Estimating the cost of a just transition in South Africa's coal sector: protecting workers, stimulating regional development and accelerating a low-carbon transition

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Abstract

South Africa's Integrated Resource Plan (IRP) 2019 – 2030 commits to a decarbonisation pathway hinging on the decommissioning of coal-fired power stations and the rapid uptake of renewable energy. But, what will the cost of the just transition from coal be and what just transition approaches might accelerate transformation of the South African political economy? This paper proposes a methodology through which to estimate the cost of a just transition in South Africa's coal sector. This first empirical study to determine the cost of a just transition aims to prioritise worker support, stimulate regional development and advance a transition in South Africa's coal sector. National labour data was applied to a just transition framework developed by Pollin and Callaci (2019). The application of a 20-year cost framework identifies attrition and contraction rates that protect coal workers' livelihoods under various scenarios, as many of them are forced to exit this declining industry, either through retirement or the migration to other employment sectors. In this study, compensation and retraining costs were calculated using coal workers' education profiles, an assessment was made of future skills in a mixed green economy as well as occupational profiles to assess skills transferability. It examined sector shifts in employment profiles from permanent to contract workers, investment trends in managing provident funds, a long term decline in retirement fund membership, increased retrenchments and the implications for securing pension guarantees. The research highlights that empirical data, specifically the interaction between decommissioning, contraction and attrition rates have significant implications for costing a just transition.

1. Introduction

South Africa has a unique opportunity to be the first coal-based economy in the global south to successfully transition to renewable energy — the energy source of the 21st century. South Africa is also unique because it has an ageing fleet of coal-fired power stations that must be decommissioned over the next 20 years. The country has no choice: it must build more energy generation capacity to offset the closures. The rationale for an energy transition from coal to renewables can be traced back to South Africa's Nationally Determined Contributions (NDCs) as part of the Paris Accord that spells out a Peak-Plateau-Decline trajectory for its carbon emissions. On the domestic front, the Integrated Resource Plan (IRP) 2019 – 2030 commits South Africa to a decarbonisation pathway hinging on the decommissioning of coal-fired power stations and the rapid uptake of renewable energy. But, what will the cost of this energy transition be and what just transition approaches might accelerate radical transformation of the South African political economy? In this paper we propose a methodology through which to estimate the cost of a just transition in South Africa.
The research estimates costs for compensation, retraining, relocation and regional development. An interrogation of this methodological approach and the corresponding just transition scenarios has the potential to inform critical policy choices and implementation strategies to advance South Africa's energy transition. While South Africa's ageing coal fleet compounds a sustained energy crisis and high unemployment rates continue to rise, the country cannot afford the spiralling cost of an unplanned, unjust transition. Aligning just transition investments with corresponding

decommissioning rates could smooth transitions and prevent the risk of amplifying climate instability. This research presented in this paper outlines various energy transition scenarios and their associated costs to support workers and stimulate regional development. Furthermore, it details various policy and governance recommendations, including the institutional mechanisms required to facilitate this just transition process in South Africa. With relevance to the sustainability transitions community, the paper synthesises the usefulness of this methodological approach to accounting for the cost of a just transition. To this end, the paper expands on avenues for future research and how this just transition framework might be applied in other contexts to support energy transitions in the global south.

2. Methodology

The study uses a model to calculate the cost of a just transition for coal workers in South Africa. This is estimated in terms of compensation, retraining, relocation and rehabilitation. Labour data was collected using employment data available in national databases and a survey questionnaire sent to coal companies. Data included: Age breakdown, Skills levels, Education, Salary, Geographical location, Pension Fund and Labour sending areas. This data was applied using a model.

Five target organisations were identified through the Department of Mineral Resources and Energy, which accounts for 85% of coal production. Questionnaires were sent to coal companies to obtain specific labour data and companies' Social and Labour Plans were used to supplement the data.

Coal industry growth and contraction rates were obtained from sector reports and standardised across the study and detailed pension information was obtained from Mineworkers' Pension Fund (MPF) Reports.

The quantitative model was used to calculate costs and considerations for worker transition strategies in the coal sector and how can a just transition be applied to mitigate labour losses.

3. Framing a Just Transition in South Africa

The 'just transition' means many things in South Africa, from radical visions of a post-capitalist socially-just future powered by renewable energy, through to a nuclear-driven mass industrialisation programme, through to ensuring coalminers who lose their jobs are employed elsewhere. The just transition concept has increasingly been used in political discourse in South Africa and this can be attributed to an increased awareness of climate change and the urgent need for a transition to a low-carbon economy. The National Planning Commission and local CSO's have hosted various social dialogues aimed at stakeholders and the wider public, to better understand perceptions of a just transition as well as energy needs. When South African government-related policymakers speak, what they usually have in mind is the future of the Mpumalanga Province's coal-based economy that supports the livelihoods of around 82 000 coal miners (Minerals Council 2019). With the loss of 60 000 jobs in the declining gold sector over the past decade fresh in their minds, unions correctly refuse to consider any deviation from coal-fired power generation.

The premise for Pollin & Callaci's (2019) worker support framework is that jobs are at risk in the transition to a low carbon economy, especially if there are no strong policies in place (Pollin & Callaci 2019:94). The authors highlight the risk of job losses and unemployment leading to instability which they argue could exacerbate climate instability. "It follows that a climate stabilisation project must unequivocally commit to providing generous transition support for workers" (Pollin & Callaci 2019:94). This argument aligns with the UNFCCC's (2016) warning about social protest. Pollin &

Callaci (2019:94) reference Tony Mazzocci's definition of a just transition for workers, which emphasises the rights of workers who "deserve a helping hand to make a new start in life".

In an unequal society, like South Africa, where distributional, procedural, restorative tenets of justice are not fully applied i.e. worker communities are exposed to unsafe polluted air, live in low-income communities and have low life expectancy, a just transition is an important consideration. A just approach will determine the selection of the types of measures to be implemented. Newell & Mulvaney (2013:1) defines a just transition as: "energy access for those who do not have it; justice for those who work within and are affected by the fossil fuel economy; and attempts to manage the potential contradictions that might flow from pursuing energy and climate justice simultaneously". This framing is closely aligned to the emerging understanding of a just transition in South Africa.

