TRADE & INDUSTRIAL POLICY STRATEGIES

Policy Brief

for the Presidential Climate Commission

The Just Transition in Coal

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PRESIDENTIAL
CLIMATE COMMISSION
TOWARDS A JUST TRANSITION

This policy brief has been commissioned by South Africa's Presidential Climate Commission (PCC) as an input to the process of planning for a just transition. Specifically, this policy brief forms part of a series of briefs that will provide an evidence-based foundation for a new "Framework for a Just Transition"—a practical guide to ensure that South Africa's transition to a low-emissions economy is well-managed, just, and equitable. The Framework will also build on existing just transition debates in the country, the vision set out by the National Planning Commission, and a new series of thematic and social-partner consultations that will gather a diverse range of views on what it means to achieve a just transition.

The views expressed in this policy brief represent those of its authors, and do not necessarily reflect the views of the PCC or its Commissioners.

About the Presidential Climate Commission:

The PCC is a multi-stakeholder body established by the President of the Republic of South Africa to advise on the country's climate change response and pathways to a low-carbon climate-resilient economy and society. In building this society, we need to ensure decent work for all, social inclusion, and the eradication of poverty. We also need to protect those most vulnerable to climate change, including women, children, people with disabilities, the poor and the unemployed, and protect workers' jobs and livelihoods. The PCC facilitates dialogue between social partners on these issues—and in particular, defining the type of society we want to achieve, and detailed pathways for how to get there.

1 Problem statement

South Africa has extraordinarily high levels of emissions from coal by global standards. The main reason is that it relies far more than most countries on coal for electricity and some petrochemicals. Yet it now costs more to generate electricity from coal than from renewable sources. In these circumstances, a shift to new energy sources is inevitable. The transition will likely take place over decades, however, although it will accelerate from 2025.

The transition away from coal offers new opportunities as well as costs. Above all, it should make electricity cheaper and more reliable, and prevent trading partners from imposing carbon taxes on South African exports. These benefits will ultimately boost overall economic growth and job creation, with broad benefits for virtually all citizens. In contrast, the costs of the transition to new energy sources will fall mostly on stakeholders in the coal value chain itself. Over time, companies will have to write off coal reserves and capital investments; mining jobs will disappear; and the four districts in Mpumalanga that rely on coal will have to diversify into new economic activities.

The various groups in the coal value chain differ in their ability to adjust to the energy transition. Their scope for action depends above all on their access to financial capital, their organisational capacity, and their individual qualifications. International mining conglomerates and financial institutions have already begun to divest from coal. They have mostly sold existing investments to emerging local companies, and pledged to refrain from new projects. Eskom, Sasol and the electricity-intensive metals refineries can shift to cleaner and cheaper energy sources. But workers, small businesses and the coal-dependent districts of Mpumalanga will find it more difficult to write off obsolete technologies in order to take advantage of new opportunities.

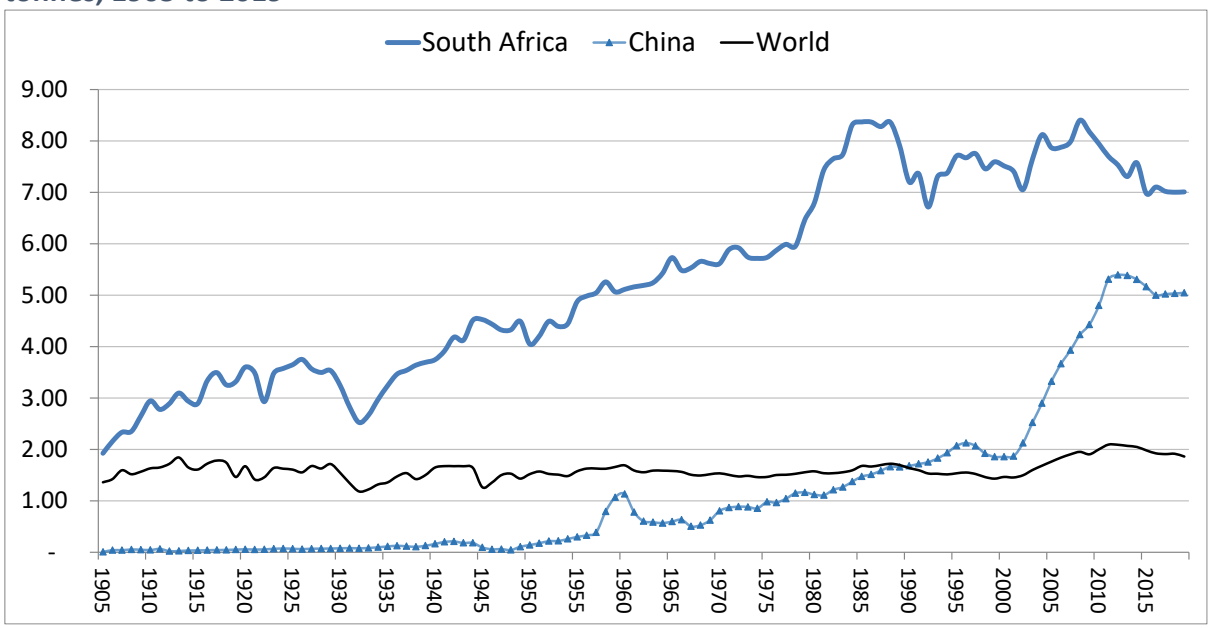
In these circumstances, unless society supports relatively disadvantaged groups in the coal value chain, the energy transition risks deepening inequalities, suffering and conflict. To assist in identifying appropriate responses, this policy brief describes the nature of the transition and the associated costs and benefits; the nature of existing governance systems; and key debates arising around the way forward.

The first section draws on a TIPS working paper (Makgetla and Patel 2021) to outline the factors behind the decline in coal. The second section reviews factors that make the transition harder. To that end, it analyses the benefits, costs and risks of the transition for different stakeholders inside and outside the coal value chain. An exploration of the weaknesses in the governance structures for the value chain follows. The fourth part looks at possible timelines for phasing out coal based on current trends and policies. The fifth section outlines the main decisions needed to achieve a just transition out of dependence on coal, and the final part suggests some conclusions.

2 Greenhouse gas emissions and the coal value chain

In 2019, South Africa emitted around seven times as much carbon dioxide (CO_2) from coal per person as the international average. In contrast, its emissions from other fossil fuels per person were slightly lower than the norm in the rest of the world. Nonetheless, emissions from coal were so large that South Africa emitted somewhat more greenhouse gases per person than China, and almost twice as much as other upper-middle-income countries. As Graph 1 shows, from 2013 South African emissions per person declined slightly as the economy became less electricity intensive and the share of coal in power generation dropped.

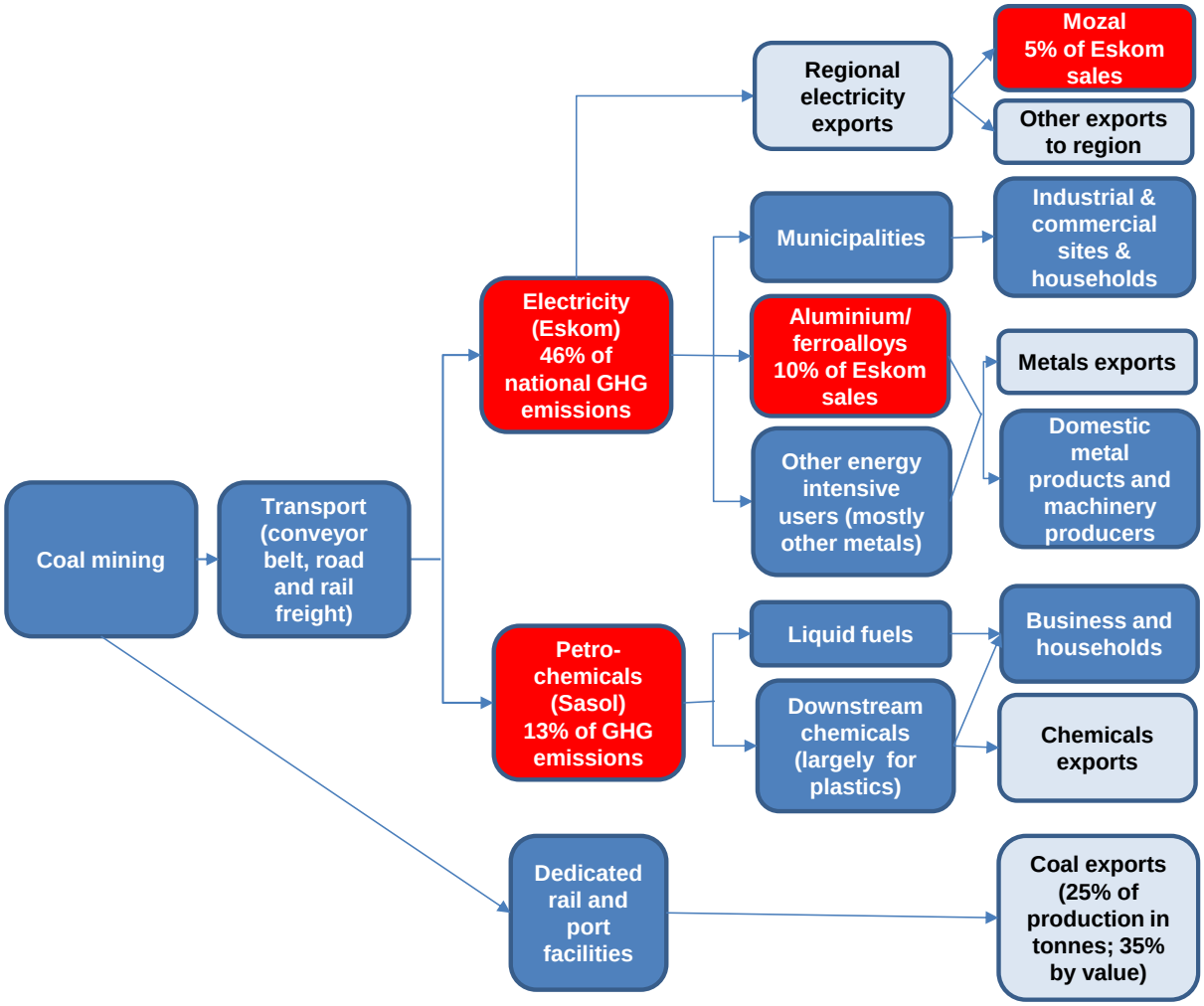
Graph 1. Coal-based CO_2 emissions per person in South Africa, China and the world in tonnes, 1905 to 2019



Source: Oxford University. Our World In Data. Interactive dataset. Downloaded from https://ourworldindata.org/fossil-fuels in May 2021.

