

South Africa's energy transition – Unraveling its political economy

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ABSTRACT

The concept of a low-carbon transition is increasingly gaining traction in South Africa. This constitutes a major technical, social and political challenge as the national energy sector highly depends on coal. Analysing the driving factors for the ongoing dominance of coal, this case study identifies main actors, objectives, and the relevant contextual factors forming the political economy of energy and coal. For this purpose, a qualitative analysis of semi-structured expert interviews was carried out. The findings yield four main objectives: “Energy availability”, “Maintaining profitability of the coal sector”, “Environmental and climate protection” and “Reducing inequalities and employment insecurity”. Pressing social issues, such as severe social inequality and high unemployment, lead to a complex and multi-layered political and social context. While incumbents and powerful coal-favouring actors try to maintain the status quo, there is a slow but steady increase in legislation favouring the uptake of low-carbon alternatives.

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Introduction

The South African coal sector has a significant impact on South Africa's socio-economic landscape. Interest groups favouring coal have been influential in policy-making processes, especially due to coal's dominant role within the energy sector. The energy sector is responsible for 80 % of South Africa's greenhouse gas (GHG) emissions (NPC, 2018). Thus, a transition away from coal is key for the country to achieve its Nationally Determined Contributions (NDCs) in line with the ratified Paris Agreement, its domestic policy targets and national development goals, and to reduce negative externalities from coal mining and coal power plants such as pollution and negative health effects (Nkambule & Blignaut, 2017).

In this case study, we aim to understand the driving forces of the continued dominance of coal in South Africa.

In 2019, coal accounted for about 75 % of total primary energy supply and 88 % of electricity generation (Enerdata, 2020). It has been a critical part of South Africa's economy for decades (Eskom, 2020a). Coal mining contributes 2.3 % to South Africa's GDP with 40 % to 45 % of the sales

income attributable to the export market, namely to India, Pakistan and South-East Asia (Chamber of Mines, 2018; IEEFA, 2019; Strambo et al., 2019).

Currently, the prospects of the coal export markets are deteriorating and South Africa is struggling to meet electricity demand with an ageing fleet of coal power plants (IEEFA, 2019). As costs of renewable energy sources (RES) are decreasing, the sector is expected to further shrink in the years to come (Burton, Caetano, & McCall, 2018; IEA, 2019, 2020c; Oyewo et al., 2019). Meanwhile, due to high RES potential and a changing policy landscape, a steady increase of Independent Power Producers (IPPs) – mainly active in the RES sector – can be observed (DMRE, 2020a, 2020b). With an expected increase in energy demand but a gap in power capacity, the diversification of the energy sector to ensure security of supply has become a primary target on the side of politics and business alike (DMRE, 2019; Eskom, 2020b; Ndlovu & Inglesi-Lotz, 2019). Yet moving away from coal creates challenges for South Africa and for the coal region in Mpumalanga province in particular. The country has a high unemployment rate of over 40 % and vast economic inequality represented by a Gini-Coefficient of 0.63, now exacerbated by the Covid-19 pandemic. As a result, the concept of a just transition that acknowledges socio-economic and environmental aspects is regarded as a crucial component for a successful low-carbon transition, including coal phase-out (World Bank, 2019; Wright & Calitz, 2020b).

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Previous literature identifies several political and economic drivers as most relevant for the continued dominance of coal. One of these drivers is the “minerals-energy complex”, consisting of the mining and energy sectors and related sub-sectors of manufacturing that use their influence to uphold profit-generating structures in the minerals sector (Baker et al., 2014; Baker et al., 2015; Fine & Rustomjee, 1996; Trollip, 2020). Incumbent actors, like the vertically integrated state-owned utility Eskom, which provides >90 % of the national electricity supply, try for many years to maintain a regime-favourable environment through resisting change and creating inertia (Ting & Byrne, 2020), as have other large emitters. Consequently, Caprotti et al. (2020) describe South Africa's energy policy and practice landscape as highly complex and dynamic while simultaneously being rigid, inefficient and intransparent. This is partly a result of path dependency in apartheid-era institutions and policy (Marquard, 2006; Steyn, 2001). Nevertheless, changes in regulation and legislation are slowly creating a more RES-favourable policy environment (GreenCape, 2020), while a financial crisis at Eskom, and shareholder pressure to divest from coal mining and large emitters, are causing incumbents to explore pathways away from coal.

Modelling approaches by Oyewo et al. (2019), Hanto et al. (2021), Arndt et al. (2019) and Wright and Calitz (2020a) show that in any least-cost scenario in line with the 2 °C global temperature target, no new coal capacities are being built in South Africa. Moreover, many analyses project an increased penetration of RES with more ambitious carbon constraints, especially wind and photovoltaics (PV) (McCall et al., 2019; Roff et al., 2020). This leads to a significant increase in employment, albeit much more decentralised jobs compared to the current, highly concentrated employment in the coal sector (Hanto et al., 2021).

The following study aims at contributing to understand the guiding forces that influence and are influenced by the coal- and energy sectors in South Africa. Looking through the lens of a political economy framework it engages in a scientific encoding practice of the socio-political entanglements of South African coal. The inquiry will help expand the understanding on how and why coal has been dominating the national energy sector and why a respective phase out has been developing rather slowly. While the study is a partial, though significant, depiction of the political economy of coal and energy in South Africa, it ought to be considered as a step towards understanding the context as a whole.

For this case study an in-depth, theory guided analysis of the political economy of electricity in South Africa was carried out, applying the theoretic framework by Jakob et al. (2020). Drawing on expert interviews with representatives from governmental institutions, businesses and civil society, we seek to identify the main actors, their main objectives and contextual factors shaping energy and coal sector related decision-making processes. The insights from the analysis are used to reveal key challenges and opportunities regarding an energy transition and to derive policy implications. The study finds four main objectives shaping the energy sector in South Africa: “Energy availability”, “Maintaining profitability of the coal sector”, “Environmental and climate protection” and “Reducing inequalities and employment insecurity”. While the uptake of low-carbon alternatives is increasing, powerful actors profiting from coal try to maintain the status quo. Concurrently, severe social inequality and high unemployment lead to a complex and multi-layered political and social context.

The following section outlines the framework and methodology of this paper. The **Energy context** section gives relevant background information regarding contextual factors and actors. The **Results** section presents the results of this study structured along the main objectives in the South African energy sector. The **Discussion** section discusses the findings and relevant policy implications. The **Conclusion** section concludes.

Framework and methodology

The analysis builds upon, improves, and adds new findings to previous work based on the political economy framework by Jakob et al.

(2020) which provides a transparent and comprehensive approach to understand energy related developments (Jakob & Steckel, 2022). It enables the analyses of climate and energy policy by incorporating a multitude of actors and contextual factors influencing the energy and coal sectors. The framework provides a structure for analyses applicable in a multitude of regional contexts, allowing for the comparisons of results across different cases. It has been applied in country case studies such as Colombia, USA, Germany, UK, Vietnam, Kenya, Indonesia and the Philippines (Dorband et al., 2020; Manysh & Jakob, 2021; Ordóñez et al., 2021). This section introduces the main elements of the framework, how they were translated into an interview questionnaire suitable for the South African context, the process by which the interviewees were determined, and the interview analysis.

The theoretical framework assumes that energy and climate policies are the results of a complex interplay between actors with different objectives influenced by contextual factors. Objectives are assumed to be represented in policy outcomes according to the influence of each actor on the policy formulation processes. While political actors can thereby directly influence these processes, societal actors mostly obtain outside positions regarding policy formulation and therefore often influence it through indirect action (e.g. lobbying, demonstrations, workers-strikes). Furthermore, contextual factors, including economic, environmental and institutional aspects, shape the environment in which actors operate.¹

The interview structure was informed by the framework by Jakob et al. (2020) and follows a guideline for semi-structured interviews by Kallio et al. (2016) and Adams (2015). This included carrying out an analysis of the literature relevant to the research questions of the study to ensure the guideline for the interview was best suited for the interviews with South African actors. Accordingly, the interview guideline is separated into four main parts. The first part asks the interviewee about the current challenges and objectives while the second part focuses on the most relevant policies in South Africa's energy sector. The third part aims to better understand the process of policy formulation and involved actors. Finally, the last part aims to identify relevant contextual factors and includes follow-up questions specifically adapted to the field of expertise of the interviewees. The guidelines enable the completion of multiple interviews with a similar structure to ensure comparability, while also giving the interviewer the liberty of addressing the interviewees' area of expertise and related topics (Kallio et al., 2016).²

The relevant actors in South Africa were initially determined through desk research and then through suggestions from interviewees in a pre-interview and the main interviews. In total, 5 political actors, 8 societal actors and 8 business actors were interviewed.³ While there is an even distribution of coal- and RES-related actors among the business sample, it should be noted that there is a slight underrepresentation of explicitly coal-related actors among the political and societal actors. This is mainly due to difficulties in getting an interview appointment with pro-coal representatives in politics and also due to a greater number of groups and individuals active in RES related fields. To account for a slight underrepresentation of pro-coal actors and to ensure the results of our interview analysis are not biased against these actors all interview-statements were complemented and verified by existing research literature, news articles, and documents on policies and regulations issued by the government to ensure reliability. This is important in general, as information from the interviews does not necessarily reflect the opinion of the interviewees themselves but also reflects those of other actors mentioned during the conversation.