Pollin & Callaci describe their cost model as basic and suggest that the cost of a just transition will likely be 'modest' due to the likelihood of jobs in the RE sector. They raise a pertinent point concerning the potential economies have to mitigate job losses:

> the single best form of protection for displaced workers in all industries is an economy that operates at full employment. A full employment economy is one in which there is an abundance of decent jobs available for all people seeking work. In a full employment economy, the challenges faced by displaced workers—regardless of the reasons for their having become displaced—are greatly diminished simply because they should be able to find another decent job without excessive difficulties. It also follows that, in a full employment economy, the costs to taxpayers of providing reasonable levels of financial support for displaced workers would be greatly diminished. Overall, then, a commitment to full employment should be understood as consistent with and supportive of the project of building a clean energy economy (Pollin & Callaci 2019:95).

This argument offers an important means of job protection. It also emphasises the need for a sectoral approach as a way to mitigate losses. But most of all it aligns with the ILO's broad definition of a just transition, which recognises that a 'sustainable economy' is instrumental to creating decent jobs in the interest of mitigating climate change.

In Germany, workers transitioned to the metals and renewables sector and in the Netherlands and Canada the designated sector was gas. If the ILO's definition applies, sustainable sectors would need to be sought and sectoral policies developed to ensure this.

At the Just Coal Transition for South Africa event hosted by the ERC, TIPS, IDDRI and Climate Strategies in February 2019, trade unionist Patrick Mathebane of NUM explained that "A just transition must be aligned with our culture – a system to which our people can easily adapt". These words are a prescient reminder that a just transition needs be suited to South African coal workers and their communities.

The Pollin & Callaci economic support model for a just transition is used to calculate the cost of the following key areas to support workers in transition:

(1) income, retraining, and relocation support for workers facing retrenchments;
(2) guaranteeing the pensions for workers in the affected industries; and
(3) transition programs for fossil fuel dependent communities

They apply this model to coal mining, oil & gas extraction, petroleum refining, fossil fuel-based electricity, power generation and natural gas distribution, as well as ancillary industries hat support

coal, oil and gas extraction. In this paper, this model will be exclusively applied to the coal mining sector in SA.

The model aims for an 83% attrition rate. Attrition is the percentage of workers between 45-65 nearing retirement as a percentage of the number of workers that need to be cut. In other words, the ideal is to have older workers in this age group retire naturally rather than lose their jobs. Therefore, pensions need to be secure, and the approach recommends benchmarks for pension guarantees as well as ideal levels of pension security.

It is within this framing that I explore the cost of a just transition, with a specific focus on mitigating labour losses in South Africa's coal sector. As such, the dominant framing of the just transition in South Africa provided the rationale for pursuing this cost estimate exercise. Moreover, recent research indicates that the mitigation of labour losses has not been adequately scoped in South Africa and a lack of data makes it difficult to plan or manage these risks (Steyn, Burton & Steenkamp, 2017).

4. Results: Forecasting the cost of coal worker protection over 20 years

Pollin and Callaci's (2019) approach was applied to the South African coal sector, using available sector and labour data. The model enabled various scenarios to be elaborated, two of these are detailed in Table 1 below. The cost model was populated with various inputs including various forecast contraction rates, the total number of people currently employed in the coal sector, and the number of workers between 45 and 65. The local scenarios are informed by attrition rates and the IRP.

Table 4.1 Attrition by retirement and coal job losses: SA coal workers (over 20 years)

		High Attrition *Scenario one*	IRP Decommissioning *Scenario two*
a	Contraction rate	43%	75%
b	Current employed total	82 248	82 248
c	Job losses over 20-year transition	35 367	61 686
d	Average job loss p.a.	1 769	3 085
e	Workers between 45 and 65 (35%)	28 787	28 787
f	Workers per year reaching 65	1 439	1 439
g	Workers u/45 p.a. req. re-employment	330	1 646
h	Total u/45 req. re-employment/20 yrs.	6 600	32 920
i	Attrition as a % of job losses	82%	46%

(Source: Employment data: Minerals Council; Age profile: Mining Qualifications Authority & TIPS)

Scenario one – achieving a high attrition rate

The application highlights the point at which an 82% attrition rate is achieved (Row I) in relation to corresponding contraction scenarios i.e. 43%. The high 82% attrition rate implies that at most 6 600 coal workers will require re-employment over 20 years, versus 32 920 in the accelerated decommissioning scenario respectively. Even at an 82% attrition rate, 6 600 translates into 330 coal workers needing retraining per year.

Following Pollin and Callaci, an 82% attrition rate scenario was used to calculate the costs of the mitigating labour losses in the coal sector in South Africa which is outlined in Table 2. In effect, the model demonstrated that the ambition for an 82% attrition rate is in line with a least cost scenario (ERC 2019). However, the picture changes radically if we take the decommissioning timeframes stipulated in the IRP seriously.

Scenario two – IRP decommissioning

The second, and most startling scenario, is that based on the contraction rate implied by the IRP's decommissioning timeframe. The IRP's decommissioning plans suggest that 75% of electricity from coal will be decommissioned by 2043. Following this plan, employment contraction rates will need to be established as part of the just transition plan. Applying Pollin and Callaci's (2019) attrition approach to this scenario in Table 1, 1646 workers would need to be retrained per annum (Row G) totalling 32 920 or a 46% attrition rate. This application demonstrates how the attrition approach significantly softens the blow from 61 686 to 32 920 workers thereby smoothing the impact of an accelerated scenario.

Cost Estimate

What is the estimated cost of mitigating coal labour losses in South Africa's just transition, according to a contraction rate for the coal industry in line with a high attrition rate?