The bulk of South African emissions arise when coal is beneficiated into electricity and petrochemicals. As **Error! Not a valid bookmark self-reference.** illustrates, Eskom accounts for around 45% of national carbon emissions, and Sasol for almost 15%. In addition, coal-fuelled electricity is the largest single input for the ferroalloys and aluminium refineries, including Mozal in Mozambique. Together, these plants use around 15% of Eskom's output. All of the alumina used in Southern Africa is imported from Australia; South Africa's main addition is coal-fuelled electricity.

Figure 1. The coal value chain and greenhouse gas emissions



Source: Adapted from Makgetla and Patel 2021:14 ff.

As the climate crisis deepened in the 2010s, South Africa's unusually large greenhouse gas emissions increasingly weighed on its economic growth. The costs emerged in five main ways: the economic burdens from climate change; falling domestic and international demand for coal; spiralling tariffs and unreliability in the national electricity grid; growing threats to exports; and the lack of private funding to replace Eskom's aging plants.

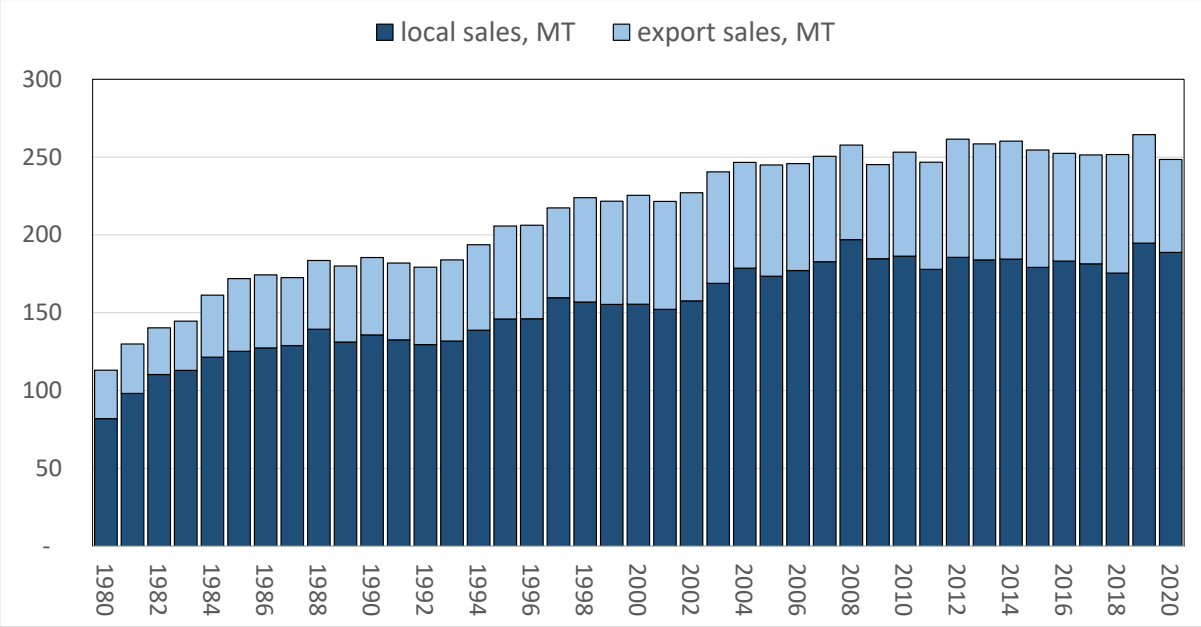
The economic impacts of the climate crisis in Southern Africa began to emerge in the late 2010s. Some regions of South Africa experienced more intense and prolonged droughts or periodic flooding, or both. These disasters increasingly affected agriculture, tourism and infrastructure. Amongst others, growth in value added in agriculture became almost twice as volatile from 2013 to 2019 as it was in the previous 15 years. Moreover, from 2013 to 2019 the sector's contribution to the GDP shrank overall, although 2020 reversed the trend. (Calculated from StatsSA 2021a) Moreover, the national government doubled the share of its budget allocated for disaster relief to provinces and municipalities in the 2010s compared to the 2000s. The funds went mostly for drought, floods and wildfires.[1]

[1] Calculated from National Treasury. Estimates of National Expenditure. Budget for National Disaster Management Centre in Cooperative Governance and Traditional Affairs (previously Department of Provincial and Local Government). Relevant years.

Second, demand for coal dropped both in South Africa and internationally through the 2010s. The trend was driven in large part by a global shift to new electricity technologies.

In South Africa, coal production declined slowly from 2008 to 2020, after climbing an average of 3% a year from 1980 to 2008 (Graph 2). In constant rand, revenues from coal sales dropped after 2008, reversing average annual growth at 4,4% from 1980 to 2008. From 2011 to 2020, coal mining shrank from 2,3% of the GDP to 1,9%. In 2019 and 2020, domestic sales rose because Eskom increased its stockpiles. That delayed the long-run decline, but did not reverse it.

Graph 2. Coal sales in millions of tonnes, 1980 to 2020



Source: Calculated from DMR. Mineral Statistics. Accessed at Quantec. EasyData. Interactive dataset. Accessed at www.quantec.co.za in May 2021.

Coal exports declined more steeply than domestic sales. Exports fell to a quarter of the coal mines' production in 2019 from a third a decade earlier. As a result, their share in coal mining revenues dropped from half to a third. In constant rand,[2] the value of coal exports plummeted more than 20% from 2012 to 2020. Coal fell from 7% of South African exports in 2012 to 5% in 2019. (Calculated from Quantec 2021; see Makgetla and Patel 2021:10)

Third, coal-fuelled electricity became increasingly uncompetitive, which contributed to rising costs and interruptions on the national grid. Various indicators demonstrated the growing price advantage of renewables for electricity generation. In 2011, renewable electricity cost ten times the Eskom price; in 2016, it cost almost 20% less (see IPPO 2020:3-4) According to Eskom, from 2015 to 2021, solar and storage costs fell another 60%, and offshore wind fell 30%. It expected generation costs to fall substantially through 2030. (Eskom 2021:9) In contrast Eskom's tariff climbed 20% in constant rand from 2015 to 2021, and was expected to rise over 30% more in 2021 and 2022. In response, from the mid-2010s companies and households accelerated investment in their own renewable generation. In 2020, the lowest cost combination of technologies for electricity generation in South Africa would cut coal-fuelled electricity to between two thirds and half of national generation by 2030, and to

[2] Deflated with CPI.

between a tenth and zero by 2050. (Wright and Calitz 2020:IV; NBI 2021:35; see also Arndt et al. 2021:160)

Higher unit costs make Eskom a growing economic burden for South Africa, even without factoring in the cost of emissions. Eskom's revenues climbed from 1,8% of the GDP in 2007 to 3,7% in 2016, then levelled out. As of mid-2021, Eskom planned sharp increases in 2021 and 2022, which would let it capture over 4% of the GDP - its highest share since the transition to democracy. Yet sales of electricity through the national grid declined 15% from 2010 to 2020. Moreover, Eskom imposed loadshedding every year from 2019, and expected to continue through 2023. These interruptions increased the actual cost of its electricity to the economy far above the tariff. (See Makgetla and Patel 2021:21 and 25) Eskom's woes arose from a variety of factors, starting with the decision to invest in two huge new coal plants – Medupi and Kusile – that came on line late and suffered major faults.

A shift in rents from Eskom to the coal mines aggravated the situation. From 2008 to 2020, the average price of coal sold in South Africa, in constant rand, climbed 40%. In contrast, the export coal price dropped 14%. If the local coal price had followed the international trend, local consumers as a whole would have paid R45 billion for coal in 2019. In reality, they paid R85 billion. Eskom alone would have saved over R25 billion (extrapolating from its share in domestic coal sales). (See Makgetla and Patel 2021:30)

Fourth, South Africa faced the growing risk that other countries would impose taxes on coal-intensive exports. Both the European Union and the US planned introduce them. (See European Commission 2021; Dlouhy 2021) The bulk of South Africa's energy-intensive exports – led by aluminium, ferro-alloys and petrochemicals - went to high-income countries in Europe, Asia and the US as well as to China. Unless they could move to cleaner energy sources, they were increasingly likely to fall foul of these measures.

Finally, it has become harder to find funding to maintain coal plants or to replace them as they age out. As discussed in more detail in section 4, the bulk of Eskom's plants will depreciate fully and have to be decommissioned over the coming 30 years. Additional capacity will also be required as the economy and the population grow over this period. Ultimately, these costs are unavoidable to maintain the electricity system. Both national and international financing for new coal plants became increasingly scarce and expensive in the 2010s, however, making it easier and cheaper to turn to alternative energy sources. (See Makgetla and Patel 2021:40) For this reason, Eskom's proposal for a Just Electricity Transition argues that it has no real choice but to move into cleaner energy sources, since it can no longer obtain affordable financing for the debt accumulated for old coal plants, much less for new ones. (Eskom 2021)

3 The costs of the transition

Given the escalating economic costs of coal dependency to South Africa, why does it persist? In part, the answer lies in the divergent impact on stakeholders inside and outside the coal value chain. In part, it reflects a bias toward coal embedded in a range of private and public decision-making systems.

3.1 The benefits and costs of technological progress

Moving to more modern, cost-effective and clean energy sources will boost overall economic growth and the quality of life for virtually all producers and households. But any transition to

a new technology requires businesses and workers to write off physical, human and social investments in the earlier, now obsolete, production process. As the transition away from coal will likely take decades, there is space to moderate the costs to working people and the poor.

The coal value chain currently accounts for 5% of the national GDP and provides employment directly to around 200 000 workers, almost half of them in mining itself. (Makgetla and Patel 2021:15) The benefits, costs and risks of leaving it behind will vary between stakeholders, as described in more detail in Annexure A.

Economic stakeholders outside of the coal value chain should benefit from cheaper and more reliable electricity and continued access to export markets. Mitigation of the climate crisis and reduced pollution will also provide broad benefits.

The coal mining companies will have to write off capital investments and coal reserves. Their investors have the capacity to move into other opportunities, however. In the late 2010s, leading companies began to divest from coal. (See Makgetla and Patel 2021:46 ff; Eskom 2021a)

Downstream producers in the coal value chain will have to find alternative energy sources or, in the case of Sasol and some metals refineries, feedstock. Finding cheaper sources of electricity should be viable, but new feedstock may prove more difficult. Still, as with the mining companies, investors in refineries usually have the scale to move into other activities if necessary.

