deliberate and proactive strategic investment in human capital and structure. Companies mitigate this by creating new, dedicated departments for energy transition initiatives, raising minimum entry qualifications, attracting highly educated talent, and adopting a "follower R&D strategy" to quickly acquire and implement proven technologies rather than incurring the risk and cost of leading research

5.4.3. RQ3 Theme 3: Redefining value creation through strategic diversification and narrative change

5.4.3.1. Evidence of findings on redefining value creation through strategic diversification and narrative change

This theme requires the coal industry to aggressively diversify into near industries and clean technologies, simultaneously working to rebuild external trust and policy support by changing the public narrative regarding its economic and strategic contribution. All groups agree that diversification and a revised public narrative are essential but differ in their strategic approach to R&D and diversification speed.

CFU decision-makers focuses on redefining their product through “green attributes” (a “green stamp”) to align with customer competitive advantage. They promote converting waste (like plastics and old ash) into cheap energy inputs and investing in research to utilise pollutants (CO₂, SO₂). They see the potential to use decommissioned mines to produce power and convert them into national key points.

<i>CFU 1</i> <i>"We came up with a green attributes approach where we are able to sell not only electricity but with. Sell green electricity and that gives the customers competitive advantage."</i>
<i>CFU 3</i> <i>"How many plastic papers are there? These are all good energy input. You understand why we are not converting these things to good businesses and produce power with it very cheaper for the communities." "We will use these mines to produce power and convert them to national key points." "Let's pay the top researchers in the world to or even in South Africa to see what products we can produce from SO₂, CO₂ and all of those things."</i>

ECM decision-makers priorities are twofold: first, requiring governments lobbying assistance to secure funding for transition projects, and secondly, actively changing the narrative by being vocal about coal’s historical and ongoing economic contribution.

<i>ECM 1</i> <i>"We have basically given up on commercial banks, and we have approached different financial institutions, we've approached the likes of the IDC, the likes of the DFIS." "The technology exists. It's possible to make coal green. We know that it's not impossible because the technology exists and China can do it." "we require government to lobby for us in these efforts with commercial banks."</i>
<i>ECM 2</i> <i>"it's up to the coal industry to change the narrative of the industry, and that can be done in many ways." "that has got a lot to do with stewardship and community development and even things like being very vocal about not only the various capabilities that coal has, but also the contribution that coal has given, you know, the economy"</i>
<i>ECM 5</i> <i>"We need to organise ourselves and make sure that we tell our side of the story and we balance the debate." "We must participate in the creation and implementation of clean</i>

energy, clean coal technologies." "we should be able to pivot to near industries that do not require too much re-skilling."

MCP decision-makers exhibit an “early transition strategy” to evolve from coal company into a broader energy company, actively diversifying into solar, water and wind energy. They consciously adopt a “follower R&D strategy,” preferring to purchase proven global technology rather than leading research. They stress the importance of industry collaboration for transition, arguing companies should not try to transform in isolation.

MCP 1

"we've sort of like create a strategy around water and energy or wind energy and how to harvest that." "the strategy that Mike and the team have to transition early and lead the company into an energy company rather than a coal company was the right and appropriate choice." "Following. So, all these organisations are in existence and we're buying their technology, putting up in plants as far as wind farms are concerned."

MCP 2

"to be able to see, to look into the future, to see what where we will be working in future and how that might be joined as well." "we're not willing to operate together to enable the transition because you can't just transform yourself. You need to transition the industry with you."

MCP 5

"The people who use the coal should be implementing those or, you know, should be researching and doing the work to do to implement that." "We're moving into other commodities. The same as Seriti, we're looking at diversifying our energy with the wind farms and solar."

5.4.3.2. Conclusion on redefining value creation through strategic diversification and narrative change

Securing the coal industry's viable long-term future demands an aggressive strategic pivot toward diversification into near industries (like wind, solar, and pollutant utilisation). Critically, this strategic move must be simultaneous with a concerted effort to address external trust and policy deficits. The industry recognises the necessity of changing its own narrative by actively promoting coal's economic contribution, engaging vocally in policy discussions, and securing government lobbying and financial incentives. This combination of diversifying outputs and stabilising the political and public perception is deemed essential to sustain economic activity and ensure the feasibility of new, cleaner BMs.

5.4.4. Conclusion on RQ3 findings

The RQ3 findings highlights that firm's struggles stem primarily from external financial and regulatory constraints, compounded by deep-seated internal inertia. Successful adaptation requires a three-pronged mitigation strategy involving stabilising the external environment, transforming internal structures and skills, and aggressively pivoting strategically.

The central finding is that radical BMI in the coal industry is fundamentally paralysed by the high cost (financial constraints) of transition combined with a challenging and unpredictable regulatory and policy environment.

- Financial constraints – decision-makers confirm that the scarcity of readily available capital is a critical barrier, largely because financial institutions are moving away from coal. This forces firms to rely on internal equity for critical investments in new projects.
- Regulatory hostility – this financial constraints is exacerbated by a hostile external environment characterised by policy uncertainty, regulatory complexity (such as difficult licensing processes), and a perceived lack of enforcement or incentives for cleaner operations, undermining the foundation needed for strategic change.

Deep-seated internal organisational resistance presents a powerful barrier to transition, manifesting as fear of change, traditional reliance on coal, short-term thinking (prioritising the “problem of today”), and significant skill deficits.

- Strategic investment in human capital and structure – overcoming this inertia requires a deliberate and proactive strategic investment in human capital and organisational structure.
- Structural mitigation – firms mitigate internal resistance by creating new, dedicated departments for ET initiatives to prevent current operations from being burdened.
- Talent strategy – firms are raising minimum entry qualifications, attracting highly educated talent (even for roles like operators), and adopting a “follower R&D strategy”. This “follower strategy” involves quickly acquiring and implementing proven technologies rather than incurring the risk and cost of leading expensive original research.

Securing the coal industry's viable long-term future demands as aggressive strategic pivot toward diversification into near industries and clean technologies.

- Aggressive diversification – the strategic pivot involves into near industries such as wind, solar and pollutant utilisation.

- Narrative change – this strategy pivot must occur simultaneously with a concerted effort to address external trust and policy deficits. The industry recognise the necessity of changing its own narrative by actively promoting coal's economic contribution, engaging vocally in policy discussions, and securing government lobbying and financial incentives. This dual focus diversify outputs and stabilising political and public perceptions is essential to sustain economic activity and ensure the feasibility of new, cleaner BMs.

In essence, coal-dependent firms are stuck between the rock of constrained capital and the hard place of internal resistance. Mitigation requires leaders to use structural reform and talent acquisition to convert the financial output of their core business (coal) into funding for diversified, future-proof ventures, while actively lobbying to stabilise the external environment that dictates their survival.

5.5. Chapter conclusion on research findings

The findings across the three research questions demonstrate that coal-dependent firms are navigating an existential crisis primarily driven by exogenous constraints, notably geopolitical rhetoric, rapid changes in investment priorities, and difficulty securing finance. Decision-makers hold a complex and conflicted understanding of the JET, characterised by cognitive dissonance: they intellectually accept the moral necessity of transitioning while asserting that coal remains essential for energy security for the next 20 to 30 years due to technical and based load constraints. The domain strategic response is a dual strategy of staged organisational transformation:

1. Internal optimisation – focus intensely on maximising cash flow by reducing costs and increasing efficiency in current coal operations. This approach generates the financial leverage needed for survival, especially because coal profits serve as the primary internal cross-funding mechanism due to external funding constraints.
2. Measured diversification – use this internal capital to fund the second stage of diversification into near industries, such as critical minerals (copper, lithium) and renewable energy BMs (solar, wind farms), often leveraging existing land and mining skills.

However, the ability to execute radical BMI is fundamentally paralysed by the scarcity of readily available financial capital and a challenging, unpredictable regulatory and policy environment. Overcoming these barriers requires significant strategic investment in human capital and R&D, systemic restructuring (like creating empowered new departments), and a

concerted effort to change the public narrative regarding the industry's economic contribution and long-term viability.

6. CHAPTER 6: DISCUSSIONS

6.1. Introduction

This chapter analyses the relationship between the findings of Chapter 5 and the literature presented in Chapter 2 to assess the conclusions of the narrative analysis. This chapter adheres to the research questions and is organised similarly to Chapter 5. Chapter 5 describes the findings for each research question and compares the eleven themes with what is currently discussed in the literature in relation to the existing theory. The systematic procedure evaluates and confirms whether the analysis in Chapter 5 is novel or integrated within existing literature. The researcher's approach was to look for consistencies, contradictions, and emerging themes from the findings in Chapter 5.

6.2. RQ1: How do decision-makers in the coal industry understand the energy transition and how that understanding influences strategic or BM adaptation?

RQ1 sought to explore the specific insights into the content and structure of decision-maker's understanding, their mental models, perceptions or framings of the ET, beyond generic cognitive barriers, and how this specific understanding positively or negatively influences strategic adaptations. This section of the discussion concentrates on four themes extracted from the dataset, as emphasised in Chapter 5.

6.2.1. RQ1 Theme 1: JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints

6.2.1.1. *Discussion of findings on JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints*

The literature frames the ET as a fundamental change in electricity sectors driven by the need to address climate change (Paris Agreement) (Markard, 2018). This involves the decarbonisation of the energy sector by replacing fossil fuels (coal, oil, gas) with renewable energy sources (wind, solar, biomass) (Bakhsh et al., 2024). The process requires political compromise and economic trade-offs (Doh et al., 2021) and inevitably creates winners and losers (Carley & Konisky, 2020). South Africa's transition is specifically directed by the JET framework (Xaba, 2023).

The study findings confirms the literature's description of the transition's complexity but contextualises it through cognitive dissonance:

- Validation of necessity of JET – eleven decision-makers intellectually accept the moral and social necessity of transitioning “in a just way” to sustain “livelihoods at stake”, validating the literature’s focus on addressing social impacts and the equitable outcomes of the ET.
- Contradiction via constraints – despite accepting the moral imperative, seven decision-makers assert that renewables are “not sufficient to give the required base load” and that coal will remain essential for the next 20 to 30 years. This conflicted view aligns with the literature’s acknowledgment that the ET requires complex political and economic trade-offs.

Coal is the predominant technology (72.1% of electricity capacity) in South Africa, and it provides a nuanced perspective by demonstrating the cognitive dissonance held by decision-makers: they accept the moral transition but are constrained by immediate technical realities. The research findings present a detailed context for the opposition to a rapid transition, which acts as a practical alternative to the push for immediate decarbonisation. As highlighted earlier, decision-makers assert that renewables alone are not sufficient to provide the required base load, claiming that coal remains essential for energy security for the next 20 to 30 years. This grounds the resistance not merely in generalised political incentives to retain coal use, but in immediate technical and resource constraints necessary for a developing economy. The three participants view the current JET framework as often “misdiagnosed, inappropriate, or misunderstood as requiring an immediate switch”. This perspective suggests that while cognitive dissonance exists, it is mitigated by a practical reliance on existing assets.

The finding that the current framework is often misunderstood as requiring an immediate switch offers an alternative argument to the literature’s focus on inertia. Instead of paralysis, decision-makers are actively planning a long-term, staged coexistence based on technical necessity.

6.2.1.2. Conclusion on JET ambivalence – recognising socioeconomic necessity while asserting technical and resource constraints

Decision-makers display cognitive dissonance, accepting the moral and social necessity of the transition but asserting that this acceptance is strongly constrained by the immediate technical reality: renewables alone are insufficient to provide the required base load. The finding empirically validates that, in a developing economy context characterised by coal abundance, the prevailing international and national ET frameworks are often viewed as

misdiagnosed or inappropriate because they require an immediate switch, ignoring the practical need for coal to ensure energy security for the next 20 to 30 years

6.2.2. RQ1 Theme 2: The dominance of financial and geopolitical pressure as existential threats to coal viability

6.2.2.1. *Discussions on the dominance of financial and geopolitical pressure as existential threats to coal viability*

The financial and geopolitical pressure are not merely challenges but are viewed by decision-makers as the dominant, existential and exogenous constraints fundamentally determining the continued existence and viability of the coal industry. The literature review establishes that the global ET poses a systematic risk to investment in coal and energy generation assets (Hanto et al., 2022; Zhao & Alexandroff, 2019).

The shift toward lower-carbon energy creates winners and losers (Carley & Konisky, 2020). Coal-dependent firms face considerable investment risks due to market demand fluctuations and policy changes (Ren et al., 2024). The influx of renewable energy capacity has increased market price volatility, leading to difficulties for traditional energy utility BMs based on commodity sales to remain financially viable (Bryant et al., 2024). The transition is recognised as often leading to the financial destruction of traditional BMs and "major wealth destruction" for utilities left with legacy assets (Bryant et al., 2024, p.7). Nine participants confirms the external factors, finance and geopolitical or regulatory pressures, are the primary drivers threatening firm survival. Three decision-makers across the CFU and coal mining groups explicitly identified the difficulty in securing finance and investment as a major threat. CFU decision-makers noted that financiers and contributors are moving away from financing coal projects toward cleaner energy. ECM confirmed that the investment community has moved faster than the innovation in the energy space, making it difficult to secure necessary funds. Further, Three participants noted that the high cost of insurance and difficulty obtaining capital make external funding very difficult. The empirical reality for ECM is that banks often only support existing facilities and will not issue new ones, posing a huge barrier to entry for transition projects that require extensive capital.