Using the data from Table 4.1, i.e. number of workers requiring reskilling and re-employment under an 82% attrition scenario, it is possible to calculate the cost of a just transition for coal workers in South Africa. The CST research estimates the annualised, and total cost, of a just transition in South Africa over a 20-year period.

The total cost of a just transition for coal workers over 20 years is estimated at R 6 billion.

The total cost is within the range of just transitions in other countries which are between R 1,2 billion and R5 billion. The total cost of the just transition includes costs for compensation, retraining, relocation and rehabilitation.

Table 4.2 Summary of just transition costs in SA over 20 years

Costs	High attrition Scenario (Total)	High attrition pa	Decommission Scenario (Total)	Decommission Scenario pa
Compensation	1 200 000 000	60 000 000	6 000 000 000	300 000 000
Retraining	621 000 000	31 050 000	3 200 000 000	160 000 000
Relocation	100 000 000	5 000 000	500 000 000	25 000 000
LED/Rehabilitation	4 000 000 000	200 000 000	6 000 000 000	300 000 000
	5 921 000 000/6bn	296 050 000/300m	15 700 000 000/16bn	785 000 000

(Source: Application by authors)

Compensation Costs

Compensation accounts for R1.2bn. On average, coal salaries are R23 000pm. On the other hand, the average salary of workers within the green economy is R20 000. As such, the difference between these is R3 000pm. The difference between coal salaries and the average salary of the green economy equals R23 000-R20 000 = R3 000 X 12 months = R36 000 X 330 workers X 5 years = R1.2bn. Note that compensation costs are recommended for a period of five years. The average salary of a job in the green economy is based on salaries in likely alternative careers e.g. construction, manufacturing, tourism etc. Note that if salaries for the low-income Agriculture sector are factored in, the cost of compensation will increase more significantly.

Retraining

Retraining as part of the just transition is estimated to amount to R621m.

Table 4.3 Retraining costs

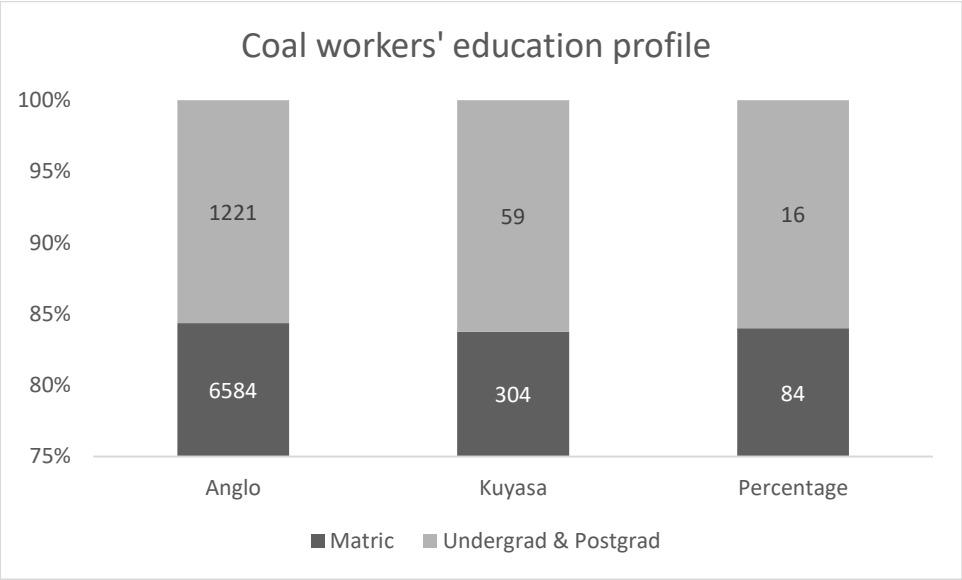
Total workers	**Workers pa**	**%**	**Type of Course**	**Cost**	**Total Cost**
1 056	53	16	Already have degrees. Retraining/Top-up: e.g. Hydraulics, Geography	R40 000	R43m
3 564	178	54	Degree	R140 000	499m
1 320	66	20	Vocational	R50 000	66m

660	33	10	Solar/Wind Turbine Technician	R20 000	13m
6 600	330	100			R621m/31m pa

According to available Social and Labour Plans (SLPs), 16% of coal workers already have an undergraduate qualification as is outlined in Figure 4.1 below, however the retraining costs includes top-up training. The balance of the 330 workers pa is split between degrees, vocational training and solar/wind turbine technician training. The retraining costs exclude accommodation, food, transport and salaries/stipends while retraining.

Education Profile

Figure 4.1 Education Profile



(Source: Anglo SLP, Kuyasa Scoping Survey)

The scoping survey found that 84% of coal workers have matric, but only 16% have an undergrad or postgraduate qualification. This is lower than the 75% of workers with matric that has been estimated previously (TIPS 2018) and could have an impact on the transferability of skills. However, artisanal skills which are typically found in the mining sector, can have significant value and can be transferable. Figure 4.1 indicates skills levels at Kuyasa Coal. The graph shows that the majority of workers are either skilled or semi-skilled.

Relocation Costs

Relocation, that is support provided to workers displaced from the shutting down of the facilities where they are employed, comes to R100m.

Relocation costs were based on one month's rent, travel costs and sundries like legal costs for a lease averaged at R15 000 X 6 600. Not all workers will need to relocate which will accommodate variances in the average cost.

Regional Development and Rehabilitation

By far the costliest aspect of initiating a just transition in South Africa will be the regional development required to rehabilitate communities and local economies that have thrived, and indeed also suffered, from their centrality in South Africa's coal-based economy.