The 20 in-depth semi-structured expert interviews with 21 actors associated with the energy and mining sectors in South Africa were conducted between August 24, 2020 and December 20, 2020. Due to the

¹ See Appendix A.1 for a more detailed description of the political economy framework.

² See Appendix A.2 for the full questionnaire.

³ See Appendices A.3 and A.4 for information on the interviewees.

Covid-19 pandemic, all interviews were conducted via Zoom. We recorded and subsequently transcribed all interviews after consent was given by the interviewees.

Qualitative content analysis of the interviews was guided by Saldaña (2016), Mayring (2000), and Linneberg and Korsgaard (2019). The analysis was conducted using MAXQDA, a software program for qualitative data analysis and mixed methods research. In a first step, notes from the interviews, information from the literature and the political economy framework by Jakob et al. (2020) were used to identify patterns and concepts in order to define a first set of objectives, related actors, and contextual factors. Hereby, an initial structure was developed that could be used to code the transcribed interviews. The coding process is used to identify themes across interview data through an iterative process of reading and re-reading the transcriptions and therefore elaborating on initial codes, to make finer distinctions within each of the coding categories or collapse them into broader categories (Linneberg & Korsgaard, 2019; Mayring, 2000).⁴ The coding process was conducted by two authors who coded all interviews at least once to reduce the likelihood of misinterpretation or error during the coding process. While the aim is to exercise a high standard of objectivity, it must be stated that outcomes may be partially subjective depending on the author's judgement.

Subsequently, the objectives and related contextual factors were coded content-wise and summarised into four overarching coding categories (main objectives) with three sub-objectives each (see Fig. 1). While contextual factors usually directly relate to one of the four objectives, they were also coded into three different sets (Techno-Economic, Institutional, Discursive) of their own to create a helpful representation of the context surrounding South Africa's energy and coal sector. The results are presented in detail in Results section.

Energy context

South Africa's energy sector is still shaped by the country's apartheid history and by post-apartheid's political, social, and economic forces (Baker et al., 2014; Marquard, 2006). Given South Africa's high coal endowment, the resource supported energy intensive economic growth by fueling the national energy-sector and other industries (e.g. coal-to-liquid productions). Coal's key position in South Africa's political economy arose as a result of a combination of factors. These include industrial policy oriented towards mining and minerals beneficiation, strong support by the government through direct and indirect subsidies (Burton, Lott, & Rennkamp, 2018), and national and international investors targeting coal (Baker et al., 2014).

Relevant actors in the energy sector

The government itself is deeply intertwined with coal interests through state-owned utilities Eskom and (formerly state-owned) Sasol. Eskom as the main national energy generator owns and operates most of South Africa's 40 GW coal power fleet while Sasol is an energy and chemical company active in coal-to-liquids and chemicals. Coal mining has been a key sector for post-apartheid economic redistribution, connecting political elites to mining interests. However, Eskom is now a national liability and in a financial and an operational crisis. It requires on-going state bailouts to repay otherwise unserviceable debt. Structural problems on Eskom's end, including cost and time overruns at new coal plants, tariffs that do not reflect underlying generation costs, as well as mismanagement and corruption have left the utility highly indebted and incapable of meeting electricity demand (DPE, 2019). In addition, 15 years of load shedding culminated in 2020 in load shedding for 10 % of the year (Wright & Calitz, 2020c). As coal is becoming increasingly uneconomical, international diversified

miners have divested or de-merged their coal mining businesses and sold assets to local actors (e.g. Anglo American, South 32), while other large mining houses have announced limits on new investments in coal mining (Glencore, Exxaro) (Burton, Caetano, & McCall, 2018; IEEFA, 2019).

Despite these developments, competing interests that benefit from coal still support the maintenance and growth of the sector. This includes parts of the government, who advocate for so-called "clean coal" with carbon capture; a complex set of coal-related trade unions with sometimes contradictory views on maintaining coal vs creating new jobs, climate policy, and just transition issues; and local coal mining companies, their owners and financiers (Burton, Caetano, & McCall, 2018). The national discussion focuses heavily on jobs and the risks to coal-dependent municipalities. Throughout the entire coal value chain, the sector currently directly employs about 120,000 people (0.7 % of total national workforce). This adds to the notion of coal being key to socio-economic development, especially in highly concentrated coal mining areas (e.g. Mpumalanga Province), which has led to strong opposition to RES (StatSA, 2021; TIPS, 2020).

On the other hand, the idea of a low-carbon transition and the uptake of RES is driven by a new group of actors consisting of pro-renewable parts of government, new investors, especially international IPPs, and civil society including NGOs and think tanks. While generally a trend towards more RES-friendly policies can be observed, the regulatory environment is still seen as stiff. The slow progression in the implementation of policies and regulations, along with a government hiatus in RES procurement, has been causing uncertainty for investors (GreenCape, 2020).

The energy sector in South Africa is predominantly regulated by the government through the Department of Mineral Resources and Energy (DMRE) as the policy and regulatory arm of the state responsible for electricity generation and allocation of new capacity, as well as mining regulation. The Department of Public Enterprises (DPE) is responsible for Eskom, while the national electricity regulator of South Africa (NERSA) determines the tariffs and charges for Eskom. Additional state ministries shaping the context of energy- and coal-related decisions are the Department of Trade, Industry and Competition (DTIC), which oversees the energy sector from a localisation and industrial development perspective. The Department of Forestry, Fisheries and the Environment (DFFE), is responsible for environmental concerns and preserving natural resources, including climate change policy (Climate Action Tracker, 2020; GreenCape, 2020).

Policy landscape

Fig. 2 gives an overview of relevant policies and plans between 2000 and 2020. The National Development Plan (NDP), the draft Integrated Energy Plan (IEP) and the Renewable Energy White Paper lay the general foundation for a more equal and less carbon-intensive society through sustainable economic growth (Department of Energy, 2016; Department of Environmental Affairs, 2011; National Planning Commission, 2012). The Integrated Resource Plan (IRP) 2019 is the national government's power plan from 2018 until 2030. It foresees a decrease in coal capacities from 38 GW to 33.3 GW and a substantial increase in PV from 1.6 GW to 8.2 GW, wind from 2.5 GW to 17.7 GW and distributed generation from 0.5 GW to 4GW as well as the introduction of battery storage until 2030 (DMRE, 2019).

While the IRP outlines how demand will be supplied, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) plays a crucial role in procuring RES through its bidding process that has thus far procured >6 GW in four bidding windows. Furthermore, policy tools and laws like the carbon tax, offsetting schemes and the Climate Change Bill specifically target climate change mitigation (GreenCape, 2020). However, the carbon tax was implemented in 2019 and set at a low rate, although a higher, medium-term price pathway was announced in the Budget 2022. Also, other policies

⁴ See Appendix A.5 for a visual representation of the coding process.

