

# **Gordon Institute of Business Science**

University of Pretoria

**Exploring the perception and attitude of senior management of coal mines in South  
Africa towards just transition:**

**A case study of Seriti, Thungela and Exxaro resources**

By

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## Abstract

Over the years climate change has been receiving attention. The impact of global warming can be witnessed through climate change where seas are rising, abnormal temperatures, and unpredictable environmental disasters such as Mozambique's Cyclone Idai and monsoon flooding in India to Australia's wildfires. Furthermore, the shift in human activities is amongst the main contributors to the increase in carbon emissions, including the burning of coal during power generation which releases carbon emissions and is identified as the main cause of climate change. To mitigate this risk, just energy transition from the use of fossil fuel energy generation to renewable energy generation was identified as the solution, especially in an economy that is dependent on coal like South Africa.

The study aimed to assess the perception, attitude, and readiness of senior coal mine managers toward just energy transition. The research questions explored the readiness, attitudes, and perceptions of senior coal mine managers toward just energy transition using socio-technical as a framework. A qualitative research method that encompasses research interviews with senior coal mining managers. The collected data were analysed using thematic analysis. Deductions made from the analysis indicate that just transition in coal mining is not a linear process, it is filled with barriers and challenges. Furthermore, coal mining is not ready to transition using renewable energy instead of coal. A study recommends a phase-in approach to continue mining coal and introduce just energy transition to mitigate the risk of load shedding.

**Keywords:** coal mines, Mpumalanga, perceptions, and attitudes

## Declaration

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## LIST OF ABBREVIATIONS

GHG	greenhouse gas
DEAT	Department of Environmental Affairs and Tourism
UN	United Nations
SDGs	Sustainable Development Goals
<i>NEMAQA Act</i>	National Environment Management Air Quality Act 39 of 2004
MoU	Memorandum of Understanding
CO <sub>2</sub> e	carbon dioxide emission
CO <sub>2</sub>	carbon dioxide
VP	Vice President
CEO	Chief Operating Officer

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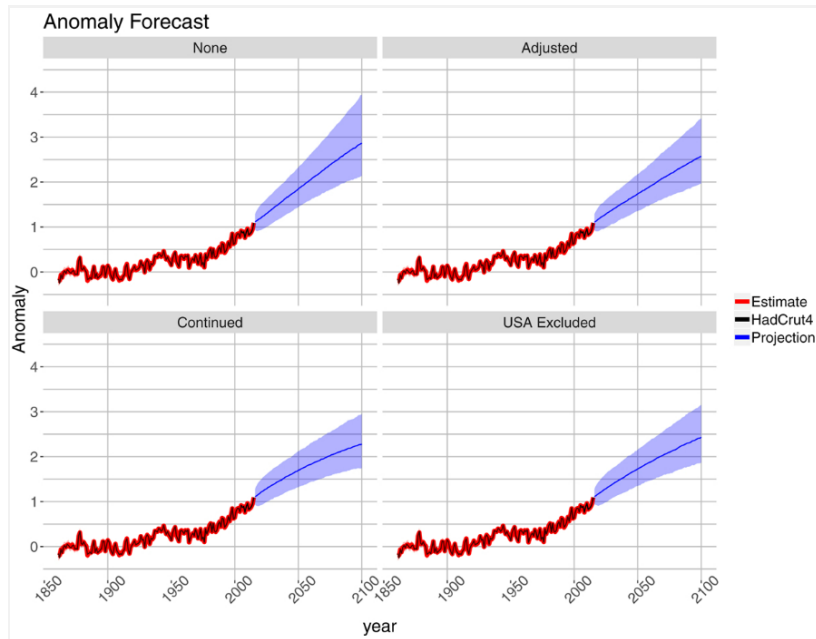
# CHAPTER ONE: DEFINITION OF PROBLEM AND PURPOSE

## 1.1. Introduction

Global warming projections indicate a dire side effect and require urgent action to mitigate the risk (Balinta et al., 2017). Climate change's impact is visible and is testified to through climate-driven disasters. "Mozambique's Cyclone Idai and monsoon flooding in India to Australia's wildfires will remain life-long and harrowing embodied experiences" (Tschakert et al., 2021). Global warming must be reduced to sustain the existence of all living on earth. The increase in greenhouse gas as not addressing it may equate to a willingness to fast-track the end of life (Balinta et al., 2017).