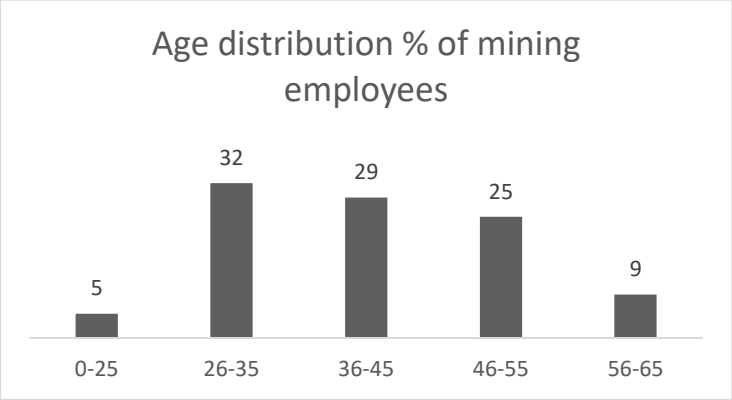
Due to a lack of transparency regarding coal companies' rehabilitation plans, further research is required to calculate this cost more accurately. The current estimate for regional development in this research study is based on average investments in Special Economic Zones (SEZs) in SA. Estimates for rehabilitation and regional development costs in other countries were also used. The cost of rehabilitation of one coal mine is estimated to be R4bn in the CER's Full Disclosure Report The Truth about Mining Rehabilitation published in 2018 (CER 2018). It follows that the cost of rehabilitation of the coal mining region would be significantly higher. It is likely that government will need to stimulate local economic development through innovative strategic partners from civil society and the business sector. It is important to distinguish between rehabilitation, land reclamation and regional development and to further define these concepts in more detail.

While supportive attrition-based just transition approaches would likely increase income protection for coal workers, complementary sequenced sectoral and regional development strategies have proven to be effective ways to stimulate job creation.

Age distribution

The median age of coal workers is 38 years which is coincidently the same for all mineworkers in South Africa. (TIPS 2019). The Minerals Qualifications Authority (MQA) provides a breakdown of the age distribution of all mineworkers in Figure 4.2. It shows that 66% of miners are 45 years and under, while 34% are over 46 years (MQA 2014).

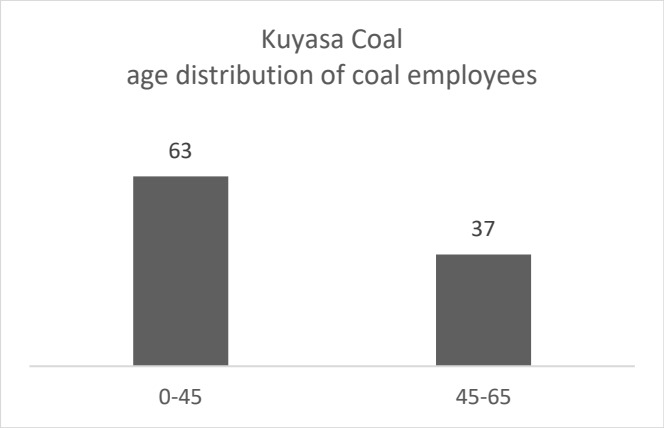
Figure 4.2 Age distribution: SA miners



(Source: Mining Qualifications Authority 2014)

Data from Kuyasa coal mine (Figure 4.3) shows that 63% of Kuyasa coal miners are under 45, while 37% are over 45. Although the Kuyasa coal data correlates with the MQA's data, the number of employees at Kuyasa Coal is only 385, so the sample may not necessarily be representative.

Figure 4.3 Kuyasa Coal: Age distribution



(Source Kuyasa Coal Scoping Survey)

The age distribution can be further estimated using inferential calculations based on the median age of 38. The median is applied to the total number of coal workers, 82 247, in South Africa. (Quantec 2017):

If the median age is 38, then half, i.e. 41 124 employees are either over or under 38 years old. The age span could not be more than approximately 40 years, given that the average life expectancy is 60 for men in Mpumalanga (Stats SA 2019). If half the number of workers take 20 years to reach the median age of 38, 6 more years to 44 will include 12 337 workers in the spread totalling 53 461 under 45 with 28 787 45 or over. Therefore, the age split is estimated at 65% of workers being under 45, with the remaining 35% being over 45. This percentage ties up with both the MQA and Kuyasa data. This percentage will, therefore, be used to calculate age in the age scoping survey.

Transferability of Skills

In terms of transferability, a US study by Louie and Pearce (2016) indicates that there are sufficient opportunities for coal sector workers in the solar industry, but that workers would require retraining. Another study by the EC and ILO (2011) indicates that the skills of electrical engineers, electrical technicians, electricians and information technology specialists are directly transferable to renewable power plants.