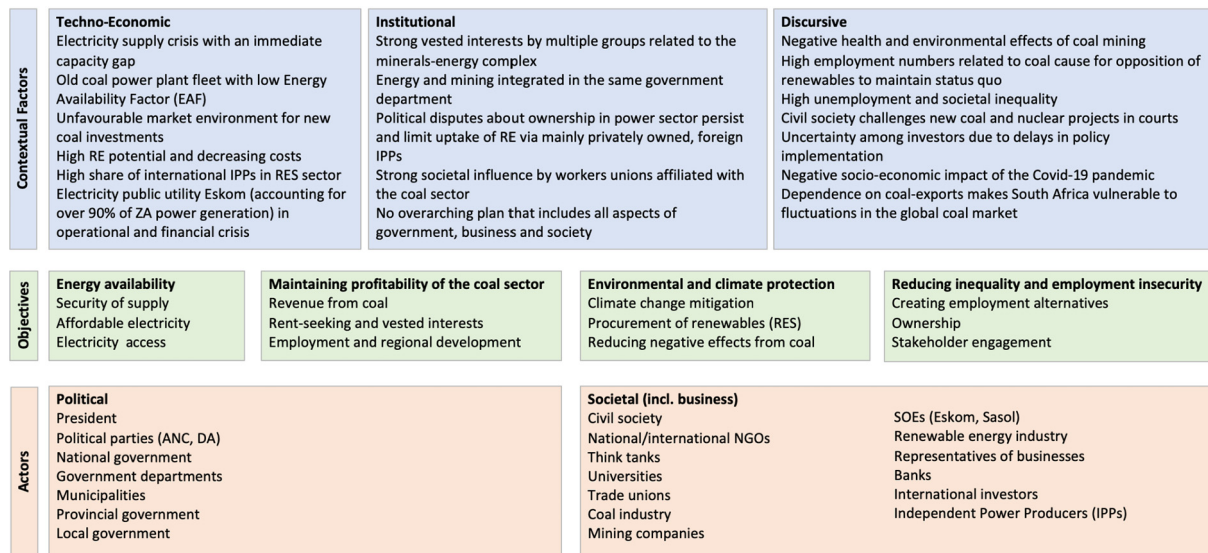


Fig. 1. Overview of contextual factors, objectives and actors mentioned in interviews (own illustration based on Jakob et al. (2020)).

and regulations are falling behind their initial targets, notably the implementation of the IRP 2019. As Eskom refused to sign power purchase agreements (PPAs), round 4 procurement from the REIPPPP was delayed for several years, although PPAs were signed in 2018. The fifth bid window was announced in April 2021 but has not yet reached financial close due to complications around grid connections and local content rules. Furthermore, the Climate Change Bill is expected to be enacted in the coming years, with public consultation taking place in early 2022 (Climate Action Tracker, 2020). As a result, the share of renewables in the last 20 years has merely increased from 0.14 % to 4.7 %, while coal remained the main electricity source with shares of 91.9 % in 2000 and 87.6 % in 2020 (see Fig. 2). However, in 2021, South Africa updated its

nationally determined contribution (NDC) under the Paris Agreement, narrowing and lowering the 2030 emissions range. While the range is achievable with current policies such as IRP 2019, to achieve the bottom 1.5 °C-compatible of the range will require policies to be updated, increasing RES uptake significantly compared to existing power plans, reducing coal plant utilisation, and ensuring implementation of other mitigation and industrial policies such as the National Energy Efficiency Strategy and the Green Transport Strategy (Burton et al., 2022). One other major recent shift in policy that is expected to increase RES uptake is the DMRE's new licensing regulations for plants <100 MW, which are expected to unlock almost 5GW of new industrial and mining capacity in the next few years (DMRE, 2021).

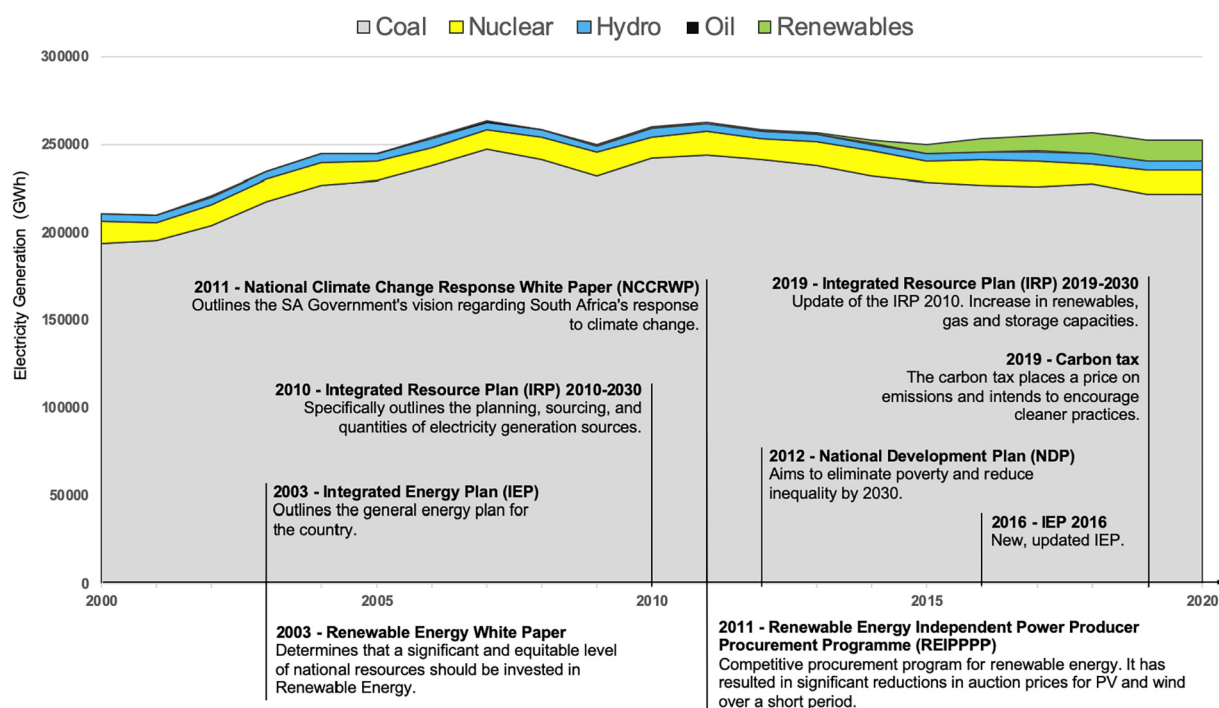


Fig. 2. Overview of electricity generation (2000–2020) and relevant government decisions (Own illustration based on GreenCape (2020) and IEA (2020a)).

Results

Through a qualitative analysis of the 20 interviews with 21 interviewees in conjunction with a literature review, the important actors, objectives and context factors for the South African energy and mining sectors were determined. The interviewees are categorised into political (p), societal (s) and business (b) actors.⁵

From the interviews, four main objectives influencing the national energy sector could be derived: “Energy availability”, “Maintaining profitability of the coal sector”, “Environmental and climate protection” and “Reducing inequality and employment insecurity”. “Reducing inequality and employment security” as well as “Environmental and climate protection” were mentioned by all interviewees as relevant objectives. Furthermore, “Energy availability” and “Maintaining profitability of the coal sector” were mentioned by nearly all interviewees to be influential objectives. There is mostly consensus on the main objectives driving the energy sector in South Africa. However, it needs to be noted that naming one of the objectives as relevant during an interview does not mean that it is an objective of the interviewees themselves. While actors acknowledge an objective to be influential, they can simultaneously oppose and criticise it. This was mostly the case with the objective “Maintaining profitability of the coal sector”, as pro-RES actors oppose it while pro-coal actors highlight the potential benefits of maintaining coal or the negative social implications of an energy transition.

The remainder of this section presents and discusses in more detail the four main objectives and their underlying sub-objectives as well as the related actors and relevant contextual factors either favouring the role of coal or encouraging an energy transition towards RES.⁶

Energy availability

South Africa currently experiences a supply-side crisis with an immediate capacity gap. This is seen as one of the leading problems of the energy sector and as detrimental to households and economic growth. Furthermore, electricity tariffs significantly increased over the last decade, resulting in additional negative effects on business and civil society alike. Despite a high electrification rate, rising prices result in households not being able to afford electricity (Ateba et al., 2019; Goliger & McMillan, 2018). While there has been historical contestation over the role of coal in the power sector and especially that it is cheap and supplies ‘baseload’, the economics and financing of new coal power has shifted dramatically over the past decade. New wind and solar have been cheaper than new coal since 2015, and in more recent bid rounds new RES were in some cases below Eskom’s marginal cost of generation (Merven et al., 2022). Progressive auction rounds enabled the market prices of technologies to emerge, and have contributed to public and government awareness about the higher costs of new coal plants. Most major commercial banks have coal power exclusions or limitations, and proposed coal plants have faced legal and regulatory challenges from civil society. The pipeline of new plants has therefore shrunk, from 6GW of new capacity in the IRP 2010 and seven plants totalling around 5GW pursuing licenses in 2015 to only 1.5GW of new capacity included in IRP 2019 and almost no plants pursuing licenses, barring the 1.2–3.5GW Chinese-backed plant in the Musina-Makhado Special Economic Zone in Limpopo (Burton et al., 2022).