Freight transporters, including Transnet, get a significant share of their income from coal. Coal contracts accounted for 20% of Transnet revenue in 2019. (Transnet 2019:52) For road freight, at a rough estimate, they contributed around 6% of the total payload (by weight) in the late 2010s.[3] The number of companies and workers involved was fairly small, however, although estimates vary substantially. According to Eskom, around 1 500 independent transport companies, mostly very small subcontractors, trucked coal to its power plants in the mid-2010s. (Eskom 2016:46)

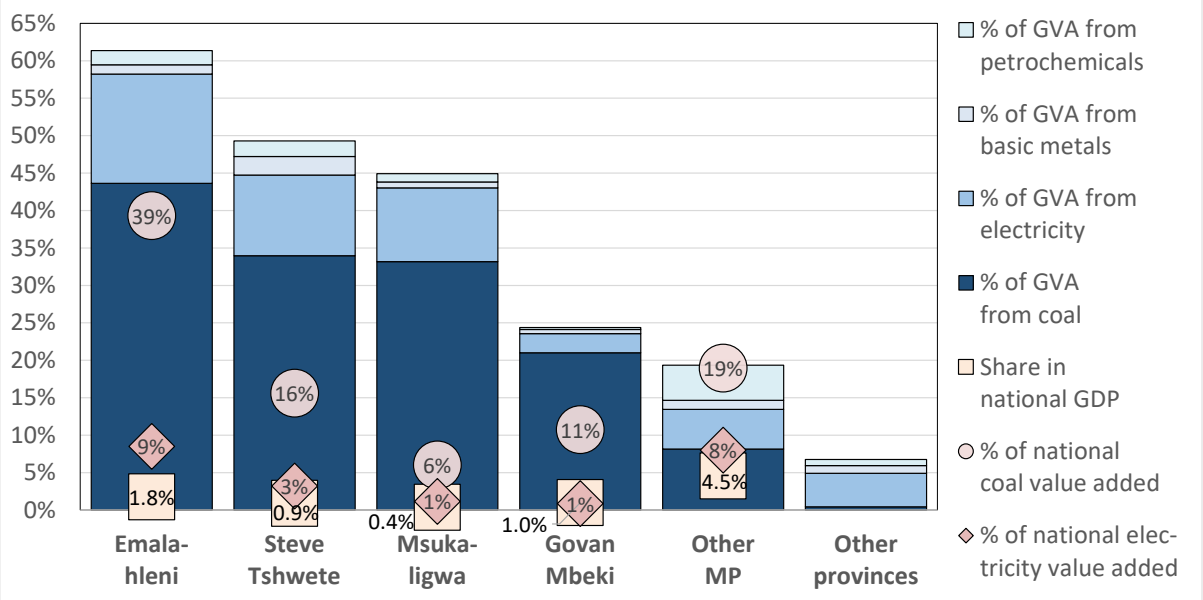
Workers, smaller businesses and the coal districts of Mpumalanga will see a decline in opportunities around coal mining. Many will require support from the rest of society to take advantage of emerging opportunities.

Four towns in Mpumalanga – eMalahleni (Witbank), Steve Tshwete (Middelburg), Govan Mbeki (Secunda) and Msukaligwa (Ermelo) - get half of their total value added and a quarter of their employment from coal mining. (Graph 3) In 2019, they generated over 70% of South Africa's total value added in coal and just under 15% of electricity and petrochemicals. Two out of five coal miners worked in Emalahleni alone. Yet taken together, the four coal towns accounted for just 2% of the national population, 4% of the economy and 3% of employment. Their populations ranged from 450 000 in Emalahleni to 175 000 in Msukaligwa.

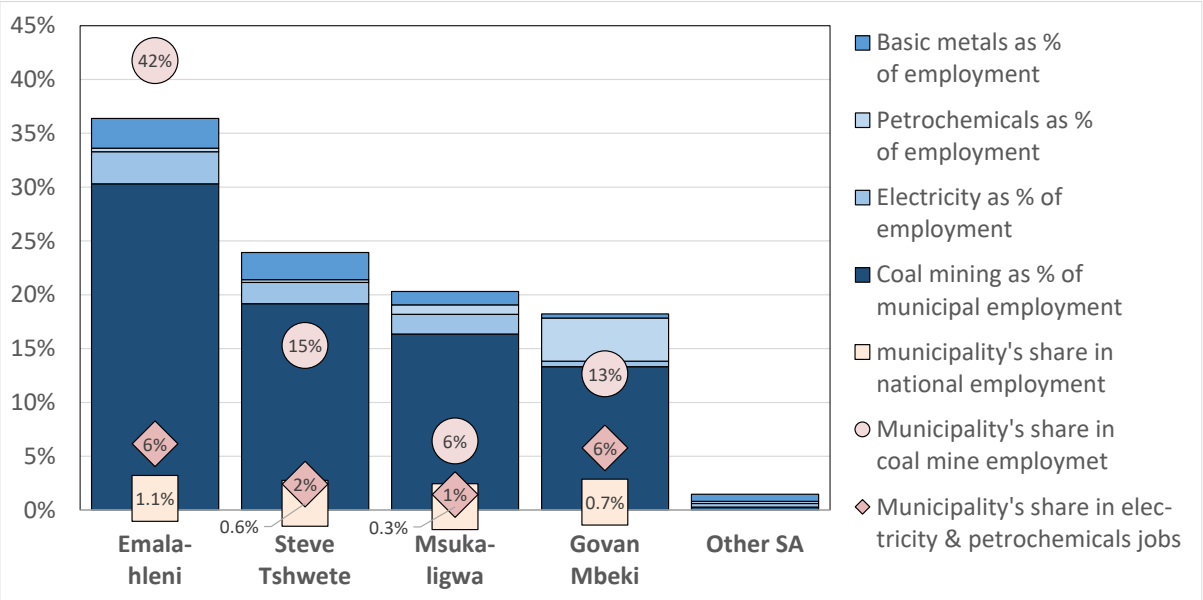
[3] Calculated based on Eskom coal tonnage carried by road (Greve 2018) compared to total road freight payload in tonnes (StatsSA 2021b).

Graph 3. Economic contribution of the coal value chain to coal towns and other regions, 2019

A. Contribution to municipal value added and share of municipalities in GDP and in national value added in coal and electricity



B. Contribution to formal employment by municipality and share of national formal employment and of employment in coal value chain



Source: Calculated from Quantec. EasyData. Interactive dataset. Standardised regional income and production series. Downloaded from www.quantec.co.za in January 2020.

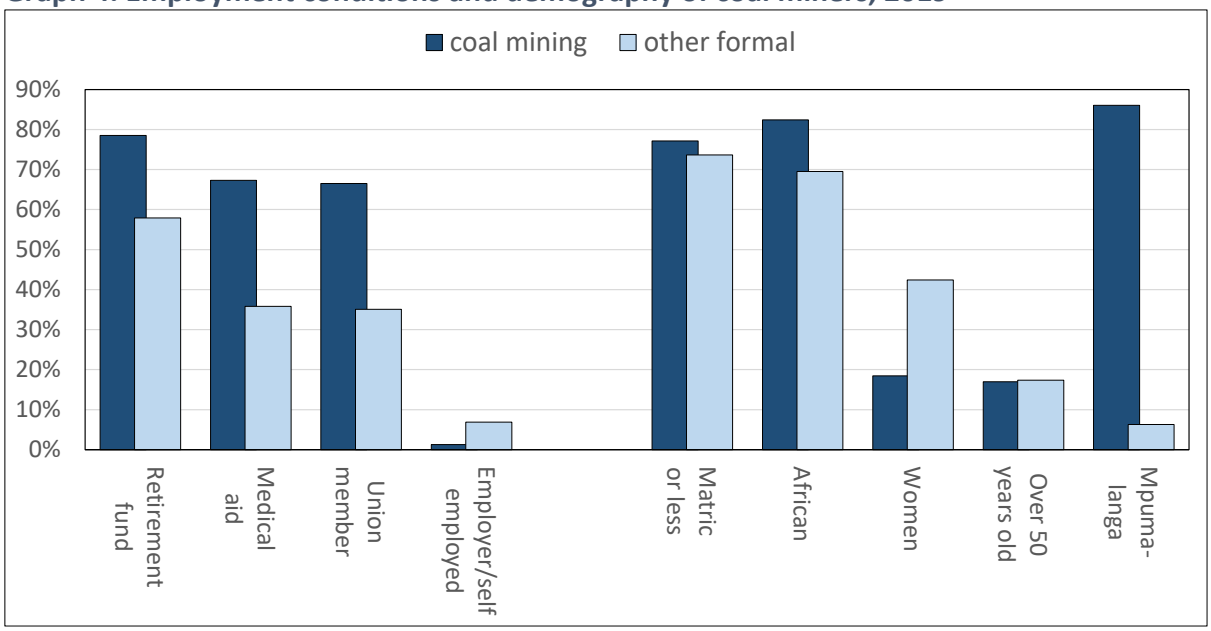
Communities that depend on a single industry have long-standing investments in infrastructure, businesses, public institutions, skills and information systems to support it. They have not built up a similarly supportive environment for other productive activities. New clusters will require both capacity to identify viable options and resources to invest in productive capacity, infrastructure and skills development.

The coal towns have a comparatively strong basis to diversify into new activities. In 2019, their GDP per person was 90% higher than the rest of South Africa; the average household

income was 25% higher; and municipal spending per person was 40% higher, although it was 30% less than the metros. Some 37% of working-aged adults were employed, compared to 32% in the rest of the country. (Quantec 2021; Treasury 2021)

Job losses are likely to affect the coal mines more than Eskom, Sasol, and the metals refineries, which can shift to alternative energy sources or feedstock. In 2020, the coal mines employed 95 000 miners, up from 90 000 in 2019 and 50 000 in the early 2000s, although down from around 130 000 in the early 1980s. In 2019, coal miners' median income was R7000 a month. That was 35% more than median pay for other formal employees, although coal miners have around the same education level. Moreover, coal miners more likely to have benefits and to belong to a union than other workers. (See Graph 4.) The relatively high earnings in mining mean it will prove difficult to develop equivalent livelihoods when coal employment begins to decline.

Graph 4. Employment conditions and demography of coal miners, 2019



Source: Calculated from Statistics South Africa. Labour Market Dynamics 2019. Interactive dataset. Downloaded from Nesstar facility at www.statssa.gov.za in January 2021.