Table 4.3 Transferability of Skills

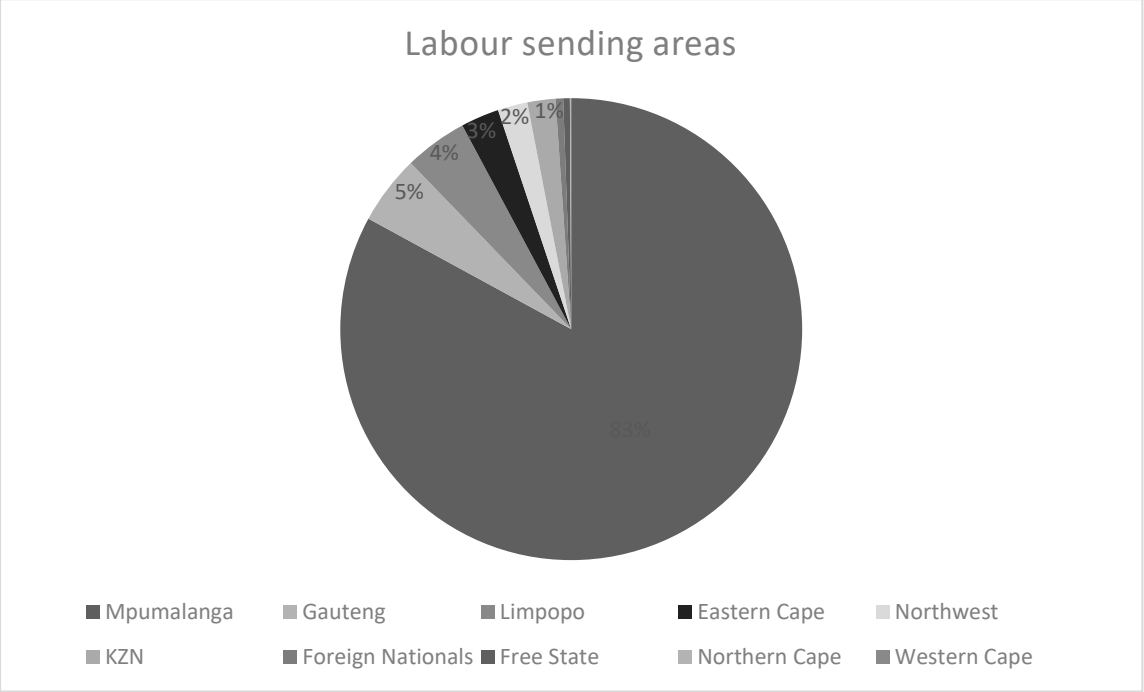
	SA1 KUY	SA2 BHP	AUS	SPV Cons	SPV Man	SPV O&M	OnW Cons	OnW Man	OnW O&M	OffW Con	OffW Man	OffW O&M
Managers	6	2	6.7	1	4.2	6.3	1.7	7.6	1.5	2.2	4.6	3
Other professions	7	9	10	5	12.7	4.4	10.6	11.3	11.6	7	26	15.8
Engineering	1		0	3.8	14.3	14.7	1.8	8.7	27	6.2	6.3	7.7
Technicians	27	11	7.5	7.2	6.3	26.2	27.8	6.5	46.9	0.1	3.5	25.1
Clerical	0	1	5.1	3.3	4.9	1.3	0.3	4.6	4.7	0.2	9.2	8.4
Construction	0		0	0.8	0	0	9.9	2.5	0	0	2	5.5
Metal Trades	0		16.3	1.8	7.9	0	7.9	28.4	0	0	23.3	0
Electricians	0		5.5	14.2	21.6	32.3	13.8	4	4.1	0.2	3.3	5.5
Plant & Machine	15	74	46.4	55.6	10.6	0	21.9	18.3	0	12.9	15	20
Elementary	45	2	2.6	7.4	17.5	14.7	4.3	8.2	4.1	0.8	6.7	8.9

(Source: SA 1 = Kuyasa Coal (n=262); SA2 = BHP Billiton Coal (n=2230) Social and Labour Plan data; AUS = Australia; SPV = Solar Photovoltaic. Across Manufacturing, Construction and Operations & Maintenance Categories, Dominish et al. 2019)

Using occupational analysis methods, Dominish et al. (2019) compare occupation categories across renewable technologies and fossil fuel industries. Table 5.16 uses their findings for coal and solar PV in Australia and compares this to Kuyasa and BHP Coal's occupational profiles. There are some similarities in both countries in terms of management, 'other professions' and plant and machine categories which implies transferability. Kuyasa has more employees in elementary positions. This could indicate that more intensive training may be required for 'in-demand' SPV categories, such as plant & machine (short-term) electricians, engineers and technicians (long term). However, during the interview the representative from Kuyasa revealed that all mineworkers have a minimum of matric with Maths and or Maths & Science, meaning that all employees appear to be highly trainable.

Displacement of workers in transition

Figure 4.4 Labour sending areas



(Source: Social and Labour Plans: Kuyasa 2016, BHP 2012 & Xtrata 2009-2013. n=4326)

Mining SLPs indicate labour 'sending areas', referring to areas that miners originally relocated from. Although miners (83%) in Mpumalanga are from the province, a significant portion come from surrounding provinces, e.g. Gauteng (5%), Limpopo (4%), KZN (3%) and Eastern Cape (2%). Many of these workers may have dependents in these provinces and could potentially be reunited with their families when alternative forms of employment are considered. This could be explored by including neighbouring areas in partnerships with municipalities, employment agencies, and the private sector.

Review of pension Guarantees

The Pollin & Callaci (2019) economic just transition framework is based on achieving attrition through retirement, which largely depends on pensions being secure, decent and available. According to TIPS (2019), 90% of South African coal workers contribute to a pension fund. This percentage does not, however, account for contract workers.

While a significant number of coal workers have historically held permanent positions, recent divestment in the coal sector has paved the way for the emergence of new market leaders, who employ a significant proportion of contract workers.

Until recently, Anglo Coal and South 32 held dominant positions in the market. However, the recent sale of assets and announcement of divestment, have effectively restructured the coal mining industry and has positioned Exxaro and black-owned Seriti as market leaders (Moneyweb 2019). Both companies have a significant portion of contract workers on their respective payrolls. Exxaro

employs 6 500 permanent workers and 15 500 contractors (Exxaro 2018) while Seriti employs 3 000 permanent staff and 3 000 contractors (Seriti 2019). This shifting landscape and the impact it has on the number of workers with limited pension cover has implications for social protection in transitions.

Besides the estimated 10% of permanent workers who do not have pensions, the pension gap amongst contractors will need to be considered when planning a just transition for all workers. Pollin & Callaci (2019) recommend that pension shortfalls be covered by government funding.

In South Africa, workers finance their retirement through various sources including employee pensions, old age grants and through personal savings. In Mpumalanga, unemployment levels exceed the national unemployment rate at 36,5% and the expanded rate is 43,8% while more than half of the population live in poverty, with 25% living in extreme poverty (StatsSA 2019). Given that most workers have 3 dependents (Burton 2019), the prospect of miners amassing meaningful savings are remote. The poverty in this region highlights the need for adequate planning to accommodate workers who have families who rely on them.

Pollin & Callaci (2019) use the following measures to assess US pension fund guarantees:

- Net Income
- Dividend pay-outs
- Stock buybacks
- Unfunded pension liabilities

This approach has been slightly modified to accommodate South African reporting methods however the focus on income, benefits paid, and levels of funding will be still be analysed. This study recommends the following measures for evaluating South African coal mineworkers pension funds:

- Contributions received
- Investment Income
- Benefits Paid
- Surpluses

This modified approach is based on a framework used by senior economist Dick Forslund to evaluate the GEPF (Daily Maverick 2019) and will be applied to the Mineworkers Provident Fund.