Security of supply

To meet South Africa’s short-term energy demand and to set the foundation for long-term adequacy, immediate measures to ensure security of supply are seen as urgent [p1–p5, s1–s3, s5–s7, b1–b8]. Consequently, the DMRE has issued a 2000 MW Risk Mitigation IPP Procurement Programme (REIPPPP), with the objective to fill the

current short-term supply gap and to alleviate the current electricity supply constraints (DMRE, 2020d). The programme is expected to have a hybrid mix of RES and gas to reduce overall costs [p3]. To meet capacity demands, interviewees further underlined the urgency for a swift implementation of RES procurement through programmes like the REIPPPP [p1, p5, s1, s2, s6, b8].

There is general consensus that solving the financial, structural and operational problems of the national electricity public utility Eskom is essential [p1, p2, p4, p5, s1, s2, s4–s8, b1–b8]. Eskom has a history of mismanagement and an underperforming coal power fleet. Its Energy Availability Factor (EAF) has been considerably lower (65 % in 2020) than projected in the IRP 2019 (71 % in 2020), resulting in constrained capacity (DMRE, 2019; Calitz & Wright, 2021).

Considering the acute gap in capacity (an estimated shortfall of 4–6GW for 2025) and the expected decommissioning of 12 GW in ageing coal capacity until 2030, the diversification of the power sector is seen as a key lever to ensure security of supply and lower electricity costs while simultaneously reducing emissions through low carbon power generation sources (Wright & Calitz, 2020a). Eskom, despite its dominant position in coal generation, has started to publicly argue for more rapid uptake of new RES to address supply insecurity and is exploring new RES at its retiring coal stations as part of its own Just Energy Transition strategy (alongside new gas plants, and grid expansion). Gas is viewed as a potential transition fuel that would account for base-load power with significantly lower emissions [p5, s1, s7, b2–b5, b7]. However, an increase in gas could hinder the uptake of RES and cause an unwanted lock-in [p1, s1, s6]. South Africa currently imports gas for mainly industrial uses but there is considerable and growing political conflict over the potential scale of new gas to power projects and the possibility of new offshore exploration and production (Burton et al., 2022). Civil society has made several legal challenges to offshore exploration and to new gas plants, while techno-economic analysis largely agrees that only a small contribution from gas is needed. One interviewee pointed to the risks to energy security posed by increasing reliance on imports from politically unstable countries such as Mozambique [s1]. Regarding nuclear energy, the government is looking into options for new small modular reactors (SMR) (DMRE, 2019). Yet, there are no concrete plans due to their high investment costs and opposition from civil society [p1, s2, s6, b1, b2]. Regarding South Africa’s future energy supply, interviewees also mentioned hydrogen as a technology with high commercial potential and as an energy storage for intermittent electricity from RES [p2, p5, s1, s8, b1, b4–b6]. The expertise around Fischer-Tropsch derived liquid fuels together with high potential for RES could position South Africa as a “leader” in the global hydrogen market. However, the technology is in an early stage and its commercial viability still has to be ascertained (Ayodele & Munda, 2019). Additionally, the question arises if green hydrogen should be exported before the exporting country has established a stable and clean energy supply (Noussan et al., 2021).

Affordable electricity

Affordability of electricity is a key component to industrial and economic growth in South Africa, as higher electricity prices negatively affect households, business and especially energy-intensive users (Goliger & McMillan, 2018; Khobai et al., 2017). Electricity prices have tripled from an average USD 0.027 before 2008 to USD 0.09 per kilowatt-hour (kWh) in 2019 and they are expected to further increase from 2020 onward (Businesstech, 2019; Edkins et al., 2010).

Interviewees pointed out that Eskom’s high debt and operational problems need to be addressed as they inhibit the utility from investing into new ventures and translates into rising electricity prices since tariffs do not reflect underlying generation costs, which is not seen as socially sustainable [p1, p4, p5, s1, s2, s7, s8, b2, b5, b7]. In an attempt to increase competition in the energy market and increase transparency and accountability [b3], the “unbundling” of Eskom into three business units, namely generation, transmission and distribution, was announced by

⁵ See Appendix A.3 for a full list of interviewees.

⁶ See Appendix B for an overview of relevant objectives, actors and contextual factors identified by the interviewees.

president Ramaphosa in 2019 (South African Government, 2019). However, there is reluctance towards the unbundling of Eskom as it might give too much power to the private sector and lead to greater concentration of ownership and higher prices for electricity users [s1].

Additionally, the diversification of the electricity sector, as mentioned in 3.1.1, is critical. Due to South Africa's high renewable energy potential and falling levelised costs of electricity for PV and wind, RES have become a cost-effective, low-emission alternative (GreenCape, 2020; Jain & Jain, 2017).

Electricity access

Following a nationwide electrification programme, the household electrification rate in South Africa is above 90 % since 2018 (Essex & de Groot, 2019). However, connecting the remaining, mostly remote or informal communities to the grid or utilising embedded generation remains a technological and political challenge that needs to be addressed [p2, p4, s3, s7, s8, b7]. This is partially due to perceived financial risks for Eskom and municipal distribution as costs for grid connection are expected to outweigh potential returns. Furthermore, being connected to the grid does not equal access to electricity as increasing prices (Affordable electricity section) lead to some people, especially poorer households, not being able to afford electricity [p2, s3].

The concept of self-generation has gained momentum in South Africa as companies and private households alike have an interest in procuring their own power to reduce dependence on Eskom [p1, p2, p4, s3, s6, b1–b3, b5, b6]. Microgrids and self-generation could address the issues of energy access and grid connectivity, especially in remote and underserved areas. The government only recently started to see and support self-generation as a possibility to decentralise the energy sector and alleviate pressure on the grid and the supply side (DMRE, 2020c). Despite growing interest, financing of embedded generation is still an issue. Many remote and underserved communities lack the resources and capacities to realize such projects. Simultaneously, private actors and companies might use embedded generation to defect from the grid and avoid rising electricity prices [s2, s3, b2].

Maintaining profitability of the coal sector

The profitability of coal for a set of influential actors and its contribution to the energy sector and related employment is a key factor for its dominance and the incentive to sustain its significance within the South African economy and energy sector [p1–p5, s1–s8, b1–b8]. Major coal related corporations and associated powerful interest groups are seen to influence political decisions in their favor. This is further reinforced by the narrative of coal as a major contributor to economic growth, industrialisation and as the provider of national employment throughout its value chain [p1–p5, s1–s8, b1–b8].

Revenue from coal

Coal-related revenues finance actors on different levels throughout its value chain and make vital contributions to the fiscal situation of administrative bodies through royalties and taxes, especially in coal regions [p1, p2, p4, s1, s3, s6–8, b1, b3, b4]. In the main coal mining province Mpumalanga, coal accounts for 25 % of GDP and 19 % of Gross Value Added (GVA) (Strambo et al., 2019).

South Africa exports about 30 % of its domestic coal production by volume, which makes coal one of the largest, albeit falling contributor to overall revenues in the mining sector, and an important asset to acquire foreign currencies. Export coal profits are highly dependent on global commodity markets and exchange rates and even large miners have seen falling EBITDA from coal in recent years. Future coal demand on the international markets is generally expected to decline. A decline in exports would lead to lower revenues for the coal sector and increase the risk of stranded assets (Chamber of Mines, 2018; IEEFA, 2019; Strambo et al., 2019; Yanguas-Parra, Hauenstein, & Oei, 2021).

Such developments motivate current restructuring efforts of local economic actors which have been focusing on coal [s7, s8, b4, b7] and recent activities of transnational coal mining companies, demerging the coal assets (e.g. Anglo) or selling their South African coal assets (e.g. South 32) (Burton, Lott, & Rennkamp, 2018; IEEFA, 2019). The assets are bought by South African companies, often unlisted (e.g. Seriti). In some cases, the viability of these transactions will rely on renegotiated Eskom coal supply agreements and strong exports, while civil society flags issues with the long-term sustainability to spun off assets and the ability to manage rehabilitation and social closure.

Exxaro, another coal major, has like Glencore indicated they will not invest in further coal and pivot into new sectors in the long-term. Moreover, with increasing uncertainty in the coal sector and the rising expenses for environmental clean-up costs, Anglo American decided to demerge with its South African thermal coal operations by creating Thungela Resources, which will from now on conduct the thermal coal operations and therefore carry the environmental liabilities (The Boatman Capital Research, 2021).

Rent-seeking and vested interests

Rent extraction from coal-related activities by actors with political and societal influence was mentioned to account for the sector's continued dominant position within the country [p1, s1, s2, s4, s6, b1].