Stricter emissions regulations and the introduction of a carbon price render coal a more unsafe investment, diminishing its competitiveness relative to alternative fuels (Banks et al., 2015). Further, the literature notes that political incentives may be the biggest obstacle to reducing coal consumption (Zhao & Alexandroff, 2019). While the decrease in coal's financial viability

won't be sufficient to make coal use obsolete, the coal sector is a strong stakeholder with a vested interest in postponing the phase-out (Jakob et al, 2020). The success of new BMs is heavily "dictated by the regulatory environment and market structure" (Bryant et al., 2024, p.7). Insights from three participants revealed that international regulations and geopolitical rhetoric are viewed as imposing significant costs and market constraints. CFU decision-makers specifically mentioned the potential for penalties due to global initiatives like the CBAM, which looks at how carbon-intensive manufacturing processes are for exported products. MCP emphasised that politics plays a major role in impacting the coal industry through perception, with one participant calling the green movement "scam". Coal miners also cited policy uncertainty, regulatory complexity (such as difficult licensing processes), and stringent policies as major barriers that make operating difficult.

The study findings highlight that radical BMI in the coal industry is fundamentally paralysed by the high cost of transition combined with a hostile and unpredictable regulatory environment, forcing reliance on internal equity. The finding reinforces the importance of systemic and regulatory barriers but elevates them to the dominant drivers threatening firm survival, overpowering domestic operational concerns. The findings specify the modern existential threats, noting that the investment community has moved faster than the innovation in the energy space. Specifically, decision-makers cited the potential for penalties due to the CBAM and the severe difficulty and high cost of obtaining insurance.

6.2.2.2. Conclusion on the dominance of financial and geopolitical pressure as existential threats to coal viability

The continued viability of the coal industry is fundamentally determined by exogenous constraints, such as the difficulty in securing finance and investment, the high cost of insurance, and the speed at which the investment community has moved faster than energy innovation. This finding elevates external financial and geopolitical factors (e.g., the potential for penalties due to initiatives like the Carbon Border Adjustment Mechanism) as the dominant existential drivers threatening firm survival, even above domestic operational or regulatory hurdles.

6.2.3. RQ1 Theme 3: Strategic adaptation – integrating multi-faceted risk management with future-oriented transition planning

6.2.3.1. *Discussion on strategic adaptation – integrating multi-faceted risk management with future-oriented transition planning*

Strategic adaptation, framed by the RBV and DC theory in Chapter 2, is empirically shown in Chapter 5 to translate into a necessity for executive portfolio resiliency, where decision-makers actively integrate risk mitigation with long-term, future-oriented planning. Literature establishes that strategic success in the ET is tied to a firm's ability to rapidly identify, mobilise and reconfigure resources in alignment with environmental imperatives (Rafique et al., 2025).

DC allows decision-makers to recognise possibilities and allocate resources to new strategies (To et al., 2020). Critical capabilities for competitive advantage require a shift toward strategic agility and innovation architecture (Richter, 2011; Rosati et al., 2023). Decision-makers must lead the effort to develop radically new BMs, even while the old one is still generating revenue, to address the difficulty in allocating sufficient resources to initially non-mainstream technologies (Richter, 2011). Firms often mitigate risk by setting up separate ventures or business units for renewable energy activities, which is vital for balancing the exploitation of the current BM with the exploration of new opportunities (Richter, 2011; Bryant et al., 2024). Strategic repositioning involves transformation, diversification and acquisition (Mori & Zhang, 2024). This transformation means leveraging existing capabilities to capture value in new niche sectors, such as expanding business boundaries into wind or solar technologies or moving toward as “energy as a service” model (Mori & Zhang, 2024; Bryant et al., 2024, p.11).

The study findings detail how decision-makers operationalise this adaptive strategy through two core methods: defining their role around executive portfolio resiliency (risk management). Decision-makers recognise their primary function as systematically creating and preserving strategic options necessary for survival.

- Financial and operational risk stewardship – For ECM, the role is paramount financial stewardship, focusing on managing operational and financial risk to ensure the "credibility and the strength of the firms balance sheet". They aim to optimise assets to "suit the market that is least affected" by the transition.
- Long-term relevance planning – MCP decision-makers focus on ensuring that ESG and JET considerations are included in their strategic planning, with the explicit goal to "right size the company" and remain relevant in 30 years from now.

- Coal-as-bridge strategy – CFU decision-makers focus on research and evaluating technologies (like carbon capture and utilisation and storage) to find ways to "continue using coal, but in a more sustainable manner". This reflects a strategy of leveraging existing core assets and expertise (100 years of experience and infrastructure) to provide a necessary foundation while managing risks

6.2.3.2. Conclusion on strategic adaptation – integrating multi-faceted risk management with future-oriented transition planning

The primary role of decision-makers has transformed into one of executive portfolio resiliency. This requires simultaneously protecting the business from operational and financial risk (including bankruptcy risk) while ensuring the strategy includes diversification into future minerals and the inclusion of ESG and JET considerations in the long-term outlook. This finding frames the strategic role as creating and preserving options necessary for survival, a dual mandate of financial consolidation and risk mitigation concurrent with the systematic adoption of future-oriented strategic themes to remain relevant in the long-term.

6.2.4. RQ1 Theme 4: The dual strategy of internal optimisation to fund measured diversification

6.2.4.1. Discussion on the dual strategy of internal optimisation to fund measured diversification

BMI is the process of modifying or replacing a firm's BM when facing declining competitiveness, such as during the ET (Rabetino et al., 2023). It involves experimentation and exploration to change the activity system and typically includes phases like BM generation and implementation and resource reconfiguration (Rabetino et al., 2023). BMI is essential for achieving dynamic consistency between strategy and environment and assists firms in redefining their value offer and how the profit from it (Rabetino et al., 2023; Sletten et al., 2023).

The firm's strategic response directly validates the implementation and resource reconfiguration phase of BMI:

- Dual strategy as BMI implantation – the dominant response observed across participants, mainly ECM and MCP, is a dual strategy. This involves maximising efficiency in current coal operations (internal optimisation) to generate cash flow, which serves as the resources needed to fund the measured stage of diversification. This

mechanism confirms the literature's premise that BMI requires the reconfiguration of resources and that decision-makers must manage the tension between exploiting current profitability and exploring new opportunities (Richter, 2011).

- Redefining value offer – BMI assists in redefining the value offer (Sletten et al., 2023). Firms are doing this by moving into critical minerals (copper, lithium) and developing renewable energy BMs (solar and wind farms). CFU is pursuing technological retrofit and modernisation to extend plant lifespan and burn coal more cleanly, aligning with the BMI goal of adaptation (Rabetino et al., 2023).

The dominant strategy is a dual strategy characterised by a theory of staged organisational transformation. This approach details the practical mechanism for funding change in a capital-constrained environment: first, aggressively maximising cash flow through internal optimisation (e.g., reducing fixed costs, reducing electricity usage intensity, improving coal quality or beneficiation) and only then using the generated resources to fund the second stage of measured diversification. This cost-conservative approach provides a practical counterpoint to the literature advocating for immediate "self-cannibalisation" of the existing BM (Bryant et al., 2024, p.7).

6.2.4.2. Conclusion on the dual strategy of internal optimisation to fund measured diversification

The dominant strategy is a staged organisational transformation relying on a dual approach: first, intense internal optimisation (reducing costs, improving coal quality, lowering fixed costs) to maximise cash flow; second, using those resources to fund measured diversification into critical minerals (copper, lithium) and renewable energy business models (solar and wind farms). This provides empirical clarity on the financial mechanics of transition for cash-constrained, legacy firms, establishing that internal optimisation functions as the primary financing mechanism that necessarily precedes and funds subsequent diversification efforts.

6.2.5. Conclusion on RQ1 discussions

The strategic response of decision-makers is characterised by a staged organisational transformation and a commitment to executive portfolio resiliency.

Decision-makers hold a complex, often conflicted, understanding of the JET, marked by cognitive dissonance. While they intellectually accept the moral and social necessity of transitioning to cleaner resources and sustaining livelihoods, this acceptance is strongly constrained by the immediate technical reality that renewables alone are insufficient to provide

the required base load. They assert that coal remains essential for energy security for the next 20 to 30 years, leading to a critical perspective that prevailing international and national ET frameworks are often misdiagnosed or inappropriate.

The continued existence and viability of the coal industry are fundamentally determined by exogenous constraints. The most impactful threats identified are the difficulty in securing finance and investment, the speed at which the investment community has moved faster than energy innovation, and geopolitical factors like the potential for penalties from international regulatory mechanisms such as the CBAM.

To manage this environment, the strategic role has transformed into one of executive portfolio resiliency. This requires integrating multi-faceted risk mitigation (protecting the business from operational and financial risk) with long-term strategic planning. The dominant strategy is a dual approach:

1. Internal optimisation – maximising cash flow by intensely focusing on reducing fixed costs, improving coal quality, and optimising diesel, electricity, and water usage intensity.
2. Measured diversification – using the cash flow generated from internal optimisation to fund the measured stage of diversification into critical minerals (e.g., copper and lithium) and developing renewable energy business models (solar and wind farms) to achieve energy security and self-sufficiency.

The study provides an empirical validation of how cognitive biases and perceived constraints in a developing economy context (South Africa) actively shape strategic outcomes. It shifts the focus from simple organisational inertia to proving that the financial and geopolitical constraints are the dominant, existential drivers threatening firm survival, even above domestic operational hurdles. This provides specific context regarding the actionable framework's decision-makers use to survive in a highly constrained environment.

6.3. RQ2: How does the energy transition influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?

RQ seeks to explore the contextual details on how coal-dependent firms in South Africa are utilising RBV and DC to implement BM adaption or respond to the ET. This section of the discussion concentrates on four themes extracted from the dataset, as emphasised in Chapter 5.

6.3.1. RQ 2 Theme 1: Sustaining foundation capacity through core asset utilisation and financial leverage

6.3.1.1. *Discussion on sustaining foundation capacity through core asset utilisation and financial leverage*

The RBV suggests that sustained competitive advantage is derived from unique, valuable and non-replaceable resources and capabilities (Varadarajan, 2020). For traditional energy firms, core RBV assets include sunk investments, long operating lifetimes of assets and existing infrastructure related to production and transportation (Mori & Zhang, 2024). DC highlights the capacity of decision-makers to allocate resources to new strategies in constantly evolving environments (Laur & Berntzen, 2023).

The study findings confirm the foundational role of RBV assets as the basis for funding the strategic change facilitated by DC:

- Infrastructure as competitiveness – CFU specifically leverage its massive existing infrastructure (transmission lines, stations) and “100 years of experience” in power generation. This confirms that existing, unique assets provide a foundational base of competitiveness that decision-makers must exploit (Shan et al., 2014).
- Leveraging RBV core assts – coal miners critically rely on optimally mining existing coal assets (including metallurgical coal) to generate internal capital. This explicitly uses the firm's traditional RBV assets (the resource itself, infrastructure, experience) as the financial leverage needed to acquire new capabilities. The findings show a practical shift in the definition of a "valuable resource". One participant from MCP noted a change in strategy: "You don't. Leave your best coal reserves for later. You have to basically find your best coal reserves now because it might not be competitive advantage later". This demonstrates a tactical use of resources driven by the high level of market uncertainty.

The finding that coal must form the financial base for the next 20 years supports the need for strategic resource reallocation that leverages existing capabilities to capture value (Mori & Zhang, 2024). While the literature often highlights massive existing infrastructure and sunk investments as a major roadblock contributing to the "lock-in" problem, the findings demonstrate that these resources (infrastructure, land rights, profitable coal reserves) are

viewed and utilised as a critical financial lever to fund necessary acquisitions and transformation.

6.3.1.2. Conclusion on sustaining foundation capacity through core asset utilisation and financial leverage

The imperative for change (strategic agility and acquisition) must be internally funded through the financial leverage derived from existing operational and core assets. For coal miners, optimally mining current coal assets is critical for generating internal capital due to external funding constraints (financial exclusion). It explicitly confirms that coal profits serve as the primary internal cross-funding mechanism for new, diversified projects, highlighting how external financial exclusion forces high-carbon firms to depend on their core, declining business for the capital required for transformation

6.3.2. RQ 2 Theme 2: Strategic investment in human capital and R&D for future competitiveness

6.3.2.1. Discussion on strategic investment in human capital and R&D for future competitiveness

DC are crucial for exploiting existing capabilities while simultaneously developing new competencies necessary for technological change (Richter, 2011). GDC are the application of DC in the green context, enabling firms to implement eco-friendly procedures and develop advanced solutions (Rafique et al., 2025). The seizing capability micro-foundation of GDC involves mobilising resources to implement green technologies and sustainable business practice (Rafique et al., 2025). New BMs often require new capabilities, specialised know-how and the employment of knowledgeable workers (Sulek & Borowski, 2024; Abdulghani & Winkler, 2025).

The findings strongly support the literature that new BMs require the acquisition of new skills and knowledgeable workers, as "people as a resource can make or break a company". The commitment to human capital and R&D demonstrates the execution of the seizing capability component of GDC:

- Targeted capability acquisition – participants across the three groups recognise an internal knowledge gap and are actively acquiring new skills, targeting specific fields like computer science and AI. CFU is driving changes in the national education curriculum to train nuclear technicians, while coal miner are hiring highly educated

talent (e.g., master's degree holder) even for operator role. This directly aligns with the necessity, highlighting in the literature, for investment in skills development and acquiring knowledgeable workers for decarbonisation (Abdulghani & Winkler, 2025).