Mineworker's Provident Fund

Notably, six coal mining companies have chosen the MPF, including market leaders such as Exxaro Coal. Coal workers' contributions were originally negotiated in collaboration with the National Union of Mineworkers (NUM), United Association of South Africa, Solidarity, and the Chamber of Mines in 2005 and range between 14,5-16,5%, and include 6,5% risk-benefits as well as separate funeral cover policies (MFP 2018). The NUM and the Minerals Council will need to be included in future just transition negotiations.

An independent valuator of the MPF describes the fund's financial position as follows: "the assets of the fund were more than sufficient to cover the member liabilities… I do not anticipate that the financial position of the fund would have changed from the statutory and interim valuation dates" (Mineworkers Provident Fund Annual Report 2019).

The actuary's confirmation is echoed by one of their existing clients, Kuyasa Coal, who indicated in the scoping survey that the pension fund is financially healthy and able to meet future obligations (Kuyasa Coal 2019).

While the fund appears to have reasonable reserves and can meet their liabilities, an initial year on year comparison shows a variance in investment income which needed to be buffered from reserves. Although the MPF appears to be able meet its pension obligations in the immediate future, it is unclear what guarantees are in place for the duration of an energy transition which is expected to last 20-30 years?

Additional analysis of the MPF annual report shows that workers were eligible for home loans, but that could cease if workers no longer receive payments from the fund. There may, therefore, be consequences for workers who withdraw their benefits or reinvest in other funds. An interview with Kuyasa Coal confirmed that their workers do make use of the MPF home loan facility (Kuyasa Coal 2019).

Anglo American describe their South African pension plans as being "in surplus" (Anglo American Annual Report 2017). The company also offers "unfunded medical aid plans," which are extended to retired employees and selected dependents. They note that Anglo's SA pension plans are currently not accepting new members; and that they are not currently making employer contributions noting that most "plans are closed to future benefit accrual". They argue that the provision for health benefits, such as anti-retroviral therapy for staff with HIV, does not impact their post-employment medical plan liability in a significant way. (The weighted average duration of the Anglo's plans is ten years). This review of Anglo's plan reveals workers' needs for medical cover as well as the health services employees have access to while employed.

(Note that Eskom, Sasol and Engen are not included in the review as this study focuses on coal mine workers)

While the MPF and Anglo evaluate their pension funds using similar criteria, how do these compare to industry benchmarks and what norms and policies were used to set these standards?

Forslund (2019) applies benchmarking to evaluate the GEPF and explains that the law that governs this fund stipulates that 90% coverage is required. Coverage is the extent to which a company's assets can cover its liabilities. By comparison, US private schemes apply a rule of 80% to their private schemes while credit rating agencies Standard & Poor's and Moody's & Fitch Group regard a fund as poor if their rating drops below 60%. Forslund asks a pertinent question in his analysis, "Why does the law stipulate a mere 90% funding level? Mustn't all pension obligations be paid?" (Daily Maverick 2019).

He answers his question with an explanation that the "pay-as-you-go" pension schemes rely on the fact that they do not have to pay out pensions to all contributors in one day and generally expect to pay out pensions incrementally over 30-50 years. He further explains that these types of pensions are standard in countries with labour movements, as is the case in the coal mining sector in South Africa.

But what does this mean for job losses in energy transitions and how are funds planning to manage the need for increased pay-outs and reduced contributions in energy transitions?

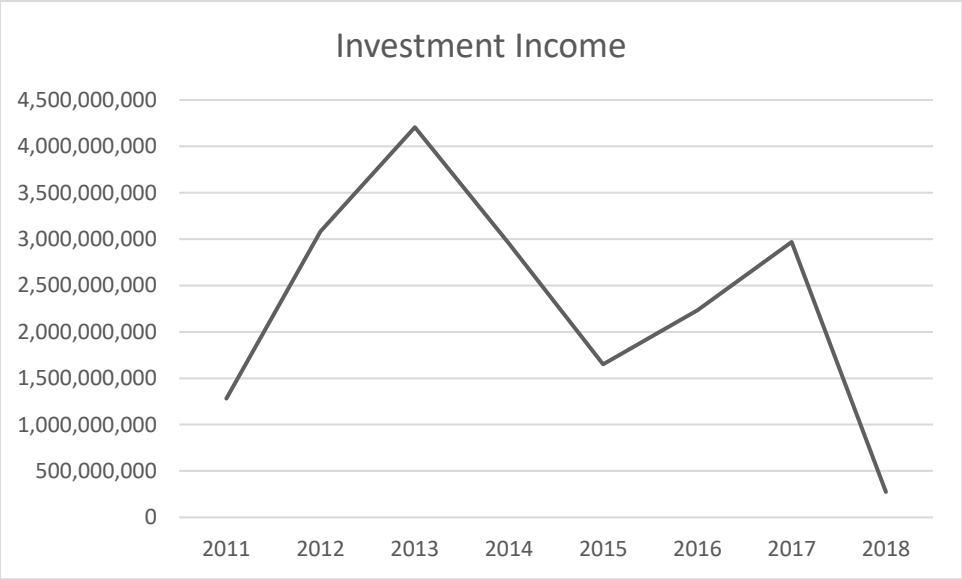
To be able to secure pensions, pension governance laws and agreed coverage standards are crucial mechanisms to ensure guarantees are met. Further to this, the history of the South African pension

industry, investment philosophies and market forces have also been instrumental in affecting a funds financial position. Similarly, market volatility, outdated investment approaches and laws may result in exposure to risks. We therefore need to ask if do current laws and policies need to be adjusted to ensure that pensions are guaranteed throughout the transition process?