Interviewees indicated the existence of strong links between stakeholders associated with the coal sector and political actors. The former include companies and official lobby groups representing coal sector interests, trade unions related to coal sector employment and individuals with private ties promoting financial and other vested interests [p1, p2, s1–s4, s6, s7, b1, b3–b5, b8]. Ties exist between the long-term ruling party, the African National Congress (ANC) political elites, coal miners, and users. This includes family ties between companies belonging to, for example, former ministers of Energy and the President, investment holding companies with stakes in the coal sector, including ANC-aligned investment companies and the ANC's Chancellor House, and “state capture” by corrupt interests of ANC politicians (Eberhard & Godinho, 2018). The long-standing “Tripartite Alliance” between the South African Communist Party (SACP), the Congress of South African Trade Unions (COSATU), and the ANC, exemplifies the institutionalisation of such connections. Actors connected to the mining and coal sectors have been holding various positions in one or more of the alliance's member parties whereby pro-coal union leaders have been playing important roles in political institutions (Ting, 2019). Such leadership constellations sometimes promote coal-favouring policies and regulations, among others motivated by vested interests [s1, s2, s4–6, b1].

Furthermore, socio-political ties of decision makers and connected underhand personal interests were mentioned as reasons for the past mismanagement and lock-in of coal within Eskom's portfolio for energy generation [s1, s6, b1, b8]. A new “elite” class has been seen using Black Economic Empowerment (BEE)-mechanisms, officially meant to contribute to the expansion of economic participation of historically disadvantaged groups in post-apartheid South Africa, to promote their own vested interests in the coal sector [s4, s6, b3]. This is done through the manipulation and abuse of procurement systems and tenders, originally intended to empower members of historically disadvantaged communities (Shava, 2016).

Employment and regional development from coal

The coal sector has been the pillar of South Africa's energy supply in the past decades, providing a local fossil fuel as the primary national source of energy and comparably well-paid employment for lower-skill levels. Coal has been key in the economy's development, not only in the mining sector, but also playing a part in broader industrialisation (Mathu & Chinomona, 2013). However, the standing of the coal sector as a contributor to the national job market was mentioned as likely to change in the future regarding expected long-term tendencies of an overall coal phase-out [p1, p4, s1, s3, b8]. To foster societal opposition

against a national coal phase-out, actors profiting from the sector, including unions, have been seen to promote partly inaccurate narratives about alleged socio-economic costs of this process, especially employment loss [p1, s1, s4, b2, b3, b7, b8]. On the other hand, unions were the progenitors of just transition in climate policy and actively seek to understand the risks and opportunities for workers and promote renewable energy that is state- or socially-owned. Overall, organised labour does not act or promote positions homogeneously, even within the same unions or federations. Without active implementation of a just transition, their concerns about job losses and 'being left behind', are not without merit [s1, s3, b5, b7].

Environmental and climate protection

According to IEA (2021), global GHG emissions need to be reduced from now on to achieve global net zero by 2050. South Africa is the world's 14th largest emitter of GHGs IEA (2020a). There is consensus about the urgent need for a low-carbon transition and a reduction in fossil fuel use and coal mining to mitigate negative environmental, socio-economic and associated harmful consequences for human health [p1-p5, s1-s8, b1-b8].

Climate change mitigation

With the current global movement to fight climate change, an increasing number of actors in South Africa also committed to taking mitigating actions [p4, s1, s2, s5, s7, b4]. The country had previously pledged to peak its GHG emissions by 2025, and plateau them for a decade before an absolute decline. In 2021, in its updated Nationally Determined Contribution, the 2030 target range was narrowed and lowered, and the peak was brought forward to 2025. The potential aim to reach net zero by 2050 was also included in its Low Emission Development Strategy (LED) (UNFCCC, 2015, 2020). However, a multitude of actors argue that climate change mitigation will lead to job losses. Particularly, coal-related actors and unions fear that more stringent environmental and climate legislation might generate disproportionate economic burdens on their businesses and customers. Thus, they call for sensible alignment, implementation and offsetting mechanisms [p1-p4, b3, b4, b5, b8]. Nonetheless, some powerful actors such as Sasol express intentions to take measures to reduce their emissions [b4-b7]. Sasol wants to reduce its GHG emissions by 10 % between 2017 and 2030 and plans to procure RES to power its operations (Sasol, 2020).

South Africa's National Climate Change Bill aims for the country to transition towards a lower-carbon economy and a climate-resilient society. This is also important to attract international companies, since most of them pay attention to their carbon footprint. Additionally, regulatory instruments like the carbon tax, pollution abatement requirements and the carbon budgets system are supposed to cut GHG emissions and increase pressure on carbon emitters but are currently regarded as ineffective and non-binding [p3, p4, s1, b4, b5]. The carbon tax in its initial phase (2019–2022), only applies to direct emissions and sets total tax-free allowances as high as 95 % (IEA, 2020b). As a result, actors from the government in support of climate change mitigation, NGOs and researchers are calling for more ambitious targets within legislation that address RES procurement and climate change mitigation (e.g. IRP 2019 and second phase (2023–2030) of the carbon tax) [p1, p4, p5, s1, s3, s5-s8, b4-b6, b8].

Actors from the coal sector are seen to stress alleged possibilities of "clean coal" and carbon capture and storage (CCS) technologies to mitigate the sector's GHG emissions [p2, s1, b3, b5]. However, these technologies are still not economically viable and are seen as a strategy from the coal sector to stall transition efforts (Viebahn et al., 2015).

Procurement of renewables

To reduce the country's carbon footprint, a higher penetration of RES and a regulatory environment favouring their uptake is needed. As

Eskom's financial situation prevents internal investments into RES expansions, IPPs and the REIPPPP play an important role in addressing the current capacity gap and a reduction in GHG emissions [p1-p5, s1-s3, s6-s8, b1-b8].

Municipalities and private households are expected to play an increasingly important role in embedded generation. While both can build generation capacity, municipalities can build business models structured around the procurement of energy from embedded generators and play a facilitating role by providing electricity services and operating storage facilities (Giljova et al., 2017). However, there are a couple of challenges surrounding different interests between South African municipalities and households with rooftop PV installed. These are mainly related to the registration of installed capacity and to the compensation for electricity fed into the grid by households (Kritzing et al., 2019).

Despite recent changes in legislation to allow for an easier procurement of RES for private investors and municipalities, the procurement process is still seen as "too prescriptive" and "disincentivising" although recent changes in legislation enable private customers and municipalities a less prescriptive procurement process (DMRE, 2020c). In a context in which the build-up of new capacities is urgently needed, this hurdle points out the lack of policy certainty in the energy sector [p2, p3, p5, s7, b2-b6, b8]. Moreover, criteria for investors should be aligned with tariffs and consistent with regulatory frameworks to allow the entry of new investors [p2, b3, b5-b7].

Another way to increase investments in large-scale RES is the idea of international concessionary finance based on accelerated retirement of coal-fired power plants, which is expected to simultaneously tackle Eskom's debt issues and reduce the carbon footprint with the support of international funders [s1, s2, s7, s8]. A promising development is an international partnership agreement with France, Germany, the United Kingdom, and the United States that South Africa signed during the 26th United Nations Climate Change Conference (COP 26) in 2021. The 'developed' countries pledged \$8.5 billion over the next 3–5 years to support a just transition towards a low carbon economy and climate-resilient society in South Africa in the form of grants, concessional loans, and investment and risk-sharing instruments, including mobilizing private sector funding for South Africa's accelerated transition from coal to renewable energy (UNFCCC COP 26, 2021).

Reducing negative effects from coal

The continuous use of coal and fossil fuels has led to negative effects on health due to direct or indirect exposure, such as cancer, respiratory, and cardiovascular problems, and to negative environmental and socio-economic effects such as polluted air, soil and water (Olufemi et al., 2018). Coal mining further increases the risk of water scarcity, a problem expected to worsen in the years to come [p1, p2, s1-s3, b7].

Civil society, despite its limited means, plays an important role in challenging the status quo. Strong activism from communities and civil society organisations, backed by legal action has challenged pollution issues stemming from mining, coal-fired power stations, and refineries [p1, s2, b6]. Campaigns by multiple organisations (e.g. Earthlife Africa, groundWork) successfully challenged new coal plants (e.g. Thabametsi) on the grounds of their potential harm to the environment and human health. Also, new coal mines were stopped on the grounds of their expected detrimental effects on the environment, climate and society (e.g. Mabola Protected Environment in Mpumalanga Province) (Humby, 2018; Reuters, 2019).