Small businesses in the coal towns will face declining demand, whether they supply the mines or the surrounding communities. Only limited data exist on these businesses, however. A fairly small number provide inputs for the mines, mostly logistics, professional services, repairs, maintenance and cleaning. The coal transporters are mobilised and vocal, although their numbers are quite small. In 2019, they argued that moving to other products would mean reconfiguring their equipment but could not equal the stability or returns from coal.[4]

Ultimately, the transition away from coal is inevitable, although it will likely only accelerate toward the end of the decade. It will impose substantial costs on stakeholders in the value chain while promising larger but more widely spread, gradual and sometimes intangible benefits for the rest of society. Coal mining will be the most affected by the decline in coal use, since downstream production can move to other energy sources. In this context, many working people and small businesses in the coal-dependent districts of Mpumalanga will need collective support in order to take advantage of new opportunities.

[4] Interviews conducted with coal transporters by Muhammed Patel in 2019.

3.2 Governance systems

Governance systems that initially emerged to promote coal use effectively raised the cost of the transition. These systems ranged from public subsidies to Eskom, to licencing, tax and pricing regimes that favoured mining and coal-based electricity and liquid fuels, to the provision of roads, dedicated freight rail and port facilities for coal transport. Re-engineering them proved difficult because governance of the coal value chain was fragmented between a host of state agencies. Table 1 indicates some core decision-making systems that fostered coal dependency.

Table 1. Selected decision-making systems linked to coal dependency as of mid-2021

Institution	Decision-making system
Eskom	DMRE Ministerial determination prevented from investing on scale in renewables, although required to purchase and provide transmission for energy contracted by the DMRE from private suppliers.
Transnet	Substantial profits from bulk coal transport, mostly for export, and expected to be financially self-sufficient.
DMRE	Decisions on energy policy and procurement for the national grid do not provide evidence on the implications for generation and transmission costs; the costs from emissions and pollution; or alignment with national emissions targets. Examples include the IRP; the policy on subsidised electricity for energy-intensive producers, effectively at the cost of other users; and the decision to fast-track coal and gas procurement, but not renewables, under the IRP.
dtic	Investment promotion activities do not require evidence on the impact on national emissions targets or alignment with the IRP; results appear in plans to build a 3,5 GW coal-fuelled plant at the Musina Makhado SEZ that equals 5% of national generation capacity but is not included in the IRP. It would make emissions targets unachievable.
DFFE	Mandated to set targets for emissions and the just transition, but does not have authority to require alignment of relevant incentives and licencing by other departments, including decisions affecting electricity generation and liquid fuel prices (and consequently Sasol), as well as mining licences.
National Treasury	Decisions on taxes, especially carbon tax and environmental levy on Eskom, do not have to be justified in terms of national emissions targets. Both measures are much lower than the average global carbon tax and are not yet aligned with the DFFE's carbon budgets.
Nersa	Legally required to set tariffs to secure a normal rate of return for efficient generation, but not required to link to emissions targets or to promote cost savings from new technologies. When Nersa tried to force Eskom to improve efficiency by restraining the price, Eskom has simply run losses, requiring a bailout, or mounted legal challenges.
IDC, GEPF and PIC	Financing policies are not linked explicitly to achieving national emissions targets. Past support for black investment in the coal value chain and SEZs means they now own large shares in the coal value chain. For instance, the IDC has significant holdings in Mozal and Hulamin (aluminium), Sasol and Exxaro.
Municipalities	Towns are required to develop local economic development (LED) plans, but the focus has been almost entirely on infrastructure provision rather than diversification. Municipalities outside of the metros have almost no budget or capacity for economic development. In 2019, the coal municipalities in Mpumalanga had budgets of R8000 per person, compared to R11 000 on average for metros but only R6000 for other municipalities.

Source: Adapted from Makgetla and Patel 2021:41.

4 Timing

Understanding the timing of the energy transition is critical for preparing and implementing programmes to support affected workers and their communities. It is important to scope out how much time is available for planning and initiating measures, and for preparing affected communities and workers, before substantial downsizing begins in coal mining; and to have some understanding of the scale required over time. The foundational assumptions are that

the main impact of the transition away from coal will fall on coal miners and their towns in Mpumalanga, since downstream industries can turn to other sources of energy; and that the decline in demand for coal will translate fairly directly into reduced employment in coal mining.

Overall, the timeframes for the energy transition remain highly uncertain, beyond the broad likelihood of:

- An initial decline in coal use for electricity of between 10% and 20% in the 2020s, accelerating from 2025; and
- Sharper falls in the 2030s and 2040s.

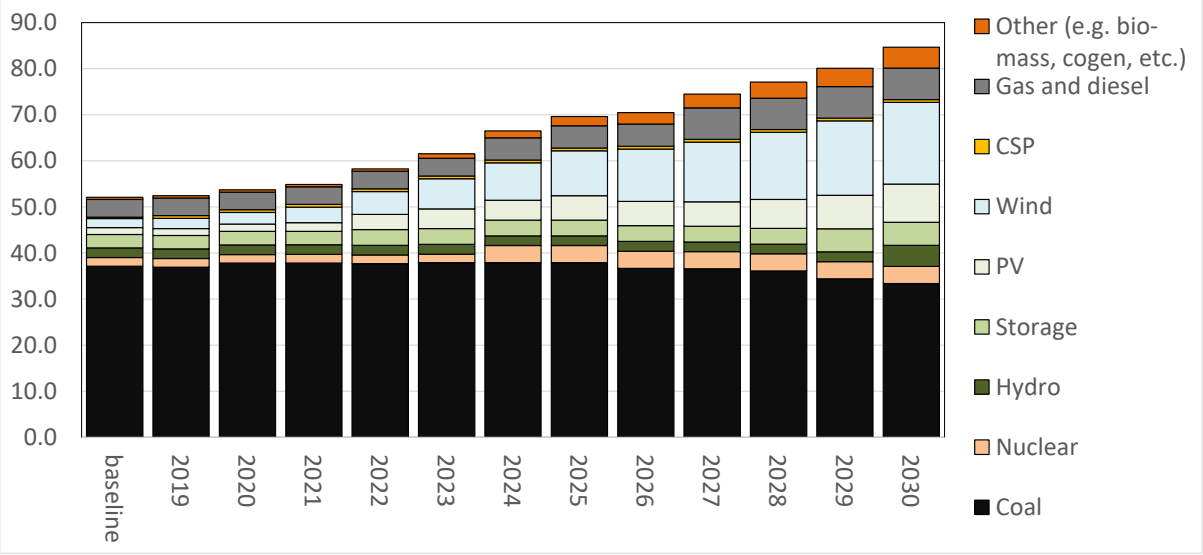
In any planning process, this kind of uncertainty requires flexible and responsive processes that can adapt as information improves and new opportunities and threats arise.

The changing demand for coal reflects the divergent pressures on the major users. As noted above, around a quarter of South Africa's coal production was exported in 2020, with the rest going to domestic customers. Eskom purchased around half of the total, while Sasol produced most of the rest. For electricity, the trajectory for coal use and employment in coal mining can be estimated based on the age profile of Eskom's plans as well as projections in the IRP and by the National Business Initiative (NBI). In contrast, there is limited scope for analysing the timeframes for declining demand from Sasol and exports.

Domestic coal sales came to 190 million tonnes in 2020. Eskom purchased 110 million tonnes, or almost 60% (Eskom 2020:136). Sasol used 30 million tonnes, about 15% of the total (Sasol 2021:51). The remainder went principally to metals refining and wood and paper production. (Calculated from StatsSA 2021c)

In terms of electricity, the 2019 IRP foresees a decline in the share of coal-based electricity on the national grid, from 70% in 2018 to 40% in 2021. As Graph 5 shows, however, the proportionate decline would result mostly from rapid growth in other energy sources. As a whole, coal generation would fall 10%, mostly from 2025.

Graph 5. IRP projections of electricity capacity by source, 2018 to 2030

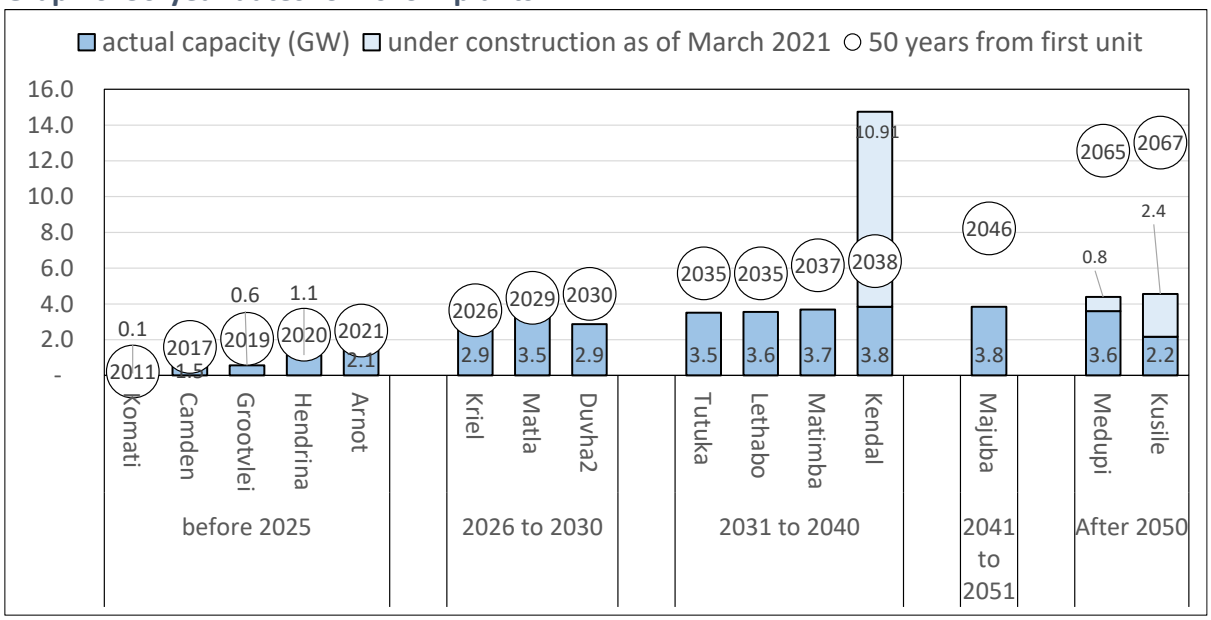


Source: DMRE. IRP 2019. Tshwane. Page 42.

The projections in the IRP equate to a reduction in demand for coal on the order of 10 million tonnes by 2030, or just over 5% of national output in 2020. If the number of miners fell proportionately, around 6 000 would lose their jobs, almost entirely after 2025.