Forslund (2019) reiterates that in the case of the GEPF, investment cash flows remained untouched for the past 14 years and that "exponential growth" was uninterrupted bar the 2008 – 2009 market crash. "The returns were so ample that finance ministers ignored auditors' recommendations to increase employee contributions and companies relied on investment returns to bolster reserves" (Daily Maverick 2019).

While the MPF shows a relatively consistent increase in reserves, surpluses and investment income, which is comparable to Forslund's analysis above, Figure 4.5 shows volatility in investment income over the past eight years, reaching a low point in 2018.

Figure 4.5 Investment Income

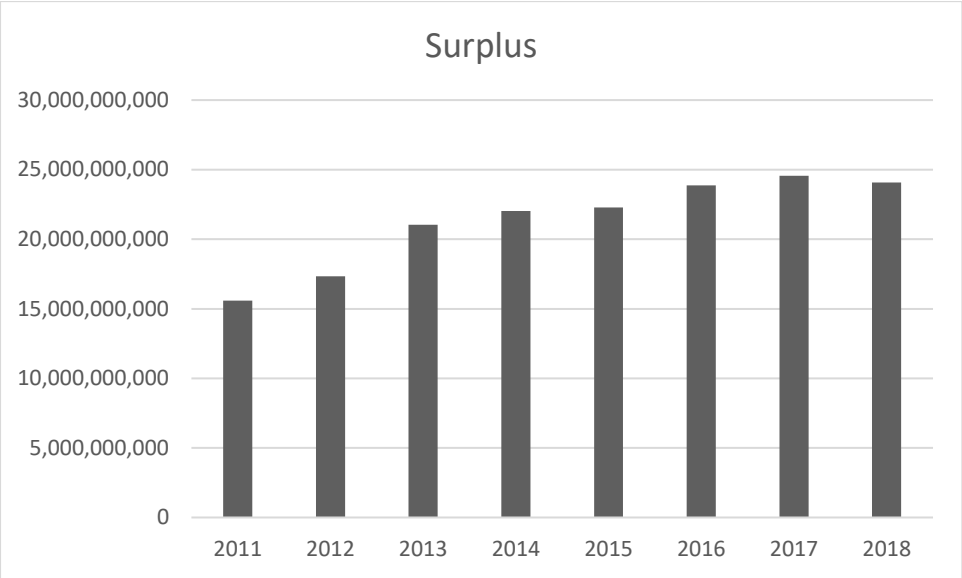


(Source: Mineworkers Provident Fund Annual Report 2011-2018)

Despite this, these shocks were absorbed by the fund's reserves. The impact can be seen in Figure 4.6. While the MPF continues to perform well, it may be necessary to review the fund's investment policy to avoid recent losses, which according to the valuators report, amount to R74m. The fund currently focuses on 40% of its portfolio on capital protection, while the remaining 60% is market-linked and aims to beat inflation (CPI) by 4,5% over three years (MPF 2018).

Over the period under review, the GEPF appears to have experienced similar losses which Forslund (2019) attributes to risky investment strategies with over 50% exposure to equities, which is less than the MPF's at 60%. These similar fates and investment strategies are concerning as the funds are meant to safeguard the pensions of their workers and their dependents.

Figure 4.6 Net Surplus

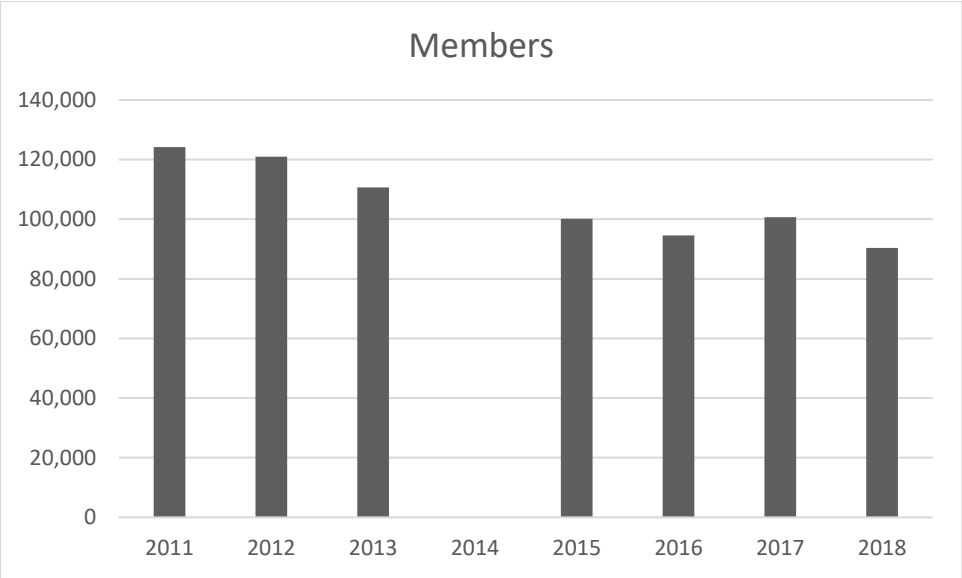


(Source: Mineworkers Provident Fund Annual Report 2011-2018)

This review of the MPF has shown that although surpluses remained solid and have weathered shocks such as low investment returns and large-scale retrenchments, it is not yet clear if the negative trend in 2018 is signalling a decline in surpluses. The fund may face the risk of a fall in membership given the recent market dynamics and emerging energy transition; divestment and the impact of the 4th industrial revolution. It is also being negatively impacted by rising electricity costs. The fund's protection mechanisms must factor these risks in through enabling legislation.