Reducing inequality and employment insecurity

The triple challenges of poverty, inequality and unemployment are relevant when assessing the implications of a low-carbon transition in South Africa [p1-p4, s1, s6-s8, b1-b8]. The idea of a just transition has been embedded in climate policy since 2011, as well as in the country's NDCs. It ought to function as a framework to prevent and balance out

the loss of employment connected to the coal sector (as discussed in [Employment and regional development from coal](#) section), create local ownership and include all relevant actors [p1, p2, p4, p5, s1–s4, s6–s8, b1–b8].

Creating employment alternatives

A low-carbon transition entails a reduction in employment in the coal value chain, although the timing of closures and the age, skills, and health of workers will be important factors. Considering the already high national unemployment, it is vital to diversify economies and create employment opportunities in affected regions, especially in the Mpumalanga province, where 80 % of coal extraction is concentrated ([Spencer et al., 2018](#); [TIPS, 2020](#)). An unplanned, opaque and hasty exit from coal might lead to severe negative socio-economic impacts in affected regions and might therefore spark social unrest and increased opposition to a low-carbon transition [s2, s3, b5]. As such, the formation of local value chains connected to RES technologies is important to create new local employment opportunities. While general production costs could not compete internationally under current circumstances, some aspects of the production value chain for key components needed for RES, such as cable ties or module assembly, could be localised in South Africa [p5, s1, s4, b1, b2, b4]. Furthermore, the retrofitting of old coal-fired power plants to natural gas or repurposing the areas for RES is an option to create employment in affected areas [b5, b7], and is being explored by Eskom's just energy transition project office.

While there is potential for employment in RES, lower salaries and benefits as well as spatial differences between new employment in RES and current employment in coal-mining areas is a problem. This is especially relevant since the increased capital-intensity of the coal mining sector created a downward trend of employment in coal mining. This trend is expected to carry on with the automatization of the sector. Additionally, reskilling is an issue as coal-related jobs are often low-skilled, making it challenging to find fitting jobs with equal pay [p1, p2, s3], partly because of very low wages across the broader economy ([Burton, Caetano, & McCall, 2018](#)).

These factors play into the hands of pro-coal actors as they call for a slow transition process to cushion the effects of unemployment caused by a declining coal sector and to ensure adequate considerations of socio-economic aspects, allowing the transition to be “just”. However, regional policy-makers already recognise the risks related to coal extraction and use, and the need for a just transition [s1, s3, b5, b7].

Ownership

The increase of RES through IPPs is generally perceived as beneficial for energy security [p1, p2, p4, s1, s6–s8, b3, b4, b6]. Since these are predominantly owned by foreign companies and private investors, some actors – especially unions – see the trend of privatization of the sector as problematic [s2, s3, s7, b1]. Through public ownership or ownership models, such as community- or socially owned capacities, the benefits of RES could go beyond the economic and environmental impacts and include socio-economic aspects of a just transition [p1, p2, p4, s1–s3, s7, b6, b7]. While increasing the number of community owned energy systems is deemed beneficial, little to no communities have the financial capabilities to develop and use them [s2, s3, b1].

Though BEE-regulations are seen by certain actors as being used to promote vested interests within the coal sector and to hamper the expansion of emerging sectors crucial for a coal phase-out [s4, s6, b4, b6], BEE is regarded as an essential social justice tool a just transition would have to embrace [s6, b1, b2, b4, b6].

Stakeholder engagement

In line with the concept of a just transition the focus is increasingly on the involvement of all actors affected by the transition. This is especially important to prevent a split between politics, business and the people affected by the transition. Therefore, dialogue is initiated on a

local, municipal, provincial and governmental level, internationally, and by major national companies like Sasol and Eskom setting up working groups [p1, p2, p4, p5, s1–s3, s6, s8, b1, b2, b4, b5, b7]. The newly created Presidential Coordinating Commission on Climate Change (PCCCC) is regarded as a first step to support the just transition to go about in a coordinated, comprehensive and strategic manner through high-level government leadership ([DEFF, 2020](#)).

Discussion

The analysis of the interviews shows that the South African energy sector is currently in an intricate state of high dependency on coal backed by powerful actors. This dependency mainly originates in the energy system being highly reliant on coal, the sector providing a considerable amount of jobs, especially in coal regions like the Mpumalanga province, as well as its importance as a source of foreign currency reserves ([Chamber of Mines, 2018](#); [IEEFA, 2019](#); [Strambo et al., 2019](#)). Nonetheless, the coal sector is increasingly economically, environmentally and socially unviable. Exacerbated by problems such as the inability to meet national energy demand and the high debt of the main electricity provider Eskom, efforts to transition towards a more diversified, low-carbon energy sector have manifested over the past years according to interviewees. Other literature also depicts, that with projected increases in national energy demand and power capacity gaps, the diversification of the energy sector to ensure South Africa's security of supply has increasingly shifted in to the focus of influential actors ([DMRE, 2019](#); [Eskom, 2020b](#); [Ndlovu & Inglesi-Lotz, 2019](#)).

However, the apparent consensus on the need for climate change mitigation and procurement of RES throughout the interviews must be viewed critically. Interviewees from companies, government and business organisations closely related to the coal sector express their interest in efforts to decarbonize the energy sector and highlight the need for a just energy transition. Yet, it remains questionable whether some of the statements made are genuine. While some actors related to the coal sector do show efforts to partake in a low-carbon transition, other actors from NGOs and research institutions question their effectiveness and sincerity.

Still, the extraction of rents is seen to create incentives to maintain the current power structures and dependency on coal, resulting in resistance towards new government regulations, policies and the low-carbon transition. This coincides with existing literature describing the influence of South Africa's “minerals-energy complex” through which mining associated economic actors exercise political influence to uphold profit-generating structures in connected sectors ([Baker et al., 2014](#); [Baker et al., 2015](#); [Fine & Rustonjee, 1996](#); [Trollip, 2020](#)). Thus, interviewees expect the coal sector to continue constituting an important source of national and community-level income throughout the near future.

South Africa in comparison to other coal dependent countries

When comparing South Africa to other countries, case studies that analysed the political economy of coal have found relevant similarities and differences. These factors could subsequently help to better understand the current challenges but also help to derive interventions while acknowledging the specific contextual factors and peculiarities of the respective countries. While the country case studies may differ regarding some of the contextual factors, involved actors, and the structure of the energy and coal sector, there is a considerable number of similar objectives that shape the political economy of energy and coal, highlighted throughout studies.

The importance of financial, political and socio-economic incentives to support the extraction and use of coal can be found, similar to this study, in case studies on Colombia, Indonesia, India, the Philippines, and Vietnam ([Puerto-Chaves & Corral-Montoya, 2022](#); [Dorband et al., 2020](#); [Montrone et al., 2021](#); [Ordóñez et al., 2021](#); [Manych & Jakob,](#)

2021). As coal plays a relevant role in all of the countries' energy and mining sectors, maintaining revenue from coal as well as personal interests from powerful economic and political players to make profits were identified as key objectives in all of the studies. Profits from exports are especially important to South Africa, Indonesia and Colombia. Profitable conditions are often created and maintained through favourable policies, market conditions and opposition to RES. Furthermore, the objectives of energy security, energy access, and affordability are recurring in all of the studies. Often coal is viewed as an important contributor towards these objectives. However, RES is increasingly regarded as a low-cost, low carbon alternative. Lastly, the need for climate change mitigation is considered an important objective in all studies. This objective includes the mitigation of negative effects from coal mining and use on civil society and also the negative global effects of climate change. This objective stands in contrast to the objective of maintaining and increasing revenue and dependence on coal and leads to vivid discussion and conflicts between powerful actors connected to coal and the different societal, political, and economic actors in favor of a low-carbon transition in the respective countries.

Interesting similarities and differences can also be found when looking at contextual factors and related actors in the country cases. The studies by [Ordóñez et al. \(2021\)](#), [Dorband et al. \(2020\)](#), and [Montrone et al. \(2021\)](#) on Indonesia, Vietnam and India show that – similarly to South Africa – coal plays a dominant role as the main fuel in energy supply and for Indonesia also as an export good. The Indonesian and Vietnamese governments regard domestic energy resources including coal as an accessible source of national income needed for further advancement of economic and structural development.

Structural similarities of the countries' electricity sectors are present as well as the electricity sectors are under state control, mainly operated by state-owned utilities. Indonesia, Vietnam, and India plan to build more coal plants to stabilize their power production and develop new infrastructure. State-owned utilities are described as tools of powerful actors to maintain the prevalence of coal. This appears to be in line with the current situation of Eskom in South Africa. Thus, the unbundling of Eskom could be seen as an opportunity to allow for a more competitive energy market. However, interviewees from South Africa, while supporting a more open approach, call for sensible privatization and stress the importance of social aspects to be considered when restructuring the energy sector. In South Africa and India, regional reliance on coal for development, jobs, and fiscal revenues adds another layer of complexity to the discourse of a low-carbon transition.