- Formal R&D and strategic choice – the intent to build formal R&D functions and business optimisation departments aligns with the GDC imperative to develop advanced solutions (Rafique et al., 2025). The insights from two MCP participants to adopt a “follow role” strategy, acquiring proven global technology rather than spending on expensive, original research, shows the strategic resource allocation aspect of DC (Bryant et al., 2024).

However, the study findings presents alternative arguments or extend the literature:

- CFU is driving changes in the national education curriculum (TVETs, nuclear technicians), and this extends the concept of developing capabilities beyond the firm level, suggesting a necessary, broader systemic involvement to secure human capital .
- The MCP's adoption of a "follow role" strategy in R&D also presents an alternative approach to innovation. Instead of aggressively developing new competencies as emphasised in DC literature, the MCP prefers to "allow companies to lead and do the research and design and then play a follow role" to quickly introduce proven technology. This strategy prioritises cost and risk mitigation over being a first-mover, reflecting the highly constrained resource environment.

6.3.2.2. Conclusion on strategic investment in human capital and R&D for future competitiveness

Capability acquisition ranges widely: the CFU is proactively driving changes in the national education curriculum (e.g., TVETs, nuclear technicians) to secure future talent. ECM use a phased approach of buying stakes in established companies to acquire and learn new industry expertise (capabilities acquisition as a learning mechanism) due to internal knowledge gaps. This showcases the distinct strategies employed by firms based on their scale and internal resources, ranging from shaping the national education ecosystem (CFU) to using M&A as a temporary knowledge transfer and learning tool (ECM).

6.3.3. RQ2 Theme 3: Systemic organisational restructuring and ecosystem integration for value creation

6.3.3.1. *Discussion on systemic organisational restructuring and ecosystem integration for value creation*

BMI requires the reconfiguration of organisational structures (Rabetino et al., 2023). Decision-makers must establish organisational structures, often by setting up separate ventures or business units for renewable energy activities, to balance the exploitation of the current BM with the exploration of new opportunities (Richter, 2011). Further, resource reallocation should be integrated into the Strategic Architecture (SA) (Shaik et al., 2024), and "smart partnerships" are required to secure necessary resources (Gitelman & Kozhevnikov, 2023, p.12).

The structural responses confirm the necessity for systemic reconfiguration (GDC's Reconfiguring Capability) to enable BMI:

- Structural separation and authority – firms mitigate internal inertia by implementing structural mechanisms, such as ECM participant suggestion of empowering new departments (like R&D) with authority over entrenched operations. This empirically validates the literature's suggestion of establishing separate ventures to shield new BMs from traditional operational requirements.
- Ecosystem integration – CFU's adoption of a "whole-of-government approach" and engagement with universities and dedicated suppliers aligns with the literature's emphasis on building "smart partnerships" and leveraging external stakeholders and partners.

The research highlights that adhering to ESG requirements (specifically, successful rehabilitation and mine closure) has become a key capability necessary for international expansion and market access, linking sustainable practices directly to financial viability and competitive advantage.

6.3.3.2. *Discussion on systemic organisational restructuring and ecosystem integration for value creation*

Internal structural changes are critical and include empowering new departments (like R&D or business optimisation) with relevance and authority over established operations to prevent current operational priorities from subordinating innovation efforts. This addresses the internal

"political" reality, emphasising that merely creating new departments is insufficient; they must be institutionally empowered to override the inertia and entrenched logic of the core business.

6.3.4. RQ2 Theme 4: Dual leadership focus – balancing coal and transition steering

6.3.4.1. *Discussion on dual leadership focus – balancing coal and transition steering*

Decision-makers are central to defining the strategic intent necessary to align operations and resources toward sustainability (Shaik et al., 2024). They must lead the effort to develop new BMs, even while the existing one is profitable, and are responsible for establishing organisational structure and overseeing resource allocation (Richter, 2011).

The study findings underscore the decision-makers' pivotal role in DC deployment:

- Governing mechanisms – Three leadership's involvement revolves around financing, fundraising and capital allocation for new projects, fulfilling the DC function of allocating resources to new strategies.
- Dual focus – the division of labour, where participants across the three groups are focused solely on sustaining the profitable coal base to provide the financial foundation for others to transition, explicitly demonstrates the tension inherent in DC between exploiting the old profitable system and exploring the new required system

Decision-makers in ECM group are often constrained, focusing primarily on sustaining the profitable core base or having transition strategies "on ice because of funding". This supports the literature noting that managers are often hindered by cognitive barriers and tend to stick to the traditional BM for too long. Furthermore, it validates the difficulty in allocating sufficient resources to initially non-mainstream technologies when constrained by financial limitations.

6.3.4.2. *Conclusion on dual leadership focus – balancing coal and transition steering*

The transition process is characterised by a division of labour at the executive level. Some decision-makers are specifically tasked with sustaining the profitable core base ("Our function is to provide the solid base financial base to actually allow this transition to occur") while others steer the new ventures. It empirically validates the tension of the dual mandate by showing that leadership must manage this internal separation, where one part of the management team is effectively ring-fenced to be the financial engine while another focuses on future strategy.

6.3.5. Conclusion on RQ2 discussions

Realising the potential of the transition requires managing the capability imperative and the need for significant strategic investment in human capital and R&D, all while leveraging the financial base of the core business.

The entire transition process is internally funded by leveraging existing operational and core assets, as external financial exclusion makes traditional funding difficult. For coal miners, optimally mining current coal assets is critical for generating internal capital, which serves as the financial base for new ventures. For the CFU, this means leveraging massive existing infrastructure and relying on external donor funding.

Capability acquisition necessitates significant strategic investment in human capital and R&D. This includes acquiring new specialised skills (e.g., computer science and AI), building formal R&D functions, and, in the case of the CFU, proactively driving changes in the national education curriculum (TVETs, nuclear technicians). Coal miners employ a strategy ranging from M&A (buying stakes) to acquire and learn new industry expertise to adopting a "follow role" for technology acquisition to avoid the cost of original research.

New capabilities are often hampered by existing organisational structures. Therefore, the organisation must implement structural changes, such as vertical integration of subsidiaries, optimal asset utilisation, and, crucially, empowering new departments (like R&D or business optimisation) with relevance and authority over established operations to override the inertia of the core business.

This process must be guided by clear executive commitment, the governing mechanism of the transition. Leadership must manage a dual focus, steering reallocation toward new ventures while acknowledging the necessity of focusing on sustaining the profitable core base (coal) to provide the financial foundation for others to transition.

This RQ provides empirical clarity on how high-carbon firms apply the RBV and DC under extreme financial stress. It confirms that coal profits serve as the primary internal cross-funding mechanism due to external financial exclusion, a specific finding relevant to resource allocation in declining industries. Furthermore, it details the internal organisational politics and structural enablement required, emphasising that new capabilities must be institutionally empowered to supersede the core business's entrenched logic

6.4. RQ3: Why do coal-dependent firms struggle to adapt their BMs to the energy transition, and how may these challenges be mitigated?

The RQ seeks to explore the contextual detail within the coal industry regarding these established challenges and solutions. This section of the discussion concentrates on three themes extracted from the dataset, as emphasised in Chapter 5.

6.4.1. RQ 3 Theme 1: The dual constraints of financial capital and regulatory uncertainty

6.4.1.1. Discussion on the dual constraints of financial capital and regulatory uncertainty

Major barriers to innovation include the high cost of transition and the existence of massive existing infrastructure, which contributes to the lock-in problem (Chipangamate & Nwaila, 2024). Firms face investment risks due to policy changes and market demand fluctuations (Ren et al., 2024). Further, the success of new BMs is "dictated by the regulatory environment and market structure" (Bryant et al., 2024, p.7), and coal-dependent firms may suffer from "regulatory capture" to delay necessary policy changes (Bryant et al., 2024, p.5).

The firms empirically confirm the dominance of financial and regulatory hurdles predicted by the literature.

- Financial paralysis – decision-makers across the three groups confirm that the primary barrier is the scarcity of readily available capital due to traditional banks moving away from coal. This validates the financial lock-in problem where funds are needed for critical investments.
- Hostile regulatory environment – the literature's focus on regulatory influences is confirmed by the three firm struggles with policy uncertainty, stringent policies, and difficult licensing processes. CFU specifically noted that the "lack of enforcement of laws and policies" allows dirty practices to continue, stifling innovation.

The success of new BMs is "dictated by the regulatory environment and market structure" (Bryant et al., 2024, p.7). The need for clear policy frameworks that support BM reconfiguration among coal-dependent firms is paramount. The concern that insufficient enforcement allows "dirty practices to continue" reinforces the argument that regulatory drivers are necessary for high penetrations of renewables.

6.4.1.2. Conclusion on the dual constraints of financial capital and regulatory uncertainty

Radical BMI is paralysed by the combination of the high cost of transition and a hostile external environment where traditional commercial banks refuse to issue new facilities for coal projects, only supporting existing ones. This is coupled with regulatory complexity, such as difficult licensing processes and a perceived lack of enforcement of laws that would penalise "dirty energy". This details the specific financial exclusion mechanism (no new funding from traditional banks) and the counterintuitive barrier of insufficient regulatory enforcement. The finding indicates that the regulatory environment fails to provide the necessary "stick" (penalties for dirty practices) or "carrot" (incentives and clear policy) needed to motivate costly internal BMI.

6.4.2. RQ3 Theme 2: Overcoming cultural and organisational inertia through focused talent investment

6.4.2.1. Discussion on overcoming cultural and organisational inertia through focused talent investment

Firms suffer from path dependency and 'lock-in' (Araújo, 2014, p.13), adhering to core businesses due to self-reinforcing factors (Bürer et al., 2021). BMI is hampered by a cognitive barrier where decision-makers struggle to develop new BMs while the current one is still generating revenue (Richter, 2011). Overcoming these core rigidities requires self-cannibalisation and overcoming internal management divisions (Mori & Zhang, 2024; Bryant et al., 2024; Bürer et al., 2021)

The mitigation strategies employed directly address the literature's description of operational inertia:

- Addressing cognitive and cultural inertia – participants from two firms confirm internal resistance, including “fear of change” and staff being “scared of change”. Cognitive limitations involve prioritising the “problem of today” over long-term strategic planning.
- Mitigation via structure and talent – in line with the mitigation strategy of organisational adaptation, CFU addresses inertia by forming new departments specifically focused on innovative tasks. Further, the proactive focus on hiring highly educated talent, even for operators' roles, is a direct countermeasure to the skill deficit barrier identified in the literature.

The study reveals that a unique mitigation strategy observed was the decision to proactively raise entry qualifications and hire highly educated talent (e.g., master's degree holders) for operational roles. This demonstrates an aggressive strategic investment in human capital used to overcome legacy barriers and a deep-seated lack of required skills.

6.4.2.2. Conclusion on overcoming cultural and organisational inertia through focused talent investment

A key strategy for mitigation is the proactive over-qualification of the workforce by raising minimum entry qualifications and hiring highly educated talent (e.g., Master's degree holders) for traditionally operational roles, such as coal operators, to build future capacity. Additionally, some firms face unique barriers related to family-based business norms and silo functioning, which hinder professional management and strategy execution. This provides a specific, actionable organisational strategy (over-hiring educated personnel) used to combat inertia and acquire latent intellectual capital in anticipation of future technological needs. It also highlights how specific organisational structures (like family-based businesses) introduce unique barriers beyond standard cognitive bias or skill deficits.

6.4.3. RQ3 Theme 3: Redefining value creation through strategic diversification and narrative change

6.4.3.1. Discussion on redefining value creation through strategic diversification and narrative change

Firms mitigate barriers through strategic repositioning and diversification, expanding business boundaries into wind, solar and other technologies (Mori & Zhang, 2024). This often involves shifting the value proposition to a service-based model or “energy as a service” (Bryant et al., 2024, p.11). Further, addressing external barriers requires government direction and planning to guide sectoral transitions.

Mitigation involves a critical pivot to diversification coupled with a necessary external political strategy:

- Strategic diversification – the three firms are aggressively pursuing diversification into near industries such as wind farms, solar, and critical minerals. This is a clear strategic move to redefine value creation and leverage existing mining skills to transition into new sectors, as suggested by the literature on expanding business boundaries.

- Narrative and policy change – the literature emphasise the need for government direction. The three firms' mitigation strategy includes a concerted effort to "change the narrative of the industry," engage vocally in policy discussions, and secure government lobbying and financial incentives to stabilise the political and public perception. This recognition highlights the reliance of new business models on the regulatory and external environment.

The findings support the necessity for coal firms to strategically reposition and diversify into near industries and shift their focus toward new value propositions, such as selling "green electricity". This aligns with the concept of capturing value through a services model. However, the study reveals that the mitigation strategy is deemed incomplete without a concerted external effort. The coal industry recognised the necessity of changing its own narrative by being vocal about its economic contribution and securing government lobbying and financial incentives to address external trust and policy deficits. This suggests that in this context, addressing the "vested interests" and the political obstacles requires sophisticated, proactive narrative management and political engagement as a core component of the transition strategy.

6.4.3.2. Conclusion on redefining value creation through strategic diversification and narrative change

Securing long-term future viability requires an aggressive strategic pivot toward diversification concurrent with a concerted effort to change the public narrative. This involves the industry actively promoting coal's economic contribution, engaging vocally in policy discussions, and lobbying the government and financial institutions for support (e.g., to negotiate innovative structures with commercial banks). The finding formalises the necessity of strategic narrative warfare as a critical component of BMI strategy in high-carbon industries. The study concludes that product diversification is insufficient without successfully stabilising the political and public perception required to secure the policy and financial environment for new business models to succeed.