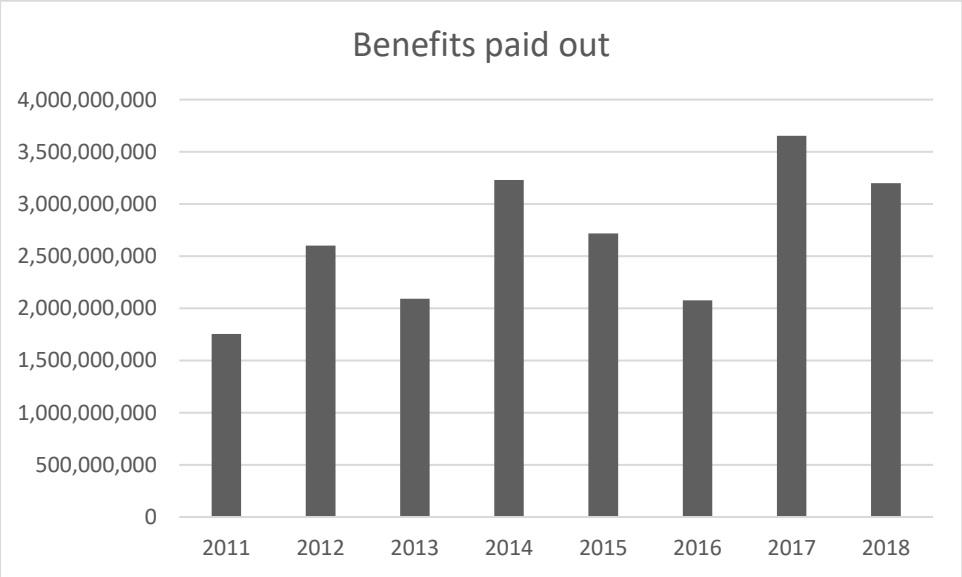
In the comparative case of the GEPF, Forslund (2019) considers the decline in member numbers and benefits paid out in the government fund. The data shows that the MPF members are steadily declining while benefits pay-outs are increasing (Figures 4.7 and 4.8). This was has been especially so in periods of retrenchment in 2012 and 2013, and between 2017 and 2018. (See Figure 4.9).

Figure 4.7 Membership growth and decline



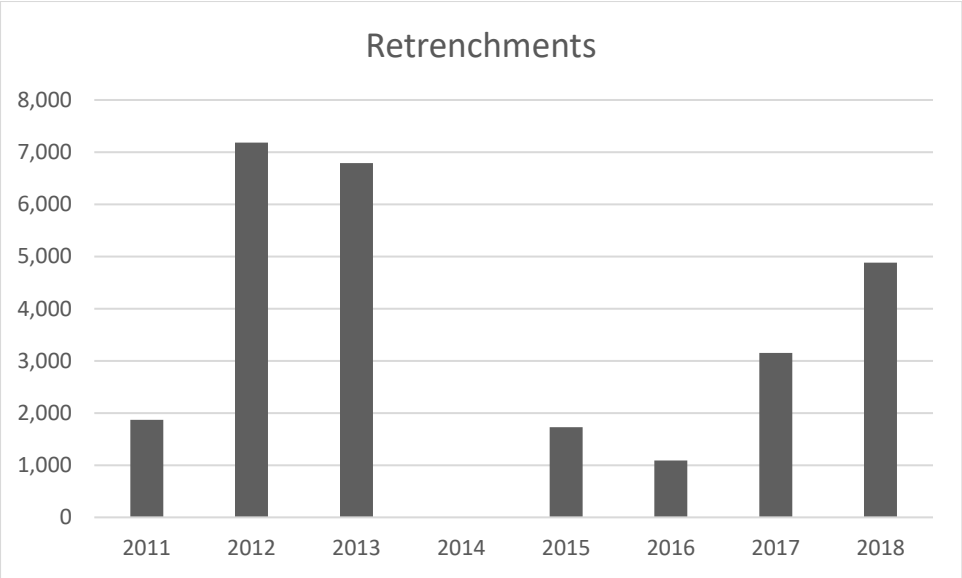
(Source: Mineworkers Provident Fund Annual Reports 2011-2018. Note that data for 2014 was unavailable)

Figure 4.8 Benefits Paid



(Source: Mineworkers Provident Fund Annual Reports 2011-2018)

Figure 4.9 Retrenchments



(Source: Mineworkers Provident Fund Annual Reports 2011-2018. Note that data for 2014 was unavailable)

5. Discussion and critical considerations

This first attempt at estimating the cost of the just transition naturally does not account for all aspects of what these efforts will entail in reality, and indeed, the dynamics that they will trigger. Specifically, the cost model does not account for full programme costs such as establishing and managing a just transition commission, just transition 'model' development, travel, accommodation and stipends for workers being retrained, strengthening social institutions (CSO's and legal support networks), health compensation costs, community and family employment initiatives and pre and post assessment to mention a few. For this reason, the model and its resultant cost estimate must be positioned as a low-end rough estimate.

It is imperative that compensation, retraining, relocation, rehabilitation and pension security costs are adequately planned for in South Africa's strategic just transition plans. What this research does, for the first time in South Africa, is to shed light on the extent of the costs involved with realising a just transition for the coal sector. Communicating this first attempt to estimate the cost of the just transition, this R6 billion figure could prove instrumental in shaping the strategies employed to transform our economy. With increased support, this model has the potential to be deepened with more accurate figures and extended across the energy sector at large. This hinges on the participation of the mining sector in releasing accurate information about employment and rehabilitation.

Globally, the cost of a just transition is administered through innovative institutional and financial arrangements facilitated by national government. In some cases, a just transition commission has been constituted to administer climate and development finance, underpinned by inclusive strategic

planning. High-level buy-in and leadership, from government is essential to unlock sufficient resources, provide appropriate incentives and enforce punitive measures to advance the energy transition.

6. Conclusion

If the decommissioning timeframes stipulated by the IRP are taken seriously, South Africa's coal sector will need to contract by two thirds. Correlating decommissioning with attrition will thus be an indispensable part of unlocking a just transition. This research provides a first effort in this direction. No matter which way you look at it, a just transition in South Africa is going to be a costly affair. But, as the saying goes, there are no jobs on a dead planet. If our lowest cost energy future depends on the finalisation of a just transition plan, the costing exercise initiated in this research could not come at a more urgent juncture in South Africa's future.

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