An age analysis of Eskom plants points to longer-term trends. Eskom generally expects that its power plants will close down around 50 years after they started generation. Delays lead to higher generation costs and more breakdowns, which in turn raise the cost of electricity for both producers and households. Graph 6 shows the 50-year dates for all of the Eskom sites. Only Medupi and Kusile were due to close down after 2050; they contributed a quarter of Eskom's output in 2020.

Graph 6. 50-year dates for Eskom plants



Source: Eskom. Integrated Report 2021. Johannesburg. Page 136.

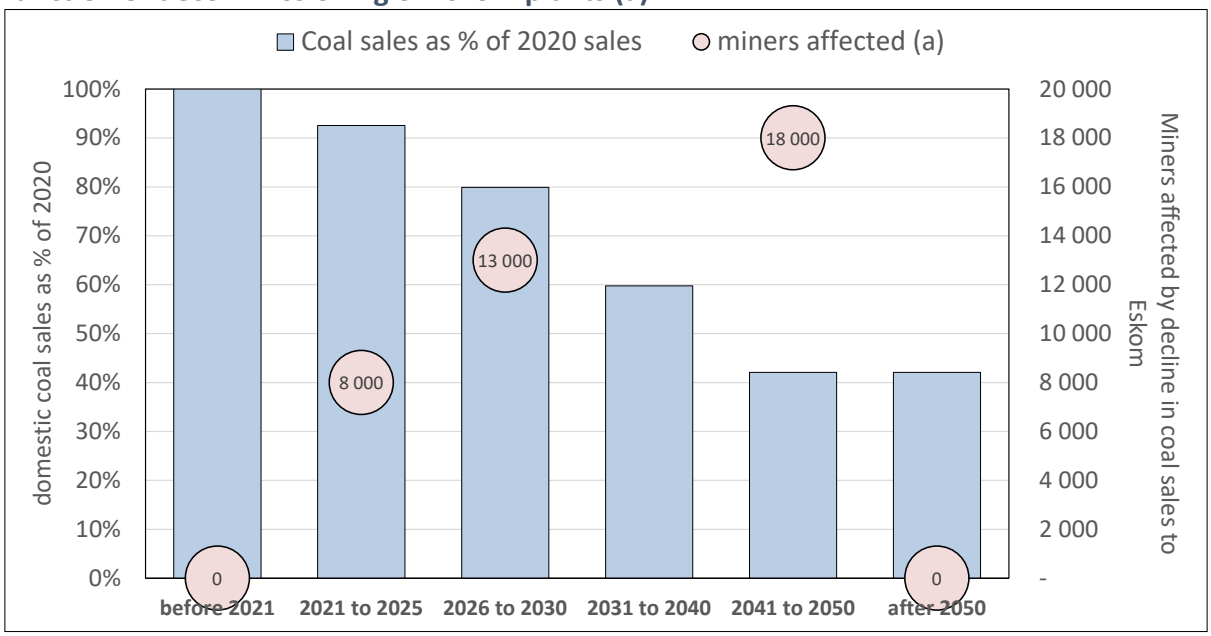
The decommissioning dates set some initial parameters for the decline in demand for coal for electricity. The estimates require the following significant assumptions, however.

- The basic assumption is that Eskom will decommission its plants more or less on schedule, and not build any new coal stations. That in turn rests on two core presumptions. One is that sufficient new capacity can be built on time both to replace closed plants and to meet new demand. Otherwise Eskom will face pressure to delay decommissioning. The other is that agreement can be reached on how to stabilise the grid in the absence of large-scale coal plants. The modelling also assumes that Eskom will only decommission Kusile and Medupi early. Those two plants will have to close down by 2050 to meet Eskom's commitment on achieving net zero by then. Eskom might, however, decide to close some plants earlier than planned if it can replace them with cleaner generation sources.
- A second assumption is that every Eskom plant uses coal equally efficiently, so that Eskom's purchases of coal parallel the generation capacity lost as plants close. In practice, older plants are generally less efficient, which means they use proportionately more coal. Figures on the differences between plants are not published, however, so it is not clear how much they will affect the demand for coal over time.
- The model assumes that outside of Sasol, which employs under 10% of coal miners but produces over 15% of coal by volume, employment per tonne of coal does not vary

between Eskom and other users. The assumption is that the average Eskom supplier does not differ from other coal mines, despite differences between individual pits.

Given these assumptions, in every decade through 2050, the decommissioning of Eskom plants would lead to around 20 000 job losses for coal miners, or close to one in four every ten years. (Graph 7) Job losses would be proportionately steepest in the second half of the 2020s.

Graph 7. Modelled domestic coal-mining sales and decline in coal-mining employment as a function of decommissioning of Eskom plants (a)



Note: (a) Calculated using assumptions as listed in text. Initial employment in coal mining due to Eskom calculated as 59 000 based on the share of Eskom in domestic coal production, given these assumptions. *Source:* Rate of downsizing based on 50-year deadlines for Eskom plants, from Eskom. Integrated Report 2021. Page 136. Initial production and employment equal to domestic coal sales from DMRE. Abstract of Mineral Statistics. Accessed via Quantec. EasyData. Interactive dataset. Macroeconomic series. Accessed at www.quantec.co.za in September 2021.

In practice, Eskom wants to shut some older, heavily polluting plants earlier than planned. Its main published reason is that it would cost R300 billion to retrofit them to meet modern environmental standards, which outweighs their revenues. Eskom has also plans to move away from coal-fuelled generation in order to improve its competitiveness. (See Eskom 2021)

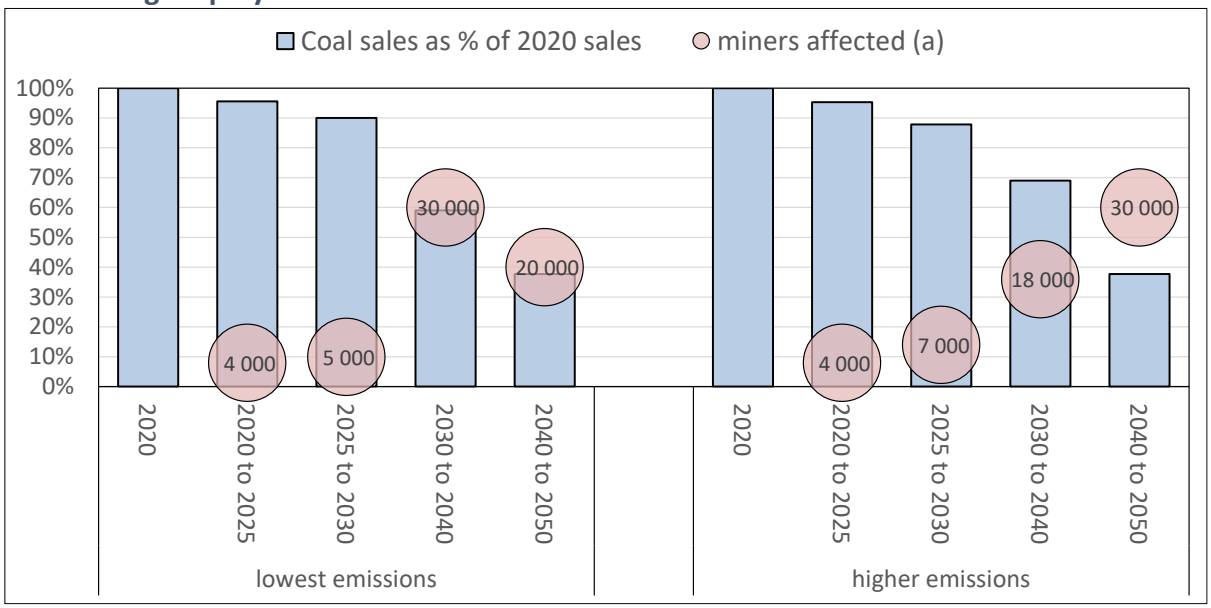
Closing plants early would mean coal sales and employment would shrink sooner, but not more in total, than Graph 6 indicates. Eskom itself has not said which plants it might close early. As of August 2021 the Department of Fisheries, Forestry and the Environment (DFFE) had instituted enforcement actions against Camden, Kendal, Lethabo and Tutuka, and anticipated moving on Grootvlei and Duvha. (DFFE 2021:14-16) Of these power stations only Camden reached 50 years of life before 2020. Tutuka, Lethabo and Kendal all turn 50 in the late 2030s. Taken together, they had 11 GW in capacity, equal to around a third of Eskom's total. If they shut down early, peak downsizing would shift to the first half of the 2030s.

In its pathways to greener electricity, the NBI analyses four technically viable ways to get to net zero by 2050. The options model different shares for coal-fuelled electricity. In the low emissions trajectory, coal declines more rapidly in the 2030s and '40s than a high-emission

simulation derived from the IRP. The low emissions trajectory would cut South African's cumulative emissions by 2050 by almost a quarter compared to the high-emissions variant.

As Graph 8 shows, both the NBI's trajectories would generate lower job losses in coal mining through the 2020s. The low emissions strategy would lead to more rapid downsizing in the 2030s. The high-emissions version would see most job shedding from the mines in the 2040s.