6.4.4. Conclusion on RQ3 discussions

Securing long-term viability requires mitigating internal inertia and external hostility through a simultaneous strategy of radical diversification and aggressive political and narrative management.

Radical BMI in the coal industry is fundamentally paralysed by a dual constraint: the high cost of transition (financial capital scarcity) combined with a challenging and unpredictable external environment. Traditional commercial banks often refuse to issue new facilities for coal projects, only supporting existing ones, forcing reliance on internal equity. This is exacerbated by policy uncertainty, regulatory complexity, and a perceived lack of enforcement of laws that would penalise "dirty energy," thereby undermining the incentive for costly BMI.

Deep-seated internal resistance, manifesting as short-term thinking ("problem of today" focus), fear of change, and skill deficits, presents a powerful barrier. Companies mitigate this inertia through deliberate and proactive strategic investment in human capital and structure. Mitigation strategies include:

- Structural enablement – creating new, dedicated departments for energy transition initiatives to prevent core operational priorities from subordinating innovation efforts.
- Talent investment – raising minimum entry qualifications and proactively hiring highly educated talent (e.g., Master's degree holders) for traditionally operational roles to acquire latent intellectual capital.
- Strategic learning – adopting a "follower R&D strategy" to implement proven global technologies quickly, avoiding the high cost and risk of leading original research.

Securing long-term viability demands an aggressive strategic pivot toward diversification (into near industries like wind and solar). Critically, this strategic move must be simultaneous with a concerted effort to address external trust and policy deficits. The industry recognises the necessity of changing its own narrative by actively promoting coal's economic contribution, engaging vocally in policy discussions, and securing government lobbying and financial incentives (e.g., negotiating innovative structures with commercial banks).

This RQ provides specific empirical evidence of the barriers facing legacy firms in South Africa. It highlights the counter-intuitive finding that a lack of regulatory enforcement (the missing "stick") prevents internal innovation, as there is insufficient penalty for continuing dirty practices. Furthermore, it formalises the necessity of strategic narrative warfare, the combination of product diversification with public and political lobbying, as a critical, mandatory component of BMI strategy required to stabilise the external environment sufficiently for new business models to succeed.

6.5. Chapter conclusion

The chapter provided a comprehensive comparison of the research findings with the existing literature, validating core concepts while offering critical empirical extensions and alternative arguments specific to high-carbon firms in a developing economy context.

The research validates the literature on the systemic risk posed by the ET, confirming that exogenous financial and geopolitical constraints are the dominant existential threats to firm viability, powerfully overriding domestic operational concerns. The study moves beyond simple organisational inertia, detailing that decision-makers exhibit cognitive dissonance, accepting the moral necessity of the JET while asserting technical realities require coal for energy security for the next 20 to 30 years. This provides a practical alternative context for resistance compared to generalised political incentives.

Critically, the findings provide empirical clarity on the financial mechanics of adaptation: internal optimisation precedes measured diversification, confirming that due to external financial exclusion, coal profits serve as the primary internal cross-funding mechanism for transformation. Further, the study identifies unique contextual contributions, highlighting the counter-intuitive finding that a lack of regulatory enforcement (the “missing stick”) prevent internal innovation by failing to penalise “dirty practices”. Finally, the research formalise the strategic necessity of narrative warfare, active political engagement and lobbying, as a critical component, required simultaneously with diversification, to stabilise the external environment needed for new BMs to succeed.

7. CHAPTER 7: CONCLUSION

7.1. Introduction

This chapter formulate the conclusion on the outcome of the study for each of the research questions. The comparative analysis on the research findings and the literature as discussed in Chapter 6, for each research question is presented herein.

This research's aim entailed exploring how do coal-dependent firms effectively overcome deep-seated financial, operational, and cognitive barriers, and leverage or acquire the necessary resources and capabilities to successfully execute BMI in response to the rapid demands of the ET. The chapter emphasises the research the primary findings, theoretical conclusion, study limitations, recommendations for firms and decision-makers and suggestions for future research.

7.2. Primary findings and theoretical conclusions

This section is organised according to the research questions. The theoretical conclusions examine the principal research findings in relation to the literature, highlighting the significant similarities and differences. Further, these are examined in search of potential new insights to augment the literature.

7.2.1. Conclusion on Research Question 1

How do decision-makers in the coal industry understand the energy transition and how that understanding influences strategic or BM adaptation?

The aim of the research question was to explore the specific insights into the content and structure of decision-makers' understanding, their mental models, perceptions or framings of the ET, beyond generic cognitive barriers, and how this specific understanding positively or negatively influences strategic adaptations. The primary findings confirm the literature on the systemic complexity of the ET while providing empirical clarity on cognitive constraints and the financial mechanics of adaptation.

Decision-makers display cognitive dissonance, intellectually accepting the moral and social necessity of the transition to sustain livelihoods but asserting that this acceptance is strongly constrained by the immediate technical reality that renewables alone are insufficient to provide the required base load. They assert coal remains essential for energy security for the next 20

to 30 years. They view prevailing international and national ET frameworks as often misdiagnosed or inappropriate because they require an immediate switch. This finding validates the literature's focus on addressing social impacts and equitable outcomes of the ET. It confirms that transition requires complex political and economic trade-offs (Doh et al., 2021). However, this conflicted view, grounded in immediate technical and resource constraints, offers a practical alternative argument to the literature's focus on inertia, instead demonstrating active planning for staged coexistence based on technical necessity.

The continued viability of the coal industry is fundamentally determined by exogenous constraints. The dominant existential threats are the difficulty in securing finance and investment, the high cost of insurance and the speed at which the investment community has moved faster than energy innovation. Geopolitical factors, such as the potential for penalties due to global initiatives like the Carbon Border Adjustment Mechanism (CBAM), are specifically cited as imposing significant costs. This finding confirms the literature that the global ET poses a systematic risk to investment in coal and energy generation assets (Hanto et al., 2022; Zhao & Alexandroff, 2019), and that coal-dependent firms face considerable investment risks due to market demand fluctuations and policy changes (Ren et al, 2024). It confirms that the transition often leads to the financial destruction of traditional BMs and "major wealth destruction" (Bryant et al., 2024, p.7). The finding elevates external financial and geopolitical factors as the dominant drivers threatening firm survival, overpowering domestic operational concerns. The importance of the regulatory environment is reinforced, as the success of new BMs is heavily "dictated by the regulatory environment and market structure" (Bryant et al., 2024, p.7).

The primary role of decision-makers has transformed into one of executive portfolios resiliency. This requires a dual mandate: simultaneously protecting the business from operational and financial risk (risk stewardship) while systematically adopting future-oriented strategic themes, such as diversification into future minerals and the inclusion of ESG and JET considerations in the long-term outlook. This empirically validates that strategic success is tied to a firm's ability to rapidly identify, mobilise and reconfigure resources in alignment with environmental imperatives (Rafique et al., 2025). It aligns with the idea that DC allows decision-makers to recognise possibilities and allocate resources to new strategies (To et al., 2020), and that critical capabilities require a shift toward strategic agility and innovation architecture (Richter, 2011; Rosati et al., 2023). The strategy of leveraging existing capabilities to capture value in new niche sectors (Mori & Zhang, 2024) or moving toward an "energy as a service" model (Bryant et al., 2024, p.11) is supported.

The dominant strategy observed is a staged organisational transformation relying on a dual approach: first, intense internal optimisation (reducing fixed costs, improving coal quality) to maximise cash flow. second, using those generated resources to fund the measured stage of diversification into critical minerals (copper, lithium) and renewable energy BMs (solar and wind farms). This mechanism confirms the literature's premise that BMI requires the reconfiguration of resources (Rabetino et al., 2023), and that decision-makers must manage the tension between exploiting current profitability and exploring new opportunities (Richter, 2011). This cost-conservative approach provides a practical counterpoint to the literature advocating for immediate "self-cannibalisation" of the existing BM (Bryant et al., 2024, p.7). This finding provides empirical clarity on the financial mechanism of transition for cash-constrained, legacy firms.

7.2.2. Conclusion on Research Question 2

How does the ET influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?

The aim of this RQ was to explore the contextual details on how coal-dependent firms in South Africa are utilising RBV and DC to implement BM adaption or respond to the ET. The findings provide specific context on how high-carbon firms apply the RBV and DC under extreme financial stress, confirming that existing assets must serve as the financial foundation for change.

The entire transition process must be internally funded by leveraging financial leverage derived from existing operational and core assets. Coal profits serve as the primary internal cross-funding mechanism for new, diversified projects. Coal miners critically rely on optimally mining current coal assets to generate internal capital due to external funding constraints. This confirms that sustained competitive advantage is derived from unique, valuable and non-replaceable resources and capabilities (Varadarajan, 2020). The strategy leverages existing capabilities to capture value (Mori & Zhang, 2024). While the literature often highlights massive existing infrastructure and sunk investments as a major roadblock contributing to the "lock-in" problem (Chipangamate & Nwaila, 2024), the findings show these assets are viewed and utilised as a critical financial lever to fund necessary acquisitions and transformation.

Capability acquisition necessitates significant strategic investment in human capital and R&D. Firms are actively acquiring new skills, targeting fields like computer science and AI. Strategies range from the CFU proactively driving changes in the national education curriculum (TVETs, nuclear technicians) to coal miners adopting a "follow role" strategy for R&D to acquire proven

global technology, prioritising cost and risk mitigation over being a first-mover. This supports the literature that new BMs require specialised know-how and the employment of knowledgeable workers (Sulek & Borowski, 2024; Abdulghani & Winkler, 2025). The intent of build R&D functions aligns with the imperative of GDC to develop advanced solutions (Rafique et al., 2025). The “follow role” strategy is noted in the literature as a strategic resource allocation aspect (Bryant et al., 2024). The finding that the CFU drives changes in the national education curriculum extends the concept of capability development beyond the firm level.

New capabilities are often hampered by existing organisational structures. Structural changes are critical, including empowering new departments (like R&D or business optimisation) with relevance and authority over established operations to prevent current operational priorities from subordinating innovation efforts. Firms also engage in ecosystem integration, such as adopting a “whole-of-government approach” and building “smart partnerships” with external stakeholders. BMI requires the reconfiguration of organisational structures (Rabetino et al., 2023). The use of structural separation (empowering new departments) empirically validates the literature’s suggestion of establishing separate ventures to shield new BMs from traditional operational requirements and balance exploitation and exploration (Richter, 2011). Ecosystem integration confirms the necessity of building “smart partnerships” to secure necessary resources (Gitelman & Kozhevnikov, 2023).

The transition process is characterised by a division of labour at the executive level. Some decision-makers are specifically tasked with sustaining the profitable core base (“the solid base financial base to actually allow this transition to occur”) while others steer the new ventures. This empirically validates the tension of the dual mandate required by DC. Decision-makers must lead the effort to develop new BMs even while the existing one is profitable (Richter, 2011). It also validates the difficulty in allocating sufficient resources to initially non-mainstream technologies (Richter, 2011) and the tendency for managers to be hindered by cognitive barriers (Bürer et al., 2021).

7.2.3. Conclusion on Research Question 3

Why do coal-dependent firms struggle to adapt their BMs to the energy transition, and how may these challenges be mitigated?

The aim of this RQ was to explore the contextual detail within the coal industry regarding these established BM adaptation challenges and solutions. The findings specify that barriers are caused by the interaction of financial paralysis and a challenging external environment, and

migration requires product diversification coupled with aggressive political and narrative management.

Radical BMI is fundamentally paralysed by the combination of the high cost of transition and a holistic external environment where traditional commercial banks refuse to issue new facilities for coal projects. This financial paralysis is coupled with regulatory complexity and a perceived lack of enforcement of laws that would penalise “dirty energy.” This validates the financial lock-in problem where funds are needed for critical investments (Chipangamate & Nwaila, 2024). It confirms that investments risks are driven by policy changes and market fluctuations (Ren et al., 2024). The success of new BMs is “dictated by the regulatory environment and market structure” (Bryant et al., 2024, p.7). Critically, the study highlights the counter-intuitive finding that a lack of regulatory enforcement (the “missing stick”) prevents internal innovation by failing to penalise “dirty practices.”

Internal resistance is widespread, driven by “fear of change” and cognitive limitations (prioritising the “problem of today”). Mitigation strategies include creating new, dedicated departments for innovation, and proactively raising minimum entry qualifications and hiring highly educated talent (e.g., Master’s degree holders) for traditional operational roles (like coal operators) to build future capacity and acquire latent intellectual capital. This addresses the literature on path dependency and ‘lock-in’ (Araújo, 2014), and the cognitive barriers where decision-makers struggle to develop new BMs while the current one still generating revenue (Richter, 2011). Overcoming these rigidities requires overcoming internal management divisions and addressing skill deficits (Mori & Zhang, 2024); Bürer et al., 2021; Abdulghani & Winkler, 2025). The proactive over-qualification of the workforce is formalised as a specific, actionable organisational strategy to combat inertia.