Policy recommendations

While in some interviews, as well as the report of [GreenCape \(2020\)](#), first governmental steps to facilitate a competitive and investor-friendly regulatory environment for RES were mentioned, there still exist critical issues related to policy and regulatory uncertainty. In accordance with findings of [Caprotti et al. \(2020\)](#), interviewees described the existing legislative body and state interventions as inconsistent and implementation of laws and regulations, through securely-funded and well-managed programs, as essential. To back the uptake of RES and diversification of the energy sector, a more coordinated political effort to allow the implementation of large-scale, small-scale and embedded generation through uncomplicated bureaucratic processes and financial incentives is seen to be needed.

Furthermore, to meet South Africa's nationally determined contribution targets, interviewees postulated the need for effective policies to address GHG emissions. Fiscal policy tools like the carbon tax present promising first steps according to interviewees, but ought to be part of an effective overarching national strategy for GHG reduction. The Climate Change Bill, currently before Parliament, offers this through, for example, setting Sectoral Emission Targets. This should include

reasonable mechanisms to not disproportionately penalise affected actors, such as businesses, but nudge them towards a low-carbon transition.

Meanwhile, projections of electricity generation cost reduction through RES and the economic unviability of the coal sector in the future already underpin forthcoming increases in RES penetration, especially of wind and PV ([McCall et al., 2019](#); [Roff et al., 2020](#)). Existing modelling approaches by [Oyewo et al. \(2019\)](#), [Hanto et al. \(2021\)](#), [Arndt et al. \(2019\)](#) and [Wright & Calitz \(2020a\)](#), thereby project the absence of new coal generation capacity installation in least-cost scenarios that contribute to meeting the 2 °C global temperature target.

To ensure support for a transition from a majority of societal stakeholders, including trade unions and actors in regions that have been relying on coal sector revenues, conscientious planning for finding alternatives to coal-related employment is crucial. Financial opportunities like the new partnership formed at COP 26 might help South Africa in reaching its NDC targets but the consequences for affected communities and workers must be addressed to create a decarbonization model for other developing countries ([Winkler et al., 2020](#)). Therefore, local value should be increased through apt ownership schemes and large-scale utility IPP projects ought to increase their focus on social impacts.

However, the topic of unemployment cannot just be approached from an energy perspective but permeates all levels of politics, business and society. Especially, due to South Africa's high unemployment rate of over 40 % and the likelihood of employees in coal related sectors not finding alternatives in the energy sector. It is essential that interventions target the challenge on municipal, provincial and national levels ([World Bank, 2019](#); [Wright & Calitz, 2020b](#)). While the energy transition should focus on affected regions it is also important to aim for a just transition that looks at the national circumstances around poverty, unemployment, and inequality in South Africa as a whole.

Conclusion

For this research, expert interviews with societal, political and business actors associated with the energy and mining sectors in South Africa were analysed in accordance with the political economy framework by [Jakob et al. \(2020\)](#). Four main objectives influencing the national energy sector were identified: “Energy availability”, “Maintaining profitability of the coal sector”, “Environmental and climate protection” and “Reducing inequalities and employment insecurity”.

The high endowment with and dependence on coal, as well as pressing social issues, which have been intensified by the Covid-19 pandemic, such as severe social inequality and high national unemployment rates lead to a complex and multi-layered political and social situation. Climate change mitigation goals and solutions cannot exclusively be considered in the context of low-carbon and energy efficiency. Rather, they are tied to broader socio-economic implications. Therefore, they need to be embedded into a just transition framework for South Africa.

Nonetheless, the transition is slowly progressing given the pressing need for climate change mitigation action and the context of quickly sinking RES installation costs, currently to lower levels than those for coal power generation technologies. But it remains to be seen how quickly coal will be phased out. Further analysis of the complex interplay between different actors associated with the coal and energy sectors, respective objectives and surrounding contextual factors, is needed to contest the status quo. A more comprehensive and detailed understanding of the political economy of coal in South Africa would help to effectively establish a transparent regulatory environment and to advance a national vision of a socio-economically “just” low-carbon transition. Additionally, in-depth country cross-comparisons might help to reveal contextual factors and structural similarities to create transnational strategies and policy guidelines to support a low-carbon just transition.

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CRediT authorship contribution statement

Conceptualization, J.H., L.K., A.S., J.B. and P.-Y. O.; methodology, J.H., L.K., A.S.; data curation, J.H., L.K., A.S.; writing - original draft preparation, J.H., L.K., A.S., J.B. and P.-Y. O.; writing - review and editing, J.H., L.K., A.S., J.B. and P.-Y. O.; visualization, J.H.; supervision, P.-Y. O.

Appendix A. Methodology

A.1. The political economy framework

The theoretical framework assumes that energy and climate policies are the results of a complex interplay between actors with different objectives influenced by contextual factors (see Fig. 3).

Therefore, it consists of three main elements. The key actors in politics, the energy and coal sector (e.g. the president, parliament, ministries, utilities, owners of coal mines, civil society, NGOs, etc.). Second, the main objectives of these actors (e.g. public infrastructure provision, energy security, energy access, collecting public revenues, alleviation of poverty, employment, profits, votes, personal enrichment, climate change mitigation etc.). Third, the context in which these actors operate (e.g. economic conditions, historical context, socio-economic situation, public attitudes, etc.)

Objectives are assumed to be represented in policy outcomes according to the influence of each actor on the policy formulation processes. Powerful actors therefore have a higher chance of seeing their respective objectives being implemented. While political actors can thereby directly influence these processes, societal actors mostly obtain outside positions regarding policy formulation and therefore often influence it through indirect action (e.g. lobbying, demonstrations, workers strikes) (Jakob et al., 2020).

A.2. Questionnaire

Introduction

1.1 Objectives and priorities

1. Could you please shortly introduce yourself and elaborate briefly on the topics/ subjects/[policies] you work/worked on and the main objectives of your work related to the South African energy sector and how these objectives are pursued?

[optional policymakers] What was your role in drafting/supporting/opposing.
[policy/decision/objective]? What other policies are/did you work on?

2. Which other actors from the energy sector are and/or have you been involved with or collaborated with in the past?
[optional] What actors have opposed/been counteractive to the objectives you pursue?
3. From the perspective of (the) organization(s) you are (or) have been working with, what are the three most important goals/challenges for the development of the energy sector in South Africa? And what are the three most important challenges for Eskom?

1.2 Policy content/context

1. From your perspective, what are relevant existing policies or government decisions to implement these energy goals?
[optional] How does the [named policy] relate to other important energy policies, such as IRP, NDP, NDCs, REs4P, NCCRWP, Carbon tax, climate change bill, national energy act ...?
2. What are the most important reforms within the [named policy] policy framework?
3. How do you evaluate the scale of representation of your / your institution's goals/ interests in these policies? Why?
4. Are there other organisations influencing this policy/reform? How? Which ones?

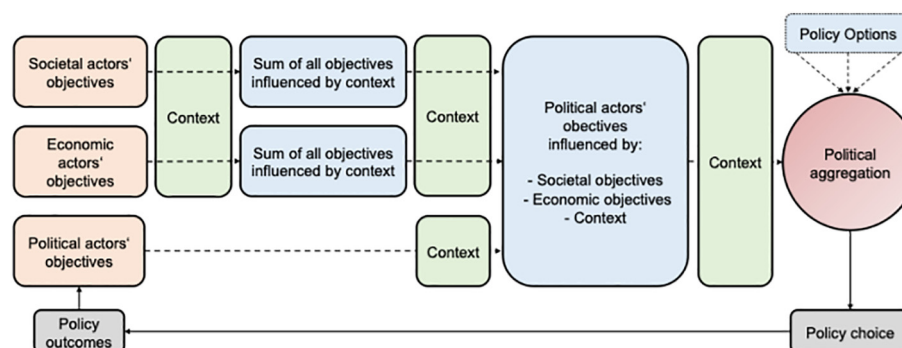


Fig. 3. Simplified representation of the framework (Own illustration based on Jakob et al. (2020)).