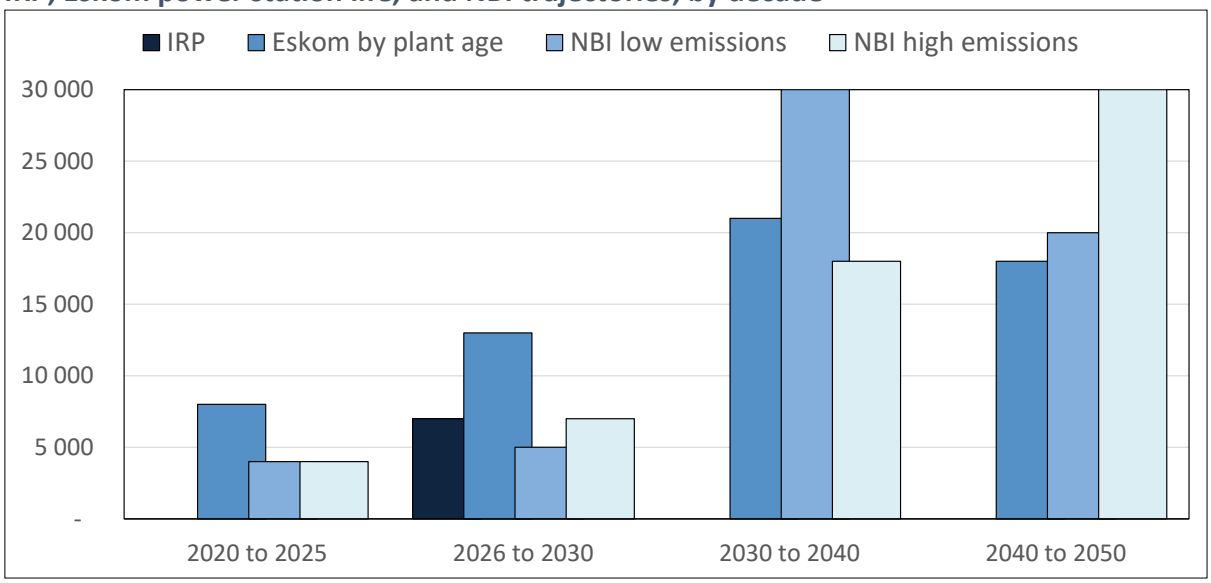
Graph 8. Estimated impact of NBI trajectories on domestic coal-mining sales and decline in coal-mining employment



Note: (a) Calculated using assumptions as listed in text. Initial employment in coal mining due to Eskom calculated as 59 000 based on the share of Eskom in domestic coal production, given these assumptions. *Source:* Rate of downsizing based on NBI. NBI. 2021. *Decarbonising South Africa's Power System.* Johannesburg. Page35. Initial production and employment equal to domestic coal sales from DMRE. Abstract of Mineral Statistics. Accessed via Quantec. EasyData. Interactive dataset. Macroeconomic series. Accessed at www.quantec.co.za in September 2021.

Graph 9 summarises the implications for downsizing in coal mining by time period according to the IDP, which only goes to 2030, the age of Eskom plants, and the NBI's two trajectories.

Graph 9. Comparison of estimated declines in coal-mining employment derived from the IRP, Eskom power station life, and NBI trajectories, by decade



Note: (a) Calculated using assumptions as listed in text. Initial employment in coal mining due to Eskom calculated as 59 000 based on the share of Eskom in domestic coal production, given these assumptions. *Source:* Earlier graphs.

Outside of Eskom, three factors cloud the timelines around reduced coal use and the consequent need for measures to support affected working people and their communities.

First, permits for private coal-fuelled generation could offset Eskom plant closures. Two proposals were planned as of mid-2021, although both had stalled. They would increase demand for coal by 13 million tonnes, or almost 7% a year, and mine employment by almost 7000, or just over 7%. The proposals are:

- A 3,3 GWh plant as part of the Musina Makhado Special Economic Zone (SEZ) in Limpopo. The SEZ was approved by the dtic in 2019 and championed by the provincial economic development department. As of September 2021, however, the coal plant was unable to obtain a favourable Environmental Impact Assessment, which meant it could not legally break ground.
- Procurement of 1500 MW of coal-fuelled electricity from private suppliers, as provided under the IRP. The IRP included the plants largely to accommodate two previously approved plants - Khanyisa and Thabametsi – that were initially approved in the early 2010s but foundered by 2021 because they could not get financing or environmental and water permits. The DMRE issued a directive affirming that it will seek to replace the two plants in September 2020, but a year later had not issued a request for proposals. (Makgetla and Patel 2021:41 ff)

Second, Sasol is the largest consumer of coal in South Africa after Eskom. It has committed to reducing its emissions, almost all of which derive from its coal-to-liquid-fuels processes. It aims to achieve this aim mostly by replacing coal with natural gas in its petrochemicals processes. So far, however, its sole commitment is a 10% reduction in its emissions in South Africa by 2030, to 57 million tonnes from 62 million tonnes in 2020. It hopes to achieve this target largely by shifting to renewable electricity rather than replacing coal as a feedstock. (Sasol 2021:3) It probably will not reduce its coal consumption substantially before 2030. Its

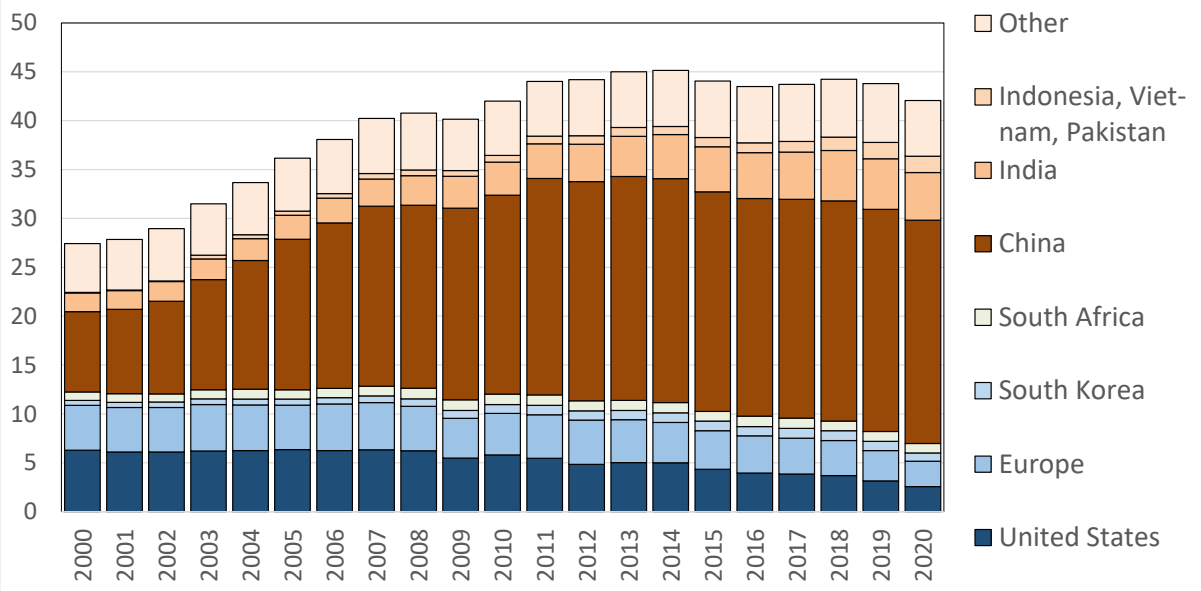
ability to replace coal depends largely on access to affordable natural gas on a sufficient scale. (Sasol 2021:13)

Sasol employs around 28 000 people in South Africa, including 7 000 in its coal mines. If it succeeds in shifting to a different feedstock, the jobs downstream from coal should not be affected in the medium term.

Third, the timing of the decline in export coal sales remains murky. The overall fall in global coal trade depends on economic trends as well as policy decisions by both public and private actors. Moreover, South African producers contribute only 4% of global coal exports. As a result, minor shifts in market share can boost their foreign sales even when the coal trade as a whole is shrinking.

Despite these caveats, a long-run decrease in coal exports seems unavoidable. The effects are already perceptible in their direction, value and volume. As **Error! Reference source not found.** shows, international coal consumption declined from 2013. The COVID-19 depression brought a sharper but likely temporary fall in 2020. Crashing European demand after 2005 left South Africa mostly dependent on exports to Asia, primarily to India, at lower average prices. (See Makgetla and Patel 2021:36)

Graph 10. Coal consumption by major international consumers, 2000 to 2020, in thousands of TWh



Source: Oxford University. Our World In Data. Interactive dataset. Downloaded from https://ourworldindata.org/fossil-fuels in September 2021.

Overall, despite the uncertainty around specific dates, significant downsizing of the coal value chain should start in around five years. That timeframe makes it possible to establish realistic programmes and systems to drive them, rather than rushing into disaster mode. Before substantial downsizing kicks in, the bulk of effort should go into developing appropriate measures and structures to drive them, and assisting individuals and communities to develop the capacity and resources required to adapt.

After 2025, the trajectory becomes much more uncertain. The transition seems likely to accelerate from the second half of the 2020s, and intensify substantially in the 2030s and 2040s. The uncertainty of these medium- to long-run timeframes means that any system to

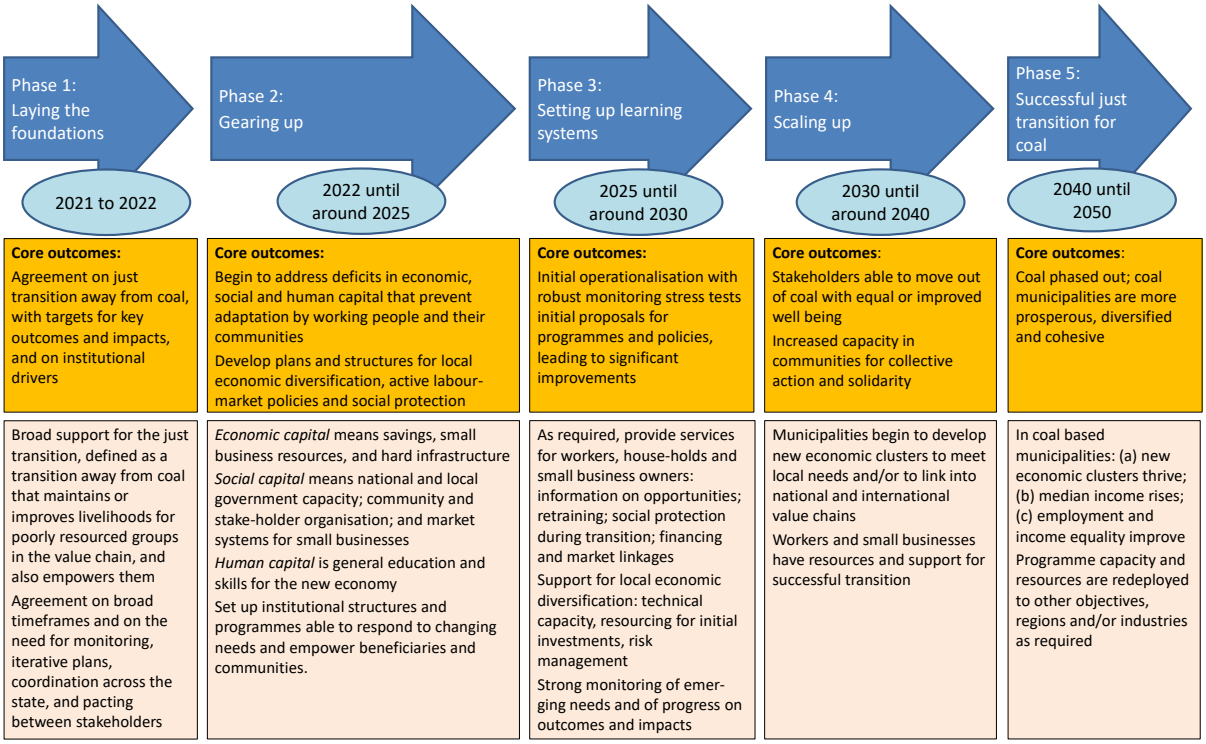
manage the just transition must be able to respond quickly and effectively as circumstances change. But the system must also be able to build up programmes and funding if a sudden decline in demand for coal leads to large-scale layoffs.