Securing long-term viability requires an aggressive strategic pivot toward diversification (into near industries like wind and solar) concurrent with a concerted effort to change the public narrative. The mitigation strategy includes actively promoting coal’s economic contribution, engaging vocally in policy discussions and securing government lobbying and financial incentives. This supports the literature that firms mitigate barriers through strategic repositioning and diversification, expanding business boundaries (Mori & Zhang, 2024). It aligns with the shift toward new value propositions, such as selling “green electricity”. It confirms the necessity of government direction and clear policy frameworks guide sectoral transitions (Bryant et al., 2024). The study formalise the necessity of strategic narrative warfare as a critical, mandatory component of BMI strategy, concluding that product

diversification is insufficient without successfully stabilising the political and public perception required for new BMs to succeed.

The study's findings collectively validate core concept, such as the systemic risk posed by the ET and the need for capability reconfiguration (Rabetino et al., 2023), while providing critical empirical extensions specific to high-carbon firms in a developing economy context, particularly highlighting how financial exclusion forces reliance on internal optimisation to fund transformation.

7.2.4. Principal theoretical conclusions: The Resources-Contingent Staged Adaptation Model

The empirical findings, analysed against the established frameworks of BMI, the RBV and DC, develop a theoretical conclusion concerning the Resources-Contingent Stage Adaptation Model for high-carbon firms operating under conditions of financial exclusion and cognitive dissonance.

This theoretical model extends the literature by providing empirical clarity on the mechanisms, funding mandates and necessary external (non-market) strategies required for high-carbon firms to transition in capital-constrained, developing economy contexts. The core theoretical finding is that the strategic adaptation of coal-dependent firms is governed by a constrained dual mandate enforced by external financial exclusion, requiring the creation of a dynamic funding mechanism through internal optimisation and demanding mandatory non-market strategies (narrative warfare) to achieve viability.

1. Internal optimisation as the dynamic funding mechanism

While established literature suggests that successful adaptation requires firms to manage the tension between exploiting existing profitability and exploring new opportunities, and sometimes requires the immediate “self-cannibalisation” of the existing BM, the study reveals a prioritised, staged and financially constrained mechanism for legacy, high-carbon firms:

- The dual strategy priority – the dominant strategy is a staged organisational transformation. Adaptation is structured as a dual approach where internal optimisation (exploitation) must necessarily precede and fund measured diversification (exploration).
- RBV assets as financial levers – in an environment where security finance and investment is severely difficult and traditional commercial banks refuse to issue new

facilities, the coal asset, often cited in literature as a source of “lock-in” due to massive sunk investments, is reconceptualised as the critical financial lever. Coal profits are confirmed to serve as the primary internal cross-funding mechanism for new, diversified projects. This emphasises that for cash-constrained, legacy firms, the RBV resource base is primarily a financial foundation that must be aggressively exploited to secure capital for DC deployment.

- Executive portfolio resiliency – this staged approach is guided by a transformed role for decision-makers focused on executive portfolio resiliency. This requires a dual focus: protecting the firm from operational and financial risk (risk stewardship) while concurrently adopting future-oriented strategic themes.

2. The critical role of external governance: the missing ‘Stick’

The study extends the literature that posits the success of new BMs is “dictated by the regulatory environment and market structure” by identifying a counter-intuitive failure mode.

- Financial paralysis via regulatory failure – radical BMI is paralysed not just by the high cost of transition and hostile external banking environment, but by a perceived lack of enforcement of laws and policies that would penalise “dirty energy”
- Undermined incentives structure – this finding introduces the concept of the missing “stick”. When a hostile regulatory environment fails to provide the necessary penalties for continuing existing, high-carbon practices, it undermines the incentives for firms to undertake the costly internal BMI required for transition. This highlights that regulatory drivers necessary for change must effectively apply both “carrot” (incentives) and “stick” (penalties).

3. Formalising non-market strategies: strategic narrative warfare

The findings formalise the necessity of combining internal BMI (product diversification) with sophisticated non-market strategy to stabilise the external environment sufficiently for new BMs to succeed.

- Mandatory external strategy – firms must engage in strategic narrative warfare as a critical, mandatory component of their overall BMI strategy. Mitigation is deemed incomplete without a concerted effort to change the public narrative, actively promote coal’s economic contribution, engage vocally in policy discussions and lobby for financial incentives.

- Securing institutional legitimacy – this formalises the idea that product diversification is insufficient without successfully stabilising the political and public perception required to secure the policy and financial environment for new BMs to succeed. This strategic necessity arises because viability is fundamentally determined by exogenous constraints (financial and geopolitical pressure).



Figure 2: The Resource-Contingent Staged Adaptation Model (simplified): Source author's own

The stages of adaptations:

1. Identify threat: Recognise existential challenges and cognitive dissonance
2. Optimise core: Maximise existing operations for cash generation
3. Diversification: Invest strategically in new products, such as renewables and minerals
4. Build capacity: Develop organisational and human capital
5. Mitigate risks: Address failure modes through external strategy

7.3. The research contribution

The research provides critical empirical extensions and alternative arguments specific to high-carbon firms operating within a developing economy context, such as South Africa. The contribution validates core concepts from the existing literature while offering specific clarity on the financial, political and organisational mechanics of adaptation for these legacy firms.

Key research contributions include:

The study provides an empirical validation of how cognitive biases and perceived constraints in a developing economy context actively shape strategic outcomes. The research validates the literature on systemic risk, confirming that exogenous financial and geopolitical constraints are the dominant existential threats to firm viability, powerfully overriding domestic operational concerns. The study moves beyond simple organisational inertia, detailing that decision-makers exhibit cognitive dissonance. While they intellectually accept the moral and social necessity of the JET, this acceptance is strongly constrained by the immediate technical reality that renewables alone are insufficient to provide the required base load. This conflicted view aligns with the literature's acknowledgment of complex political and economic trade-offs. This finding that coal remains essential for energy security for the next 20 to 30 years provides a practical alternative context for resistance compared to generalised political incentives often cited in the literature.

The research offers empirical clarity on the financial mechanics of adaptations for capital-constrained, legacy firms. The study confirms that due to external financial exclusion (difficulty in securing finance and investment), coal profits serve as the primary internal cross-funding mechanism for transformation. The imperative for change must be internally funded through the financial leverage derived from existing operational and core assets. The findings establish that the dominant strategy is a staged organisational transformation relying on a dual approach: internal optimisation precedes measured diversification. Aggressively maximising cash flow through internal optimisation (e.g., reducing costs, improving coal quality) functions as the primary financing mechanism that necessary precedes and funds subsequent diversification efforts into critical minerals and renewable energy BMs.

The research identified unique contextual contributions related to regulations and strategic survival, formalising them as critical components of BMI strategy. The study highlights the counter-intuitive finding that a lack of regulatory enforcement (termed the “missing stick”) prevents internal innovation by failing to sufficiently penalise “dirty practices”. This undermining of incentives contributes to the paralysed of radical BMI. The findings formalise the strategic necessity of narrative warfare, active political engagement and lobbying, as a critical, mandatory component of BMI strategy. Product diversification is deemed insufficient without successfully stabilising the political and public perception required to secure the policy and financial environmental for new BMs to succeed.

The research also provides detailed evidence on how high-carbon firms apply the RBV and DC under extreme financial stress. The study details the internal organisational politics and structural enablement required, emphasising that new departments (like R&D or business

optimisation) must be institutionally empowered with relevance and authority to override the inertia and entrenched logic of the core business. The transition process is characterised by a division of labour at the executive level, where leadership manages a dual focus; some decision-makers are specifically tasked with sustaining the profitable core base (coal) to provide the financial foundation, while others steer the new ventures. A mitigation strategy identified is the proactive over-qualification of the workforce by raising minimum entry qualification and hiring educated talent for traditionally operational roles, such as coal operators, to acquire latent intellectual capital and combat inertia.

7.3.1. The similarities between the research study and the literature

The research study confirms and validates several core concepts and findings established in the existing literature regarding the ET, BMI and the challenges faced by coal-dependent firms. Key similarities between the research study and the literature include validation of core theoretical frameworks and transition dynamics, confirmation of existential and regulatory barriers, and agreement on resources, capabilities and strategic adaptation.

1. Validation of core theoretical frameworks and transition dynamics

- Systemic risk and complexity of ET – the research validates the literature on the systemic risk posed by the ET. The study confirms the literature’s description of the transition’s complexity.
- Role of DC – the research establishes and the strategic response confirms that strategic success in the ET is strongly tied not only to the firm’s internal resources (RBV) but also to its ability (DC) to rapidly identify, mobilise and reconfigure those resource in alignment with environment imperatives. Decision-makers’ involvement in financial and capital allocation fulfils the DC function of allocation resources to new strategies.
- Necessity of BMI – the study supports the literature stating that BMI is essential for achieving dynamic consistency between strategy and environment and assists firms in redefining their value offer and how they profit from it. The firms’ strategic response directly validates the implementation and resource reconfiguration phase of BMI.
- Social and moral imperative – the research findings validate the literature’s focus on addressing social impacts and equitable outcomes of the ET by confirming the decision-makers’ intellectual acceptance of the moral and social necessity of transitioning “in a just way.”

2. Confirmation of existential financial and regulatory barriers

- Financial and geopolitical constraints – the research confirms that external financial and geopolitical constraints are the dominant existential threats to firm viability, overpowering domestic operational concerns.
- Systematic investment risk – the findings confirm the literature that the global ET poses a systematic risk to investment in coal and energy generation assets. Decision-makers explicitly identified the difficulty in securing finance and investment as a major threat.
- Financial destruction of traditional models – the study confirms that the influx of renewable energy capacity leads to difficulties for traditional energy utility BMs to remain financially viable, often resulting in the “financial destruction of traditional BMs” and “major wealth destruction” for utilities left with legacy assets.
- Regulatory influence – the firms empirically confirm the dominance of regulatory hurdle predicted by the literature. The success of new BMs is heavily “dictated by the regulatory environment and market structure”. Firms struggled with policy uncertainty, stringent policies and difficult licensing processes, confirming the literature’s focus on adverse regulatory influences.

3. Agreement on resources, capabilities and strategic adaptation

- Resources reconfiguration and dual mandate – the study confirms the literature’s premise that BMI requires the reconfiguration of resources and that decision-makers must manage the inherent tension between exploiting current profitability and exploring new opportunities. The findings empirically validate the tension of the dual mandate by showing that leadership must manage as internal separation where one part of the management team is the financial engine while another focuses on future strategy.
- Foundation role of RBV assets – the findings confirm the foundation role of RBV assets, such as massive existing infrastructure and years of experience, as the basis for funding the strategic change facilitated by DC.
- Acquisition of new capabilities – the findings strongly support the literature that new BMs require the acquisition of new skills and knowledgeable workers. The proactive focus on hiring highly educated talent aligns directly with the necessity for investment in skills development and acquiring knowledgeable workers for decarbonisation.
- Organisational adaptation – mitigation strategies employed confirm the literature’s description of operational inertia. The use of structural separation (empowering new departments or R&D) empirically validates the literature’s suggestion that of

establishing separate ventures to shield new BMs from traditional operational requirements and overcome internal inertia.

- Strategic repositioning – firms are aggressively pursuing diversification into near industries (wind, solar, critical minerals), confirming the mitigation strategy of strategic repositioning and expanding business boundaries. This also confirms that BMI assists in redefining the value offer.

In essence, the study functions like a field test, confirming that the theoretical necessity of BMI and resource reconfiguration for coal-dependent firms is established in the literature, and providing empirical evidence that the primary internal and external forces driving and constraining strategic change are exactly those highlighted in the academic discourse.

7.3.2. Differences detected between the research study and the literature: including potential novel contributions to the existing theoretical framework.

The research study provides critical empirical extensions and alternative arguments to the existing body of literature, particularly concerning high-carbon firms operating in a developing economy context, such as South Africa.

The differences identified between the research study and the literature, and potential novel contributions to the existing theoretical framework, are detailed below:

1. Differences and alternative arguments to existing literature

The study shifts the focus or provides counterpoints to established literature in several key areas:

- a) Nature of resistance and inertia – the literature often attributes difficulties in adapting to simple organisational inertia or generalised political incentives to retain coal use.
 - The study moves beyond simple organisational inertia , confirming that decision-makers exhibit cognitive dissonance. While they intellectually accept the moral and social necessity of the JET, they are constrained by the immediate technical reality that renewables are insufficient to provide the required base load. This leads them to assert that coal remains essential for energy security for the next 20 to 30 years. This offers a practical alternative context for resistance compared to generalised political incentives.

- b) Role of legacy assets (lock-in vs. lever) – the literature often highlights massive existing infrastructure and sunk investments as a major roadblock contributing to the “lock-in” problem for coal-dependent firms.
- The study demonstrates that these traditional RBV assets (massive infrastructure, land rights, profitable coal reserves and 100 years of experience) are viewed and utilised by decision-makers as a critical financial lever to fund necessary acquisition and transformation.
- c) Pacing of transformation (self-cannibalisation vs. stage approach) – some literature advocates for immediate “self-cannibalisation” of the existing BM.
- The dominant strategy observed is a cost-conservative, staged organisational transformation. This approach relies on intense internal optimisation to aggressively maximise cash flow, which then precedes counterpoint to the call for immediate self-cannibalisation in capital-constrained environments.
- d) Innovation strategy (first-mover vs. follower) – DC literature emphasise the need for firms to aggressively develop new competencies.
- Coal miners (MCP) prefer a “follow role” strategy in R&D. This strategy prioritise cost and risk mitigation by acquiring proven global technology rather than spending on expensive, original research, reflecting a strategic adaptation to a highly constrained resource environment.