5. What are relevant currently planned/newly implemented policies (or government decisions) for the achievement of these energy goals? (e.g. energy security (load-shedding), reduce fossil fuels, increase share of renewables)

1.3 Policy formulation/actors

1. Which departments/actors were/ have been involved in past and current policy formulations? [for policymakers] Which energy policies or decisions were you or your ministry/department/organization involved in?
2. What have been the respective goals/ interests of the involved actors?
3. Which actors may not have been involved officially/directly in policy formulation processes, but have been influencing energy and coal sector decisions according to respective own interests?
4. How do you evaluate the situation concerning the past and prevailing role of coal mining and usage in South Africa? What are subsequent problems or rather opportunities?
[optional]: ...especially, from the perspective of [relate to the specific work/focus by the interviewee]?
[optional]: How do you evaluate the situation given challenges such as low prices, shrinking global demand and high emissions?
5. What are current actors and policy-instruments that define/challenge the respective role of coal?
[optional]: What role does Eskom play?
6. “The IRP 2019 by the Department of Energy plans to reduce installed coal capacities (share of Total installed capacity from 71% to 43%) while increasing renewable energy capacities (share of Total installed capacity from 17% to 46%) until 2030”
How do you assess the targets set by the IRp2019? Are they feasible? Why/why not?
7. Who was involved in the formulation of the IRp2019 and what were their objectives?

1.4 Contextual issues: climate policy, conflicting objectives and perspectives

1. Do you see a discrepancy/challenge emerging from the current focus/ reliance on coal and the GHG emission reduction targets?
2. Does climate change play a role in decisions made by your organization? → Do you perceive climate change as an opportunity and/or challenge for development in South Africa?
3. Could you elaborate briefly on societal and economic roles coal plays in South Africa and on challenges it has been and will be facing in the future?
4. Which role does civil society play and how was and will it be affected by the developments in the energy and coal sector?
[optional if not mentioned] Could you briefly elaborate on the just transition and climate justice discourse in South Africa and its importance for the energy sector development from your point of view?
5. How do you imagine the future of the energy system in South Africa?
[optional] What in your eyes are short- and medium-term policies that could be implemented to achieve such an energy system
6. How do you evaluate the usage of following power generation technologies in South Africa in the future: natural gas, nuclear power, hydro power and coal?
7. How do you think the COVID-19 Pandemic will impact the developments in the South African energy sector?

Follow Up Questions for the specific actor...

Is there anything else you would like to share on this topic?

Can you recommend further contacts we could talk to?

A.3. List of interviewees

Table 1

List of interviewees.

Type of actor	Name of institution	Interview date
Political		
p1	Department of Environment, Forestry and Fisheries (DEFF)	04.09.2020
p2	Department of Science and Innovation (DSI)	01.10.2020
p3	National Treasury (NT)	18.11.2020
p4	Department of Environment, Forestry and Fisheries (DEFF)	4.12.2020
p5	National Planning Commission (NPC)	21.12.2020
Societal		
s1	Friedrich-Ebert Stiftung	24.08.2020
s2	90by30	25.08.2020
s3	The National Labour & Economic Development Institute (NALEDI)	28.08.2020
s4	Alternative Information & Development Centre (AIDC)	31.08.2020
s5	Think Tank international	15.09.2020
s6	Think Tank national	25.09.2020
s7	The African Climate Foundation (ACF)	16.10.2020
s8	International NGO	18.11.2020
Business		
b1	Navitas Holding	14.09.2020
b2	South African Photovoltaic industry Association (SAPVIA)	22.09.2020
b3	Minerals Council South Africa	19.10.2020
b4	SASOL	5.11.2020
b5	SASOL	6.11.2020
b6	Inspired Evolution Investment Management	20.11.2020
b7	Eskom	02.12.2020
b8	Business Unity South Africa (BUSA)	8.12.2020

A.4. Share of interviewees per actor category

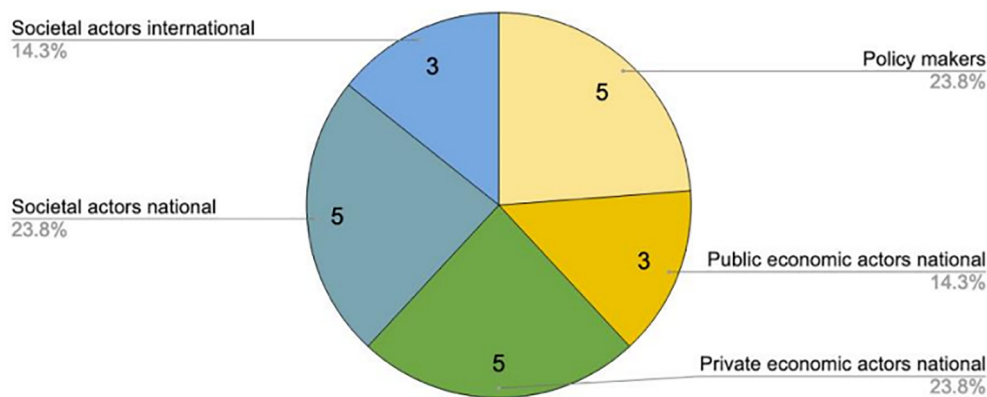


Fig. 4. Share of interviewees per actor category (own illustration).

A.5. Coding process

Fig. 5 gives a visual representation of the iterative coding process based on Mayring (2000) and Linneberg and Korsgaard (2019).

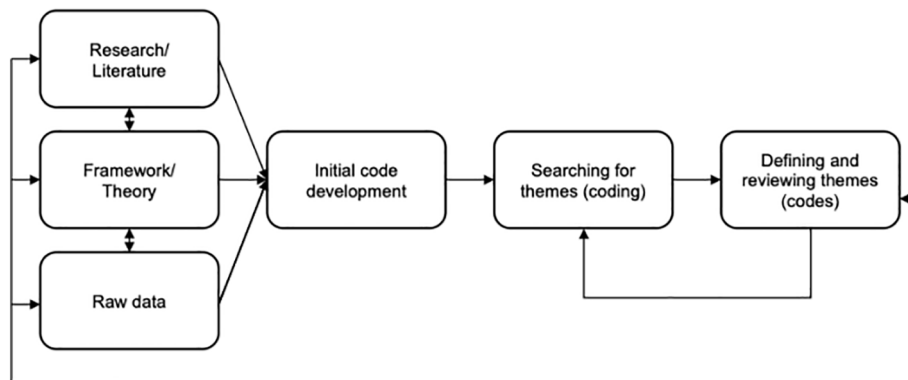


Fig. 5. Coding process (own illustration based on Mayring (2000) and Linneberg and Korsgaard (2019)).

Appendix B. Relevant objectives and actors identified by the interviewees

Table 2

Overview of relevant objectives and actors identified by the interviewees (own illustration based on Jakob et al. (2020)).

Objectives	Actors
Energy availability - Security of supply - Affordable electricity - Electricity access	Political - President - Political parties (ANC, DA) - National government - Government departments - Municipalities - Provincial government - Local government
Maintaining profitability of the coal sector - Revenue from coal - Rent-seeking and vested interests - Employment and regional development	
Environmental and climate protection - Climate change mitigation - Procurement of renewables (RES) - Reducing negative effects from coal	Societal (incl. business) - Civil society - National/international NGOs - Think tanks - Universities - Trade unions - Coal industry - Mining companies - SOEs (Eskom, Sasol) - Renewable energy industry
Reducing inequality and employment insecurity - Creating employment alternatives - Ownership - Stakeholder engagement	

(continued on next page)

Table 2 (continued)

Objectives	Actors
	- Representatives of businesses - Banks - International investors - Independent Power Producers (IPPs)
Contextual factors	
Techno-economic	
Electricity supply crisis with an immediate capacity gap	
Old coal power plant fleet with low Energy Availability Factor (EAF)	
Unfavourable market environment for new coal investments	
High RE potential and decreasing costs	
High share of international IPPs in RES sector	
Electricity public utility Eskom (accounting for over 90 % of ZA power generation) in operational and financial crisis	
Institutional	
Strong vested interests by multiple groups related to the minerals-energy complex	
Energy and mining integrated in the same government department	
Political disputes about ownership in power sector persist and limit uptake of RE via mainly privately owned, foreign IPPs	
Strong societal influence by workers unions affiliated with the coal sector	
No overarching plan that includes all aspects of government, business and society	
Discursive	
Negative health and environmental effects of coal mining	
High employment numbers related to coal cause for opposition of renewables to maintain status quo	
High unemployment and societal inequality	
Civil society challenges new coal and nuclear projects in courts	
Uncertainty among investors due to delays in policy implementation	
Negative socio-economic impact of the Covid-19 pandemic	

Table 2 (continued)

Objectives	Actors
Dependence on coal-exports makes South Africa vulnerable to fluctuations in the global coal market	

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