Responsive systems to deal with the uncertainty around timing require above all strong monitoring capacity. They must be able both

- to identify changes and unanticipated blockages, and
- to ensure prompt action on new information as it comes in.

Figure 2 outlines the main requirements for each phase of a just transition away from coal.

Figure 2. Phases in the just transition (timeframes are rough estimates)



5 Key steps and decisions in implementing the just transition

This section outlines the critical steps and decisions for establishing and implementing programmes to support a just transition in coal. It starts with the agreement on the need for an energy transition that protects workers and their communities in the coal value chain. In line with the theory-of-change methodology, it outlines the main prerequisites to achieve a successful outcome, defined essentially as prosperous, equitable and empowered communities. The underlying theory of change is summarised in Annexure B.

A successful just transition must ensure that working-class communities in coal-dependent districts ultimately gain in terms of prosperity, collective agency and economic equality. Critical impact measures of success include the level and distribution of incomes; employment; asset ownership; household and productive infrastructure; quality education; and participation in relevant decision-making processes.

The policy decisions required for a successful just transition range from clear-cut short-run choices to strategic directions to guide trade-offs as they arise. The theory of change summarised in Annexure B lays the basis for identifying key steps in the process.

Step 1: Agreement on a just transition

Outcomes and preconditions: The first step is for the main economic stakeholders, led by the national government, to agree both that

- A transition away from dependency on coal is inevitable, in line with national emissions targets and global developments, and
- Working people and their communities must be supported to deal with the costs and take advantage of new opportunities.

Decisions required: A just transition away from coal has already been agreed in principle. Some immediate decisions are however required to achieve emissions targets, above all an agreement to end plans for new coal plants (Musina Makhado and procurement under the IRP); to develop targets for Sasol to achieve net zero; to promote alternative energy sources; to ensure a sustainable grid and market structure while coal downsizes; and to phase out interventions that promote and facilitate coal exports.

Blockages: The fragmentation of decision-making on coal leads to stop-start actions and opens the door to lobbying. The resulting uncertainty makes it much more difficult to establish and resource a coherent strategy. In addition, efforts to assist the coal towns must compete with resources for even less prosperous settlements.

Step 2: Agreement on timeframes, targets, strategies and responsibilities

Outcomes and preconditions: Aligning efforts around the energy transition and support for coal-dependent communities requires targets as the basis for effective mandates and monitoring. The targets for the energy transition need to include specific steps to reduce coal emissions, and by extension production, over time. Targets for the just transition should effectively define priority elements, amongst others greater income and asset ownership in working-class households, improved education, and community mobilisation.

Translating targets from a wish list into action items also requires a sense of the main strategies, which centre on diversification of the municipal economies into new economic clusters and value chains; active labour-market policies to support workers to transition into new livelihoods; social protection to assist workers and households during the transition and avoid a downward spiral in affected regions; and systems to empower community members and workers to mobilise to influence decisions and implement economic and social projects.

Once strategies have been defined, government has to ensure a coherent allocation of responsibilities between its agencies. The parties also need to set up monitoring systems that enable communities and stakeholders to understand programmes and progress, and that identify new obstacles and opportunities and trigger effective responses.

Decisions:

The revised national emissions targets lay the basis for determining trends in coal demand. Those targets in turn make it possible to identify the impacts on different stakeholders in the coal value chain over the coming decade.

Urgent decisions around the coal transition include:

- Terminating plans for large new coal plants;

- Agreement on medium and long term emissions targets for Sasol and the metals refineries, with an analysis of the implications for coal demand over time.

Targets for the just transition could include some combination of employment levels; earnings; asset ownership; small business development; economic growth and diversification; improved access to relevant quality education; reduced pollution and emissions; and collective action through unions, co-ops and community structures. It is important to analyse the trade-offs between these targets, taking into account the divergent costs and benefits for different stakeholder groups. For instance:

- Directing support to small, emerging and black-owned business may make it harder to leverage the capacity, networks and resources of large established companies;
- Decentralised participatory decision-making has to be balanced against the need for national resourcing, regulatory reforms, and technical capacity.

In this context, a critical decision relates to securing coherence across the state. As discussed in the policy brief on governance, mechanisms to that end include:

- Changes in decision-making systems by setting appropriate mandates and KPIs for all relevant government agencies; requiring greater transparency, especially published written reasons for key decisions that include impacts on targets; and establishing more accessible and faster dispute-settlement systems.
- Dedicated structures to drive the just transition, with forums to consult and to settle disputes, and to identify and respond to blockages as well as new opportunities.

Blockages: Government agencies and major stakeholders have not been able to align decisions that affect the energy transition and emissions, which demobilises efforts to secure a just transition. Leading departments and agencies do not include either emissions targets or support for coal communities and miners consistently in their mandates and KPIs. No structure is currently mandated or designed to align government efforts around the just transition in the coal districts.

Step 3: Development and testing of proposals

Outcomes and preconditions: The just transition requires viable and sustainable programmes to diversify the economies of the coal districts in Mpumalanga, and to support displaced workers and small businesses. Diversification entails identification of potential clusters that can generate livelihoods on a large scale, along with measures to address binding constraints on their growth. These constraints may include inadequate demand or market access; high production, input or infrastructure costs; regulatory burdens; or large initial investments. Developing feasible proposals at scale requires structures with the mandate and capacity to come up with ideas; analyse their viability, sustainability and risks; map out implementation systems, with budgets and success indicators; and secure support from government agencies as well as local and national economic stakeholders.

The mix of new clusters in the coal districts of Mpumalanga may include agriculture; manufacturing of all kinds, from food processing to intermediate inputs for heavy industry; logistics; new kinds of electricity generation and water management; tourism; and other services. Projects should not prioritise projects based on their sector, but rather on their potential for achieving the targets set for the just transition. A key challenge is to ensure that interventions are on the requisite scale.

Decisions:

A number of decisions will have to be made around the quality of livelihoods supported through just transition programmes. For instance, should they include only formal jobs or extend to public employment schemes and self-employment, which is usually more precarious? Communities and other stakeholders will have to agree broadly on a realistic minimum income level for state support. As noted above, the decision will likely be difficult because the coal value chain historically offered relatively high earnings for workers with matric or less, and for communities outside of the metros.

Decisions also have to be taken around how to manage the risks of innovation. There is almost always an initial premium for setting up new economic activities and relationships rather than extending existing systems. The challenge is to avoid both:

- over-reliance on existing industries that cannot grow or provide opportunities for employment or small business on the requisite scale, and
- projects that promise outsized socio-economic benefits but are very unlikely to succeed.

Decisions also have to be made around how to link measures to support individual workers, through active labour market policies and social protection, with economic diversification. In early phases, social protection can act as wage subsidy, effectively reducing costs for emerging clusters and giving them more time to become competitive. It also sustains local demand for small businesses. Experience shows, however, that where entire regions face a downturn, labour market measures only succeed if linked to an effective diversification strategy. Moreover, re-skilling alone has limited potential for workers who lack matric, or in some cases mathematics.

Finally, the mines' social labour plans were supposed to promote diversification in mine communities, to prepare for the day when mining resources are exhausted. It will be important to determine how they can be strengthened and aligned with just-transition initiatives, including in terms of aims; resourcing; and accountability to the affected communities.

Blockages: It may prove difficult to identify viable new economic clusters as a result of slow national or global growth; lack of capacity and funding; and poor risk management systems, which effectively restrict innovation from technical experts, stakeholders and public agencies. Furthermore, the government needs to be specific about the support it wants from stakeholders, including big business, small businesses, unions and community members, in order to forge real agreement on initiatives. Finally, communities and workers may end up rejecting initiatives that are imposed on them without discussion. They may also object to projects that would mean lower pay and less security than the mines.

Step 4: Successful implementation of programmes and projects

Outcomes and preconditions: Once programmes and projects are authorised, state agencies and private actors must implement them. To that end, they have to commit resources and skills; manage the inevitable risks; and adapt to changing conditions and new insights. As discussed, that requires adequate institutional and decision-making systems; sufficient support from stakeholders, other government agencies and citizens both inside and outside of the affected communities; and risk management able to prevent both paralysis and waste.

Blockages and risks: The programmes will fail if stakeholders inside and outside of the state do not provide consistent support, including infrastructure, investment, capacity and regulatory changes. A particular challenge is that groups that benefit from the current inequalities often oppose programmes that promote more inclusive growth. These efforts include prioritising infrastructure and housing for lower-income communities; support for township industrial sites; and social enterprises, for instance to manage housing or allotments.

An on-going difficulty is that the skills required for effective economic planning are not easily available. Moreover, budget and procurement systems generally seek to avoid all risk.

External risks include a national or global economic slowdown or fiscal crisis.

Step 5: Working people and their communities successfully transition away from coal into sustainable, dynamic new livelihoods

Outcomes and preconditions: The final outcome should be that the KPIs set for inclusive growth in the coal districts are met, despite some inevitable failures and modifications along the way. As noted in previous stages, the preconditions are effective programmes and projects that promote inclusive growth and social cohesion on a large scale.

6 Conclusions and questions for discussion

The transition away from coal promises large benefits for South Africa's overall economy and society. But it imposes significant costs on stakeholders in the value chain over the coming decades. A successful and cost-effective transition requires collective action to enable the affected working people and their communities to develop new livelihoods while strengthening participatory democracy and social solidarity. Programmes centre on effective economic diversification, while supporting working people through innovative active labour market measures and social protection. Preconditions for success centre on more consistent decision-making systems and mandates for public agencies around both the transition from coal and mitigating the impacts on workers and communities; adequate resourcing, prioritisation and technical skills; and strong monitoring and risk-management systems.

References

Arndt, C., Arent, D., Hartley, F., Merven, B. and Mondal A.H. 2019. Faster Than You Think: Renewable Energy and Developing Countries. In Annual Review of Resource Economics. 11:149–68. Available at: https://doi.org/10.1146/annurev-resource-100518-093759.

DFFE. 2021. "Eskom and Sasol Compliance with the Air Quality Minimum Emission Standards". Presentation to Portfolio Committee on Environment, Forestry and Fisheries. 24 August. Accessed at https://pmg.org.za/committee-meeting/33430/ in September 2021.