2. Potential novel contributions to the existing theoretical framework

The study validates core concepts from the literature, RBV, DC, and BMI, but offers several unique contextual contributions and formalisations for the body of theory:

a) Contributions to financial and strategic adaptations

- Dominant existential threats – the study elevates exogenous financial and geopolitical constraints (such as securing finance, the high cost of insurance and the threat of international regulatory penalties like the CBAM as the dominant existential drivers threatening firm survival. These external factors are found to powerfully override domestic operational concerns.
- Formalisation of internal cross-funding – the findings provide empirical clarity on the financial mechanics of adaptation. Due to external financial exclusion (traditional commercial banks refusing to issue new facilities for coal projects),

the study confirms that coal profits serve as the primary internal cross-funding mechanism required for transformation.

- Executive portfolio resiliency – the study frames the strategic role of decision-makers as one of executive portfolio resiliency. This requires a dual mandate: simultaneously protecting the core business from operational and financial risk (including bankruptcy risk) while systematically adopting future-oriented strategic themes to remain relevant long-term.

b) Contribution to organisational and capability management

- Impact of missing regulatory enforcement – the study identifies the counter-intuitive finding that a lack of regulatory enforcement (the “missing stick”) prevents internal innovation. The absence of penalties for continuing “dirty practices” undermines the incentives for costly internal BMI.
- Empowering new departments – the findings detail that internal structural changes are not sufficient by merely creating new departments. New departments (like R&D or business optimisation) must be institutionally empowered with relevance and authority over entrenched operations to supersede the core business’s entrenched logic and override inertia.
- Systemic capability development – the study reveals that the CFU is proactively driving changes in the national education curriculum (e.g., TVETs, nuclear technicians) to secure future talent. This extends the concept of capability development beyond the firm level, suggesting a necessary, broader systemic involvement.
- Proactive talent over-qualification – a specific, actionable organisational strategy to combat inertia and skill deficits is identified: the proactive over-qualification of the workforce. This involves raising minimum entry qualification and hiring highly educated talent (e.g., Master’s degree holder) for traditionally operational roles.

c) Contributions to mitigation strategy

- Formalisation of strategic narrative warfare – the research formalise the strategic necessity of narrative warfare as a critical, mandatory component of BMI strategy in high-carbon industries. The study concludes that product diversification is insufficient unless it is concurrent with a concerted external effort to change the public narrative, engage vocally in policy discussions, and lobby for financial incentives to stabilise the political and public perception required for new BMs to succeed.

7.4. The study limitations in its entirety

The study was exploratory in nature, presented several limitations primarily related to its methodology, scope and data access constraints. Key limitations of the study include:

1. Sample size and scope

The findings of the study are based on a small, targeted sample.

- The findings are a summary of data collected from 14 participants.
- The study is described as an exploratory study.
- These participants were divided into three classifications: five from ECM, five from MCP and four from CFU.
- The research is focused specifically on coal-dependent firms and how they navigate the ET within a developing economy context, such as South Africa. This specific geographic and industry focus limits the generalisation of the findings to firms in other sectors or developed economies.

2. Data accessibility and internal constraints

Decision-makers faced limitations in accessing and sharing certain internal details

- One participant from the CFU noted that a personal limitation is they faced was the difficulty accessing information and data. This is because internal organisation data is considered the intellectual property of the firm.

3. Interpretive constraints due to cognitive dissonance

While a core finding of the research, the observed cognitive dissonance in participants may present as interpretive constraint. Decision-makers were found to hold a complex, often conflicting understanding of the JET. They intellectually accept the moral and social necessity of transitioning, but this acceptance is strongly constrained by immediate technical and resource constraints. This conflicted view means that decision-makers' strategy narrative are rooted cognitive dissonance. For instance, they assert that coal remains essential for energy security for the next 20 to 20 years despite accepting the need for cleaner resources. This necessary context must be applied when interpreting their stated strategies, as their thinking is torn between ethical imperative and practical, operational survival.

7.5. Recommendations for the firm and decision-makers

7.5.1. Firm level strategic and financial recommendations

The dominant strategy response recommended is a dual approach designed to maximise internal cash flow to fund future ventures, necessitated by external financial constraints.

Firms must intensely focus on maximising cash flow and efficiently in current coal operations. This cost-conservative approach provides the necessary resources because coal profits serve as the primary internal cross-funding mechanism due to external funding constraints. Firms should implement internal efficiency measures, such as reducing fixed costs. They must maximise efficiency and drive down operational costs, including improving coal quality or beneficiated. Efficiency measures also include reducing diesel, electricity and water usage intensity.

The cash flow generated from internal optimisation should be used to fund the measured stage of diversification. Firms should pursue diversification into critical minerals (like copper or lithium), leveraging inherent mining skills for the transition. They should develop renewable energy BMs (solar and wind farms) to achieve energy security and self-sufficiency, reducing reliance on external power suppliers. The CFU should pursue technological retrofit and modernisation to extend the lifespan of existing plants and burn coal more cleanly. They should focus on advanced technologies like ultra supercritical boilers, battery energy storage and hydrogen.

Securing long-term future viability requires an aggressive strategic pivot toward diversification concurrent with a concerted effort to change the public narrative. Pivoting strategically into near industries such as wind, solar, and pollutant utilisation. The industry must proactively engage in “strategic narrative warfare” by actively promoting coal’s economic contribution and vocally participating in policy discussions. Firms need to secure government lobbying and financial incentives. A specific recommendation is to lobby the government to negotiate innovative financial structures with commercial banks to overcome the barrier of traditional banks refusing to issue new facilities for coal projects. Leverage the external ecosystem and stakeholder relations (government, academia, partners). The CFU’s adoption of a “whole-of-government approach” is an exemplar strategy for external leveraging.

7.5.2. Organisational and capability recommendations

To mitigate deep-seated internal resistance (fear of change, short-term thinking and skill deficit), structural mechanisms must be implemented. Organisations must implement structural mechanisms that empower new, dedicated departments (like R&D or business optimisation) with relevance and authority over established operations. This is essential to prevent current operational priorities from subordinating innovation efforts. Implement strategies for optimal asset utilisation. Vertically integrate subsidiaries within the group that are currently functioning as silos.

Realising the potential of the transition requires significant strategic investment in capabilities. Firms should raise minimum entry qualifications and proactively hire educated talent (e.g., Master's degree holders) even for traditionally operational roles, such as operators, to build future capacity and overcome legacy barriers. Actively acquire new specialised skills, specifically targeting fields like computer science (AI and programming). Coal miners should consider adopting a "follow R&D strategy", quickly acquiring and implementing proven global technology rather than incurring the high cost and risk of leading original research. The CFU is recommended to drive changes in the national education curriculum (e.g., TVETs, nuclear technicians) to secure future talent beyond immediate hiring.

7.5.3. Recommendations for decision-makers

The primary role of decision-makers has transformed into one of executive portfolio resiliency. Decision-makers must serve as the governing mechanism that ensures effective systemic reallocation of resources. This requires defining the strategic vision and actively steering capital toward new ventures. The role requires integrating multi-faceted risk mitigation, including protecting the business from both operational and financial risk (such as bankruptcy risk), with long-term strategic planning. Leaders must manage the internal tension of the dual strategy. This involves acknowledging the necessity of focusing on sustaining the profitable coal core to provide the financial foundation, while simultaneously ensuring the strategy includes diversification and the inclusion of ESG and JET considerations in the long-term outlook to remain relevant. Leaders should be proactive and hands-on in the transition, focusing on defining the vision, talent management and building external partnerships. They must be involved in financing, fundraising and capital allocation for new projects.

7.6. Suggestions for future research

The study highlights the counter-intuitive finding that a lack of regulatory enforcement (the “missing stick”) prevents internal innovation. Decision-makers noted that insufficient enforcement of laws allows ‘dirty practices to continue,’ stifling the motivation for costly internal BMI. Future studies could focus on the specific design and implementation of regulatory mechanisms that effectively incentivise cleaner operations in coal-dependent economies. The study also formalises the strategic necessity of narrative warfare, active political engagement and lobbying, as a critical, mandatory component of BMI strategy in high-carbon industries. This political strategy, which involves actively promoting coal’s economic contribution and lobbying for financial incentives to stabilise external perception, is deemed essential for new BMs to succeed. Future research could quantify the impact of such external narrative management on securing policy support and financial viability.

In summary, the study, being exploratory in nature, provides specific context regarding the actionable framework decision-makers use to survive in a highly constrained environment. Further research could leverage these specific empirical findings such as the “missing stick” of regulation, and narrative warfare to build more tailored theoretical models for managing high-carbon transition in developing economies.

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APPENDICES

Appendix 1: Individual consent letter

Informed consent letter for qualitative study towards MPhil 2024/25

I am conducting research on “**Business model innovation towards energy transition in emerging markets: The case of South African coal industry**”. Our interview is expected to last up-to 60 minutes and will help us understand **how decision-makers allocate resources or adapt capabilities to enact business model innovation for coal dependent firms in emerging markets?**

Your participation is voluntary, and you can withdraw at any time without penalty. By signing this letter, you are indicating that you have given permission for:

- the interview to be recorded;
- the recording to be transcribed by the researcher through the use of audio transcriber application;
- verbatim quotations from the interview to be used in the report, provided they are not identified with your name or that of your organisation;
- the data to be used as part of a report that will be publicly available once the examination process has been completed; and
- all data to be reported and stored without identifiers.

If you have any concerns, please contact my supervisor or me. Our details are provided below.

Researcher:	Name:	
	Email:	
	Phone:	
Research supervisor:	Name:	
	Email:	

Signature of participant: _____ Date:

Signature of researcher:  _____

Appendix 2: Interview protocol

Research questions	Literature	Interview guide
4. Research question 1 How do decision-makers in the coal industry understand the ET and how that understanding influences strategic or BM adaptation?	Key theme: Decision-maker understanding and cognitive influence The literature frequently addresses decision-maker's cognitive limitations and barriers, such as historical bias, risk aversion and the difficulty of innovating while the current BM is profitable (Richter (2013); Bürer et al., 2021; Richter, 2011). It also notes they may default to a "wait and see" approach due to complexity (Bryant et al., 2024). The literature review focuses on the failure or barriers inherent in their thinking.	1. Can you please introduce and describe your role in the organisation? 2. What do you understand about the JET? 3. What do you think are the most factors that affect the coal industry, or your firm in relation to the ET? 4. In your opinion, what is your primary role as a decision-maker in your firm in relation to BMI and ET? 5. What BM initiatives have you proposed or initiated in response to the ET?
5. Research question 2 How does the ET influence the allocation of the firm's key resources and capabilities, and the extent that these resources and capabilities must be maintained or acquired?	Key theme: Resources allocation, maintenance and acquisition The literature establishes that firms must acquire new resources and capabilities for survival (Bryant et al., 2024), and overcome core rigidities (Mori & Zhang, 2024). It details the necessity of strategic resource reallocation, diversification into new technologies (e.g. wind or solar), and leveraging existing capabilities (Mori & Zhang, 2024). Theoretical framework like the	6. What do you consider as key resources and capabilities that exists in your organisation? 7. Which of these key resources and capabilities do you consider critical for your organisation in creating a competitive advantage in the new energy world? 8. To what extent do you think your organisation must acquire new resources and build new capabilities? 9. How should the identified resources and capabilities be reallocated to create value for the organisation?

	Resource-Based View (RBV) and Dynamic Capabilities (DC) directly address integrating and reconfiguring resources to address environmental changes (Rafique et al., 2025).	10. How are you involved as a decision-maker in identifying and introducing resources and capabilities that help the organisation respond to the ET?
6. Research question 3 Why do coal-dependent firms struggle to adapt their BMs to the ET, and how may these challenges be mitigated?	Key theme: Barriers to BMI and mitigation strategies The literature detail financial barriers (stranded assets, massive infrastructure), firm inertia (path dependency, lock-in), regulatory barriers (regulatory capture), and socioeconomic influence (vested interests, job loss) (Chipangamate & Nwaila, 2024; Araújo, 2014; Sánchez and Leadem, 2018; Mori & Zhang, 2024; Bryant et al., 2024; Jakob et al., 2020). Mitigation strategies include strategic repositioning, diversification, organisational adaptation (separate ventures), and the need for clear regulatory frameworks (Mori & Zhang, 2024).	11. What do you consider as barriers for your firm or organisations in the coal industry to innovate their BMs? 12. How is your organisation dealing with the barriers that hinders innovation for value creation in relation to ET? 13. In your opinion, what should be done to allow the coal industry to build new BMs or enter new markets in response to the ET? 14. What do you think are your limitations, different to organisational barriers, as a decision-maker to introduce innovative solutions in response to the ET?

Appendix 3: List of codes used

No	1st order codes	2nd order codes (categories)	Themes
1	Gradual energy switch	JET understanding and scope	JET ambivalence - recognising socio-economic necessity while asserting technical and resource constraints
2	Shift from non-renewable to renewable		
3	Focus on transitional processes		
4	Reduce greenhouse gases		
5	Transition management		
6	Shift to cleaner/sustainable resources		
7	Consideration for affected stakeholders	Socio-economic imperatives	
8	Employee reskilling		
9	Community economic sustainability		
10	End goal overlooks people aspect		
11	Ensuring communities/industries are not stranded		
12	Renewables cannot provide base load	Systemic and resource constraints	
13	High cost of renewable energy		
14	Capacity to store and transmit renewables lacking		
15	Coal supports base load (20-30 years)		
16	SA primary energy source is coal		
17	Energy security		
18	Pressure on SA and Africa to abandon coal	Critical assessment of jet	
19	immediate switch		
20	JET is not the right framework		
21	Investor speed outpaces energy innovation	Financial and investment constraints	The dominance of financial and geopolitical pressure as existential threats to coal viability
22	Difficulty securing finance		
23	Lower ROI for coal investment		
24	Expensive insurance		
25	Carbon border adjustment mechanism (CBAM) or penalties		
26	Evolving public perception of coal	Socio-political and perception pressure	
27	Negative perception impacts coal mining		

28	Media amplification of climate impact		Strategic adaptation - integrating multi-faceted risk management with future-oriented transition planning
29	Legislation is a big factor		
30	Reduced markets and customers		
31	Disagreement with international rollout approach		
32	Global leadership/rhetoric influences perception		
33	Coal is cheaper energy	Socio-economic importance of coal	
34	Coal supports employment and jobs		
35	Affordability risk for consumers and cost of living		
36	Impact on workforce		
37	Impact on communities surrounding industries		
38	Increased processing due to quality specs	Operational and technical challenges	
39	Increased mining costs		
40	Stringent international requirements (heavy metals)		
41	Threat to infrastructure		
42	Dependence on base load for renewables development		
43	Address operational risk	Risk and financial stewardship	
44	Address financial risk		
45	Ensure balance sheet strength and credibility		
46	Bankruptcy risk vs GDP support		
47	Investment must be profitable		
48	consider jet in decision making	Strategic transition planning	
49	Include jet and ESG in strategic planning		
50	Remain relevant in 30 years		
51	Diversify into future minerals (metals or rare earths)		
52	Need to review business model		
53	Evaluate techno-economic feasibility and policy alignment		
54	Focus on input efficiency	Operational optimisation and consolidation	
55	Reducing energy draw intensity		
56	Consolidate current viable coal assets		
57	Responsibly wind down core operations		
58	Continue using coal sustainably		
59	Communicate balanced narrative		

60	Participate in national green coal debate	External communication and certainty	
61	Create certainty for coal industry		
62	Moral obligation to future generations		
63	Minimising usage intensity (diesel, water, electricity)	Operational efficiency and cost reduction	The dual strategy of internal optimisation to fund measured diversification
64	Sensor lighting for energy reduction		
65	Developed KPIs for energy efficiency		
66	Energy efficient HVAC (air cons)		
67	Reduce fixed costs		
68	Engage OEMs for energy efficient machines		
69	Developed bm for renewable energy (solar)		
70	Solar to support current and new operations		
71	Aim for energy self-sufficiency		
72	Partnerships for wind and solar projects		
73	battery energy storage		
74	Utilise wind farms		
75	Just diversification from coal	Strategic diversification	
76	Using coal revenue for expansion		
77	Initiative: lithium project exploration		
78	Gas as energy source		
79	Focus remains on coal	Coal lifecycle management	
80	Focus on low strip ratio coal		
81	Optimise mining methodology		
82	BM - retrofit, modernisation and lifespan extension		
83	BM - ultra supercritical boilers		
84	Competent and resilient workforce	Human capital and future skills	Strategic investment in human capital and R&D for future competitiveness (human capital and future skills, innovation and R&D, strategic agility & acquisition)
85	Diverse technical expertise		
86	Struggling to attract talent or people		
87	Need to develop people and skills		
88	Staff resilience through market shock		
89	Criticality of electrical engineers		
90	Targeting computer science skills (ai or programming)		
91	Blending old and new skills		

92	Lack of re-allocatable internal talent		
93	Internal employee secondment		
94	Competitive salaries required		
95	Prioritising future national skill preparation		
96	Promoting TVETs to lead education		
97	Reliance on internal capital and equity	Financial and capital strategy	Sustaining foundational capacity through core asset utilisation and financial leverage (operational and core asset, financial and capital strategy, strategic agility and acquisition)
98	Innovative capital raising		
99	Good balance sheet aids external funding access		
100	Stable coal price advantage		
101	Coal value extraction required for funding future		
102	Optimal and economic coal mining critical		
103	Coal assets needed due to lack of external funding		
104	Low internal capital generation		
105	Financial exclusion (traditional markets)		
106	Internal cross-funding from coal operations		
107	Scale of required investment (2 trillion rand)		
108	High-quality installed infrastructure	Operational and core assets	
109	Infrastructure supports tech integration		
110	Flexibility of coal resource		
111	Key asset - Makhado metallurgical		
112	Access to land and mining rights		
113	Infrastructure is competitively valuable		
114	Prioritising best reserves now		
115	Focus on rehabilitation and mine closure (ESG requirement)		
116	Addressing rehabilitation backlog through innovation		
117	Sustain and improve efficiency		
118	Organisational resolve and adaptability	Strategic agility and acquisition	
119	Strategic shift to new niches (water and renewables)		
120	Need for diversification		
121	Acquisition is necessary for survival		

122	Criticality of timely decision implementation		
123	Late entry acknowledged		
124	Catch-up possible		
125	Phased acquisition approach		
126	Acquire global technology or play a follow role		
127	Strategy of optimal asset utilisation	Organisational structure and reallocation	Systemic organisational restructuring and ecosystem integration for value creation (organisational structure and reallocation, ecosystem and external relations, strategic agility and acquisition)
128	Treating plants as individual business units		
129	Internal consulting or service model		
130	Central workshops or factory model reintroduction		
131	Full integration of subsidiaries		
132	Departments as income-generating cost centres		
133	Resources need authority and relevance		
134	Restructuring precedes resource reallocation		
135	Reallocation based on talent and passion convergence		
136	Whole-of-government approach needed		
137	Stakeholder collaboration for resources		
138	Donor funding for green initiatives		
139	CFU is a national enabler/ecosystem		
140	Network of dedicated supplier companies (de facto internal skills)		
141	Partnerships for project completion and operationalisation		
142	Criticality of CFU for grid relationship		
143	Stewardship leadership and right culture	Leadership and involvement	Dual leadership focus: balancing coal continuity and transition steering (leadership and involvement, operational and core assets, financial & capital strategy)
144	Leadership balancing coal and wind focus		
145	Leadership masters transition space		
146	monitoring business, political and economic changes		
147	Contribution during strategic planning sessions		
148	Current management focused solely on sustaining coal base		

149	Self-acknowledged insufficient decision-maker involvement	Innovation & R&D	
150	Role as enabler and facilitator		
151	Research must be applied/practical		
152	Lack of investment in specific research		
153	Broad energy focus (R&D)		
154	R&D function suggested		
155	Empowered R&D over operational priority		
156	Internal knowledge gap in new energy		
157	Innovation process steps		
158	Capital access barrier	Financial capital and investment constraints (FCIC)	The dual constraint of financial capital and regulatory uncertainty (FCIC + RCEL)
159	Reliance on own equity for innovation		
160	Bank policies restricting new financing		
161	price volatility risk		
162	Seeking alternative funding models		
163	Attracting like-minded offshore investors		
164	Primary barrier is funding		
165	Need funding for R&D transition		
166	Funding clean energy with coal revenue		
167	Tax and financial incentives required		
168	External refinancing required		
169	Innovation requires internal funding reallocation		
170	Capital resource deficit as root of decision constraint		
171	Impact of financial strain on innovative mindset		
172	Policy uncertainty barrier	Regulatory complexity and external legitimacy (RCEL)	
173	Developed nations' policy hypocrisy		
174	Stringent policies hinder coal operation		
175	Regulatory licensing difficulty		
176	Political interference barrier		
177	Involvement in industry policy discussions		
178	Coal recognised as strategic mineral		
179	Industry must change its own narrative		

180	Demand for jet suspension/pause		
181	Resistance to external imposition of jet		
182	Providing certainty of continued coal role		
183	External debate creates uncertainty (trump)		
184	Innovation reluctance/traditional reliance	Internal organisational inertia and capacity (IOIC)	Overcoming cultural and organisational inertia through focused talent investment (IOIC+ RCEL)
185	Lack of integration/silo functioning		
186	Family business operational constraints		
187	Need to decide future company identity (strategic clarity challenge)		
188	Lack of innovation skill/talent		
189	Stagnant university curriculum		
190	Modification challenge for existing infrastructure		
191	Short-term thinking barrier		
192	Lack of visionary thinking		
193	Strong family decisions impede change		
194	Role limits decision making authority		
195	Constrained by CEO vision		
196	Inherited policies and people limitations		
197	Operating within boundaries of legacy design		
198	Lack of previous personal experience (novice status)		
199	Prioritising immediate challenges		
200	Redefining just energy transition	Strategic adaptation and market pivoting (SAMP)	Redefining value creation through strategic diversification and narrative change (SAMP + RCEL)
201	Openness to explore new energy (e.g., hydrogen)		
202	Strategy for renewables (water and wind)		
203	Long-term growth focus		
204	Sustaining economic activity for communities		
205	Follower R&D strategy		
206	Formation of new green energy division		
207	Customer alignment for competitive advantage		
208	Investing in clean coal technologies		

209	Diversification into solar generation		
210	Early transition strategy to become energy company		
211	Need for collaborative industry innovation		
212	Focus on green attributes (new markets)		
213	Research on pollutant utilisation		

Appendix 4: Organisational consent letter (CFU)

[Redacted]

[Redacted]
[Redacted]
[Redacted]
[Redacted]
Middelburg, MPUMALANGA
1055
E-mail: [Redacted]

Date:
13 August 2025

Enquiries: [Redacted]

Dear [Redacted]

ETHICAL CLEARANCE LETTER: REQUEST TO CONDUCT INTERVIEWS/SURVEY FOR MASTERS STUDY USING ESKOM INSIGHT TO ENRICH THE STUDY

PURPOSE

1. The purpose of this submission is in response to your request to conduct Research (Interviews) at [Redacted] for your academic study, at Gordon Institute of Business School (GIBS), as per your e-mail to [Redacted] dated 31 July 2025.

BACKGROUND

2. [Redacted] has an in-house documented process to share [Redacted] owned data for research and academic purposes, in order to support skills development internally in the business and externally for the country.
3. [Redacted] owned data can be shared with both internal [Redacted] Employees) and external students, except in cases where [Redacted] data is classified as confidential or intellectual property.
4. [Redacted] does not allow external students to do online surveys or face-to-face interviews with [Redacted] Employees, since it is a violation of the Protection of Personal Information Act No 4, of 2013 (POPIA), without written permission from [Redacted] employees (Data subjects). Provision of email addresses or any other related information which is deemed as personal information without consent is prohibited in terms of POPIA.
5. However, if you are familiar with [Redacted] Employees and wish to engage them on your own, and you require **Ethical Clearance** to be able to engage them, then [Redacted] can provide you with a clearance to do so.

[Redacted]

In partnership with
 **G20** SOUTH
AFRICA
2025

6. The Eskom IP Office **will not** engage [REDACTED] Employees on your behalf, for data you require, nor will they circulate your survey to [REDACTED] employees, for the purpose of your study,

DECISION MAKING PROCESS

7. You are currently registered with Gordon Institute of Business School (GIBS) doing research for your Masters studies, with a study titled "*Business model innovation towards energy transition*"
8. Your request is to conduct interviews with [REDACTED] employee (s), for the period August 2025 to December 2025,
9. The findings of your research will be of benefit to and will be shared with [REDACTED]
10. Notwithstanding [REDACTED] policy in terms of interviews/surveys, you are familiar with [REDACTED] Employees and wish to engage them on your own.
11. The [REDACTED] Employees will be engaged are :
- a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
12. You require approval and ethical clearance to be able to engage with [REDACTED] Employees.
13. Attached to this submission is:
- a. Interview Guide from GIBS

ETHICAL CLEARANCE

14. This letter hereby grants you [REDACTED] GIBS student number: [REDACTED] approval and Ethical Clearance, to engage [REDACTED] Employees, on your own, for the purpose of conducting your Masters studies at GIBS, South Africa.

Compiled by:

[REDACTED]

Date: 13 August 2025

Authorised by:

[REDACTED]
[REDACTED] and
Development

Date: 2025-08-14

Acknowledgment of Acceptance

[REDACTED]
External Student

Date: 14/08/2025

Appendix 5: Organisational consent letter (MCP)



Organisation Consent Letter

We are aware that [REDACTED] is conducting research in partial fulfilment of **"Business model innovation towards energy transition in emerging markets: The case of South African Coal industry"**. We hereby give permission for [REDACTED] to conduct research relating to this topic to understand **how decision-makers allocate resources or adapt capabilities to enact business model innovation for coal dependent firms in emerging markets?**

We acknowledge that this research will involve collecting data **through semi-structured interviews** from **three decision-makers at executive positions** for a period not exceeding **end of November 2025**.

We understand that participation in this research is voluntary, and that the principle of informed consent will be applied to everyone involved in the data collection process. We confirm that the researcher will protect the identity of the organisation and that of the individuals involved in the research by keeping this information confidential in any stored data, reports or publications that may emanate from this research.

We also confirm that this permission is granted by a person duly authorised to do so.

Signature: 

Name of signatory: [REDACTED] Title of signatory: [REDACTED]

Place of signing: [REDACTED] Date of signing: 18/07/2025



Appendix 6: Organisational consent letter (ECM)



Organisation Consent Letter

We are aware that [REDACTED] is conducting research in partial fulfilment of “Business model innovation towards energy transition in emerging markets: The case of South African coal industry”. We hereby give permission for [REDACTED] to conduct research relating to this topic in order to understand how decision-makers allocate resources or adapt capabilities to enact business model innovation for coal dependent firms in emerging markets?