Dlouhy, J.A. 2021. This Tariff Could be Biden's Best Climate Change Tool. Bloomberg. 18 May 2021. Available at: https://www.bloomberg.com/news/articles/2021-05-18/this-tariff-could-be-biden-s-best-climate-change-tool-quicktake. (Accessed in July 2021).

Eskom. 2016. *Integrated Report 31 March 2016*. Johannesburg.

Eskom. 2021. *Eskom and the Just Energy Transition*. Discussion document. Johannesburg. August.

European Commission. 2021. Carbon Border Adjustment Mechanism: Questions and Answers. 14 July 2021. Brussels. Available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3661. (Accessed July 2021.)

Greve, N. 2018. "Eskom will favour coal juniors with wheels for new supply." Miningmx. 1 February 2018. Available at: www.miningmx.com. (Accessed May 2021).

IPPO. 2020. *Independent Power Producers Procurement Programme (IPPPP): An Overview as at 31 December 2020.* Independent Power Producer Office. Available at: https://ipp-projects.co.za/Publications#. (Accessed May 2021).

Makgetla, N. and Patel, M. 2021. *The Coal Value Chain in South Africa.* TIPS Working Paper. Pretoria.

NBI. 2021. *Decarbonising South Africa's Power System.* Johannesburg.

Quantec. 2021. EasyData. Interactive dataset. Accessed at www.quantec.co.za in July 2021.

StatsSA. 2021a. Statistics South Africa. GDPp 2q20 previous format. Excel spreadsheet. Downloaded from www.statssa.gov.za in April 2021.

StatsSA. 2021b. Land transport survey. Excel spreadsheet. Statistics South Africa. Available at: www.statssa.gov.za. (Accessed May 2021).

StatsSA. 2021c. SUT 2013-2018. Excel spreadsheet. Accessed at http://www.statssa.gov.za/?page_id=1854&PPN=Report%2004-04-04 in September 2021.

Transnet. 2019. *Annual Financial Statements*. Johannesburg.

Treasury. Municipal Budget information for relevant years. Accessed at www.mfma.treasury.gov.za in January 2021.

Wright, J. and Calitz J. 2020. Systems analysis to support increasingly ambitious CO2 emissions scenarios in the South African electricity system. Technical Report. 22 July. Meridian Economics and CSIR.

Annexure A. The costs, benefits and risks of the transition away from coal

Stake-holder	Benefits	Costs	Risks
Govern-ment	Reduced subsidies for electricity and refineries. More reliable and cheaper electricity in medium term, resulting in faster growth and higher tax revenues. Reduced healthcare costs in communities from Eskom pollution. Mitigate impact of climate emergency and consequent periodic disasters and overall slowdown in economic growth. Reduce effects of foreign emissions taxes on exports.	Need to allocate capacity, resources and political capital manage the transition consistently and appropriately. Capacity and resources to engage with stakeholders to reach agreement as far as possible, without compromising transition. Fiscal and regulatory support for new generation capacity and economic diversification for coal communities.	Destabilise electricity grid as remove coal baseload. Unable to manage lobbying or implement measures consistently, resulting in incoherent or inappropriate approach, higher costs in the long run, and reduced benefits. Unable to support affected constituencies, resulting in political opposition and deeper inequality and poverty.
Workers and busi-nesses outside the mining value chain	Faster growth and job creation due to diversification from coal mining and refineries into more labour-intensive activities. Lower-cost and more reliable electricity for households and producers promote overall growth. Limit impacts of emissions taxes on South African exports. Reduced climate change.	Public and private resources required to fund just transition and new generation and transmission capacity over the coming decade.	More disruption and higher costs for electricity if investment in cleaner energy stalls and/or technological challenges are not fixed timeously. Other countries do not reduce emissions, so benefits around climate change do not materialise.

Stake-holder	Benefits	Costs	Risks
Com-munities outside the coal value chain	Lower cost and more reliable electricity, leading to improved growth and living conditions. Reduced air pollution. Limit impacts of emissions taxes on South African economy. Reduced climate change.	As above.	As above.
Coal miners	Opportunity to move into new occupations that are safer and healthier, with better prospects for promotion and rising incomes over time. Access to resources to assist in transition to new livelihoods. Reduced climate change.	Loss of stable, relatively secure employment with pay that is comparatively better for jobs that do not need a degree. Devaluation of existing skills and occupations.	Alternative employment is unavailable, worse paid and/or insecure. Resources to assist the transition do not materialise or are inadequate. Other countries do not reduce emissions, so benefits around climate change do not materialise.
Com-munities that depend on coal	Diversification into more dynamic and sustainable industries. Improved health as pollution declines. Access to resources to cushion transition.	Coal mines and power stations shed jobs when they close. Closure of coal enterprises leads to decline in businesses that supply them or that serve their workers.	Failure of programmes to promote diversification. Resources to assist the transition do not materialise or are inadequate. Out-migration of people with marketable skills or assets.
Coal mining com-panies	New and more sustainable opportunities arise as economy diversifies and grows.	Loss of historically profitable activities, and write down coal reserves and related assets. Rehabilitation plus costs for just transition, including through social labour plans.	Write-off of reserves and assets leaves without capacity to take advantage of new opportunities.
Sasol	New and more sustainable opportunities arise as economy diversifies and grows. Shift to cleaner feedstock and electricity secures export markets.	Write off assets and reserves in coal mines and coal-based technologies. Investment in new technologies and feedstock sources. Devaluation of CTLF technology.	Unable to identify viable new feedstock, leading to soaring domestic and foreign levies for emissions over time.
Ferroalloy and alu-minium refineries	New and more sustainable opportunities arise as economy diversifies and grows. Shift to cleaner electricity secures export markets.	Investment in cleaner electricity generation.	Unable to generate clean energy affordably on necessary scale or reliably enough to maintain production.

Stake-holder	Benefits	Costs	Risks
Eskom	Escape the utility death spiral. Opportunities for new investment in renewable electricity generation.	Loss of historically profitable activities. Write-off of assets. Culture change from protected (near) monopoly to competition. Need to develop more sophisticated grid management.	Not allowed to get into new technologies, so access to funding and market share crash. Unable to develop new skills sets and capacities for more competitive market based on new technologies. New grid technologies prove inadequate.
Transnet	New opportunities as economy diversifies and grows.	Loss of profits from coal, and possibly aluminium and ferroalloys.	Bulk coal lines and port facilities do not or cannot adapt to new products, leading to write downs.

Source: Adapted from Makgetla and Patel 2021:54.

Annexure B. Theory of change for the just transition in the coal value chain

	Required outcomes	Preconditions	Risks and blockages
Initial agreement to initiate the just transition in coal	Stakeholders and government agree on • key targets for emissions and • the need to ensure empower coal-dependent workers and communities to develop alter-native livelihoods	Agreement that no new coal plants will be built. That requires a final halt to Musina Makhado and smaller private coal projects.	Key agencies or stakeholders unable to agree on emissions targets or on prioritising a just transition in coal Government permits new coal projects to go forward, making emissions targets unachievable.
Agreement on targets and responsibilities	Government and stakeholders agree on • impact and outcome targets for both energy and coal communities, and • key responsibilities, systems and measures to achieve them	Finalisation of national emissions targets and initial determination of implications for coal value chain through 2050. Entails initial targets for Eskom, Sasol and metals refineries, and understanding of impact on coal demand in medium and long run. Establishment of measures to secure coherence across the state, including through appropriate KPIs and forums for engagement and effective, fast dispute settlement Agreement on structures to plan for and implement the just transition in coal.	Deadlock on targets, usually because of concerns around resourcing or existing wealth and privilege. Policymakers make unrealistic promises to coal towns, leading to unfulfillable expectations. Inability to resolve disputes between departments and spheres prevents agreement on responsibilities. Targets and programmes planned by officials without consulting or empowering municipal stakeholders, leading to unrealistic proposals and illegitimacy.

	Required outcomes	Preconditions	Risks and blockages
Agreement on key initiatives and structures to drive them	Government and stakeholders analyse options and agree on nature and scale of programmes, and government establishes structures to secure both responsiveness and alignment across state agencies.	Able to reach sufficient consensus inside government and the main stakeholders on priorities, scale and resourcing. Government establishes systems and structures that ensures programmes effectively marry technical expertise and resourcing with expertise and empowerment of communities and working people. Government agencies agree to systems to ensure alignment, including engagement forums and dispute-settlement mechanisms. Role of local governments clarified, with sufficient capacity and resourcing.	Unable to reach agreement on priorities, so end up with a long list of small, ineffective projects that cannot scale up as required. Government does not clarify responsibilities or deal with disagreements between agencies. Government does not ensure that managers of new institutions and programmes understand the aims and strategies for the just transition, and that they have the technical expertise and experience required. New systems o not take into account the realities of poverty and disempowerment, for instance requiring beneficiaries to have smart phones and cars. Local governments expected to take on key responsibilities for which they lack both capacity and resources.
Communities empowered to deal with downsizing in advance	Initial implementation of programmes ensures affected workers and their communities have greater economic, human and social capital.	Programme managers able to work with communities and households to implement and, where necessary, adapt empowering programmes, including to improve infrastructure, support small businesses and collective action, and extend quality relevant education. Local governments begin to identify viable options for new clusters. Resourcing and regulations are adequate for programmes to have effects on an adequate scale.	Programmes are designed to prevent all risk of corruption, which means they cannot innovate at all and ultimately fail. Decision-making systems rely on experts without local consultation or understanding of realities in communities, and ultimately prove unworkable. Programmes lack measures to prevent corruption and patronage, leading to failure. Programmes are underfunded so they never reach the requisite scale. Local governments cannot identify viable options on the requisite scale, or rush into unsustainable and inappropriate projects

	Required outcomes	Preconditions	Risks and blockages
Communities and workers find acceptable new livelihoods as coal downsizes	Diversification and empowerment of working people and their communities scales up as mining downsizes, ensuring realistic alternatives are available and accessible	Government agencies are able to identify and align around large-scale new initiatives. Workers and households have sufficient support to transition into new livelihoods. Resources are sufficient to ensure programmes scale up proportionate to downsizing in coal.	Government agencies cannot agree on effective initiatives on sufficient scale. Government agencies do not align around projects, leading to contradictions such as inability to get permits and infrastructure. Programmes to support workers and households do not develop effective systems to identify and reach them.
Former coal communities prosper economically and socially after coal disappears	Former coal communities have new identifies as dynamic, thriving, less polluted and more equitable social and economic centres	Success of programmes on the requisite scale.	Programmes fail to generate new economies and/or to ensure that working people and their households can transition into them successfully.