We acknowledge that this research will involve collecting data through semi-structured interviews from three decision-makers at executive positions for a period not exceeding end of October 2025.

We understand that participation in this research is voluntary and that the principle of informed consent will be applied to everyone involved in the data collection process. We confirm that the researcher will protect the identity of the organisation and that of the individuals involved in the research by keeping this information confidential in any stored data, reports or publications that may emanate from this research.

We also confirm that this permission is granted by a person duly authorised to do so.

Signature: [REDACTED] _____

Name of signatory: [REDACTED] Title of signatory: [REDACTED]

Place of signing: Pretoria _____ Date of signing: 05 August 2025

Appendix 7: GIBS ethics clearance

GIBS ETHICAL CLEARANCE APPLICATION FORM 2025/26

RESEARCH PROJECT INFORMATION

NAME:	[REDACTED]
STUDENT NUMBER:	[REDACTED]
PHONE NUMBER:	
E-MAIL ADDRESS:	[REDACTED]
PROPOSED TITLE OF STUDY:	Business model Innovation towards energy transition in emerging markets: The case of South African coal industry
RESEARCH SUPERVISOR:	[REDACTED]
E-MAIL OF SUPERVISOR:	[REDACTED]
RESEARCH CO-SUPERVISOR	
E-MAIL OF CO-SUPERVISOR	

The purpose of this Research Ethics process is to ensure that all research conducted under the auspices of GIBS is done so in an ethical manner, in accordance with the University's policy and in such a way that the rights of all stakeholders associated with the research are protected.

In order for the GIBS Research Ethics Committee to assess your application, you are required to submit a description of your Research Methodology that must contain sufficient detail to ensure that the required steps have been taken to achieve this purpose, in the research design, data collection, analysis and storage of data used in the conduct of this research.

Please indicate the nature of the output your research is aimed at producing (mark one box only):

- ☐ ABP Applied Business Project
- ☐ MBA Research Report
- ☐ MBA Project Publish Article
- ☐ MBA Teaching Case Study
- ☐ MBA Entrepreneurship Stream Portfolio
- ☐ MBA Consulting Stream Portfolio/MBA Health Stream
- ☒ MPhil Research Report

GIBS Ethics Policy distinguishes between FOUR main types of data and THREE main types of methodology. Please complete the table for ALL the data types that you plan to use. Note that all applications must be accompanied by a description of the methodology to be used in the study. Initial all sections that apply to your research

GIBS ETHICAL CLEARANCE APPLICATION FORM 2025/26

Section of form and type of data or methodology	Attachments – Including methodology chapter (please mark that they are included)
A Pre-existing personal records of human subjects, e.g. performance reviews	☐ Methodology section of proposal ☐ Description of the nature of the records to be used ☐ Signed permission letter from appropriately authorised person in the organisation to use the data
B New data solicited from human subjects, e.g. through interviews or surveys	☒ Methodology section of proposal ☒ Informed consent statement attach proforma (separate for qualitative data collection; as part of survey questionnaire for quantitative data collection) ☒ Interview guide / survey questionnaire / pre-existing proprietary test instrument / description of intervention ☒ IF pre-existing proprietary test instrument, letter of permission from the owner/copyright holder (e.g. the MBTI)
C Public non-human data, e.g. World Bank or other databases (no letter needed)	☐ Methodology section of proposal ☐ Explanation of the nature of the data, how you will source it and how you will use it
D Private Organisation-specific non-human data, e.g. financial statements, marketing or safety records	☒ Methodology section of proposal ☒ Explanation of the nature of the data, how you will source it and how you will use it ☒ Permission letter from the owner/organisation to use the data
E Indicate which methodology you will be using. Choose one only	☒ Qualitative ☐ Quantitative ☐ Mixed methods

GIBS ETHICAL CLEARANCE APPLICATION FORM 2025/26

SECTION A. PRE-EXISTING PERSONAL RECORDS OF HUMAN SUBJECTS

1. Specify the nature of records and how they will be used

2. Confirm that permission has been obtained from an appropriately authorised person to study and report on these records.

Remember to attach permission letter(s).

☐ I confirm

3. Provide the name and job title of the person in the organisation who has authorised the use of the records.

Name:

Job Title:

4. How will **confidentiality** (when the identity of the respondent is known to the researcher e.g. when data collection is via interviews) and/or **anonymity** (when the identity of the interviewer is not known to the researcher e.g. when data collection is via surveys) of the respondents and their data be assured?

Mark all that apply – ensure this is included in your methodology chapter.

- ☐ No names will be requested
- ☐ No names will be reported
- ☐ Data will be stored without identifiers
- ☐ Only aggregated information will be provided
- ☐ Other. Please specify

SECTION B. NEW DATA OBTAINED FROM HUMAN SUBJECTS

5. Does the nature of your research require you to collect data from respondents who constitute a 'vulnerable population' (defined as those who are particularly susceptible to coercion or undue influence or who have difficulty giving free and informed consent to being the subjects of research)?

☒ No

☐ Yes.

IF yes, explain the nature of the population and what measures will be put in place done to reduce or minimise this vulnerability. Ensure this is included in your methodology chapter.

6. Please confirm that no incentive is to be offered to respondents to participate in the study.

☒ I confirm

7. Mark the applicable box(es) to identify the proposed procedure(s) to be carried out to obtain data.

- ☒ Interview guide Attach if applicable
- ☐ Survey questionnaire Attach if applicable
- ☐ Pre-existing proprietary test instrument, e.g. MBTI Attach if applicable
IF a pre-existing proprietary test instrument is used, confirm that permission has been obtained to use it.
- ☐

GIBS ETHICAL CLEARANCE APPLICATION FORM 2025/26

I confirm

Remember to attach permission letter(s) to use proprietary test instrument/s from an appropriately authorised person.

- ☐ • Intervention, e.g. training or experiment Describe in full in methodology chapter

8. Confirm that the data gathering is accompanied by a consent statement.

- ☒ I confirm

9. Where is the consent statement found?

- ☐ As part of the survey questionnaire, if quantitative data collection, in the introduction section of the questionnaire.
- ☒ As a separate document, if qualitative data collection, remember to attach.

10. Is there a risk that the respondents may not fully understand the nature of the study, or instructions or questions, or their rights as a result of language barriers between themselves and the researcher?

- ☒ No, there is not a risk
- ☐ Yes, there is a risk.
If yes, how will the subjects' full comprehension of the content of the research, including giving consent, be ensured? Please specify, and include in methodology chapter

11. Do any respondents risk possible harm or disadvantage (e.g. financial, legal, reputational or social) by participating in the research?

- ☐ No
- ☒ Yes.
If yes, explain what types of risk and what is done to minimise and mitigate those risks and include in methodology chapter.
- The researcher's failure to maintain the confidentiality of the organisation's and participants' information will be addressed by removing any details that could identify the organisation or participants from the report. A signed confidentiality and non-disclosure agreement will govern this process, ensuring the researcher maintains the privacy of the participants' and organisation's information. Before scheduling any interview, obtain a consent letter from the participants. The gathered data will be secured with a password and saved safely on a personal computer, with backups maintained on a secure iCloud.

12. Are there any aspects of the research about which subjects are not to be informed?

- ☒ No
- ☐ Yes.
If yes, explain why, and how subjects will be debriefed, and include in methodology chapter.

13. Will the audio or video recorded data be transcribed and/or translated by an independent transcriber and/or translator?

- ☒ No
- ☐ Yes.
If yes, confirm that the transcriber and/or translator will be required to sign a non-disclosure agreement to protect the respondent's confidentiality, and include in methodology chapter
- ☐ I confirm. Remember to attach a pro-forma non-disclosure agreement

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14. How will confidentiality (when the identity of the respondent is known to the researcher e.g. when data collection is via interviews) and/or anonymity (when the identity of the interviewer is not known to the researcher e.g. when data collection is via surveys) of the respondents and their data be assured? Include in methodology chapter

- ☐ No names will be requested, relevant when the identity of the respondent is not known to the researcher
- ☒ No names of individuals or organisations will be reported, relevant when the identity of the respondent is known to the researcher
- ☒ Only aggregated information will be reported
- ☒ Data will be stored without identifiers
- ☐ Other. Please specify

15. Is the topic of your research and the nature of the interview or survey questions about one or more particular organisations or to be conducted within one or more particular organisations?

- ☐ No
- ☒ Yes. If yes, confirm that appropriately authorised person/s have provided written permission for you to conduct this research
- ☒ I confirm. Remember to attach signed permission letter/s

SECTION C. PUBLIC NON-HUMAN DATA

16. Specify the nature of records to be used. Explain how they will be selected, where the data will be sourced and how the data will be used, and include in methodology chapter.

17. Confirm that this pre-existing non-human data is in the public domain, is legally accessible and is free of any copyright.

- ☐ I confirm

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SECTION D. PRIVATE ORGANISATION-SPECIFIC NON-HUMAN DATA

18. Specify the nature of records (e.g. financial reports, marketing reports or safety records) and how they will be used.

The semi-structured interviews will be used to collect primary data, then followed by firm documents or reports, policy documents, websites, press releases, or industry analysis, for data triangulation, and to enhance credibility.

19. Confirm that permission has been obtained to study and report on these records.

☒ I confirm. Remember to attach a signed permission letter(s).

20. Provide the name and job title of the person in the organisation who has authorised the use of the records.

Name:

Job
Title:

21. Do companies risk possible harm or disadvantage (e.g. financial, legal, reputational or social) by participating in the research?

☐ No

☒ Yes. Explain what types of risk and what is done to minimise and mitigate those risks. Include explanation in methodology chapter

The researcher's failure to maintain the confidentiality of the organisation's and participants' information will be addressed by removing any details that could identify the organisation or participants from the report. A signed confidentiality and non-disclosure agreement will govern this process, ensuring the researcher maintains the privacy of the participants' and organisation's information. Before scheduling any interview, obtain a consent letter from the participants.

22. How will confidentiality (when the identity of the respondent is known to the researcher e.g. when data collection is via interviews) and/or anonymity (when the identity of the interviewer is not known to the researcher e.g. when data collection is via surveys) of the respondents and their data be assured? Include in methodology chapter

☐ No names will be requested, relevant when the identity of the respondent is not known to the researcher

☒ No names of individuals or organisations will be reported, relevant when the identity of the respondent is known to the researcher

☒ • Only aggregated information will be reported

☒ • Data will be stored without identifiers

☐ Other. Please specify

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ALL APPLICANTS MUST COMPLETE SECTIONS E AND F

E. CONFIDENTIALITY OF RESEARCH REPORT SUBMITTED FOR EXAMINATION OR PUBLICATION

23. Please select the relevant option relating to the confidentiality of the research report you will submit for examination:

- ☒ Free access, i.e. report not embargoed
- ☐ No access for a period of two years after research report is submitted for examination
Note that in exceptional circumstances, GIBS, being the copyright holder of the published research, may consent to an embargo of the report submitted for examination for a period of no more than two years. If you wish to apply for such an embargo, please provide reasons for this in a separate attachment.
- ☐ No access under any circumstance for an undetermined period.
A letter of permission from the Vice- principal: Research and Postgraduate Studies at the University of Pretoria must be obtained prior to making this application – and attached to this application for ethical clearance.

F. DATA STORAGE AND DISSEMINATION OF RESEARCH REPORT SUBMITTED FOR EXAMINATION

24. Please confirm that you will use appropriate methods to ensure your data is safely stored in an accessible format for a minimum period of 10 years

- ☒ I confirm

25. Confirm that the details of your data storage method are set out in your attached methodology chapter

- ☒ I confirm

26. It is a goal of GIBS to make research available as broadly as possible. Mark the boxes below for the medium/media in which you do NOT wish results to be made available.

Academic dissemination

- ☐ Research report
- ☐ Scientific article
- ☐ Conference paper
- ☐ Book

Popular dissemination

- ☐ TV
- ☐ Radio
- ☐ Lay article
- ☐ Podcast
- ☐ Book

Provide reasons for any limitation on publication marked above

27. Confirm that the consent obtained from participant in the research is aligned with the extent of dissemination, specified in question 26. For example, consent if you are planning to use the research to launch a consulting career will be more comprehensive than in the case of research that is intended only for a scientific audience.

- ☒ I confirm

28. IF you wish to describe any other information which may be of value to the committee in reviewing your application

- ☒ No
- ☐ Yes. Provide details in a separate sheet attached to this application

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G. APPROVALS FOR/OF THIS APPLICATION

When the applicant is a student of GIBS, the applicant must please ensure that the supervisor and co-supervisor (where relevant) has signed the form before submission

STUDENT RESEARCHER/APPLICANT:

29. I affirm that all relevant information has been provided in this form and its attachments and that all statements made are correct.

Student Researcher's Name in capital letters:

[REDACTED]

Date:

22 Jun 2025

Supervisor Name in capital letters:

[REDACTED]

Date:

01 Sep 2025

Co-supervisor Name in capital letters:

Date:

22 Jun 2025

Note: GIBS shall do everything in its power to protect the personal information supplied herein, in accordance to its company privacy policies as well the Protection of Personal Information Act, 2013. Access to all of the above provided personal information is restricted, only employees who need the information to perform a specific job are granted access to this information.

Decision:

Approved

REC comments:

Thank you for the permission letters. Good luck with your research.

Date: 01 Sep 2025