The increase in greenhouse gas (GHG) emissions has been on an upward trend leading to climate change (Zheng et al., 2019). According to Orru et al. (2017), climate change is caused by increased gas emissions such as carbon dioxide (CO<sub>2</sub>), nitrous oxide, methane, chlorofluorocarbons, and water vapour released into the atmosphere by natural or anthropogenic processes. According to Momodu et al. (2022), anthropogenic activities are the main contributor to climate change. Anthropogenic is when environmental pollution such as fossil fuel combustion and land use conversion from ecosystem to agricultural land are caused by human activities (Momodu et al., 2022). What is alarming is the projection by Liu and Raftery (2021) of a sudden steep increase in temperature. The temperature rise is an indication of global warming. Figure 1 portrays a steady rise in temperature from 1850 and a steep projection from 2100. These indications should inspire drive and support towards just energy transition.

Figure 1. 6: Global mean temperature forecast



(Liu & Raftery, 2021)

Many countries, including South Africa, have implemented policies and taxes on carbon emissions. The aim is to reduce carbon emissions to a global level below 2 degrees Celsius (2°C) to align with the 2015 Paris Agreement (Liu & Raftery, 2021). South Africa’s greenhouse gas emission is rising (Zheng et al., 2019). In 2014, South Africa contributed to 1.37% of global carbon emissions, which is lower than the desired global target of below 2°C (Wang & Jiang, 2019). Even though the emitted carbon was lower than the global average, the issue is that there is an increase in carbon emissions. Coal is responsible for 87.8% of net carbon dioxide emissions in South Africa, making it the biggest emitter in the country (Thopil et al., 2018).

In 2009, the Department of Environmental Affairs and Tourism (DEAT) set a target of a 42% reduction in carbon emissions by South African power stations in the year 2025 (Pretorius et al., 2015). As of December 2021, 88.9% of South Africa’s power is generated by coal-fired power stations. Renewable energy sources contribute 5.5% to the grid, and the remaining 5.6% comes from nuclear power. Both nuclear and coal-fired power stations can provide baseload power. Baseload in South Africa, baseload power supplies the grid 24 hours a day, seven days a week, except during maintenance (Thopil et al., 2018).

According to Cock (2019), a significant driver of environmental inequality in South Africa is coal mining and burning coal for power generation by Eskom. Eskom is South Africa’s

largest power entity generating approximately 96% of South Africa's electricity (Akinbami et al., 2021). Coal burning was identified as a major polluter of the environment, and South Africa's reliance on coal for energy generation will compromise a drive toward low carbon emissions (Akinbami et al., 2021). Mpumalanga is the biggest culprit of carbon emission in South Africa, with Emalahleni as the significant source due to the coal mining industry (Cock, 2019). Mining activities have been classified as a primary source of air pollution according to the National Environmental Management Air Quality Act (NEMAQA) No. 39 of 2004 (Tshehla & Wright, 2019) and are a significant producer of GHG emissions (Lui et al., 2021).

Climate change challenges need all countries to work together in establishing a policy that will address the reduction of GHG emissions, and set targets must be complied with to reduce further impacts (Balinta et al., 2017). Climate mitigation policy is still challenging on global, continental, national, and regional levels (Babatunde et al., 2017). Some aspects still require clarity concerning cross-border pollution and how the targets must be set, ranging from developed, developing and underdeveloped countries. Regardless of the allocation of targets among different countries, the focus remains to save the planet from global warming. According to Jewell & Cherp (2019), a feasible model solution to slow down the current threat of global warming is by keeping warming below 1.5 degrees Celsius (°C) to achieve an ambitious target of less than 2°C by 2050. The identified area to fast-track the achievement of the desired target is to rapidly decarbonise the power generation sector, mainly coal power generation (Momodu et al., 2022).

Despite the mining industry's positive contribution towards economic growth, it also offers a negative consequence in the form of GHG emissions (Carvalho, 2017). The mines produce essential minerals used every day for different uses, including construction activities and energy generation. The South African economy was anchored by the mining industry for over a century (Mancini & Sala, 2018). The mining industry in South Africa has contributed immensely to both social and economic growth (Mancini & Sala, 2018). Sub-industries were established to service the mines, including manufacturing. Many of the Sustainable Development Goals (SDGs) set by the United Nations (UN) for 2030 could not be reached without the mining and manufacturing sectors. Mancini and Sala (2018) further state that during the extraction of minerals, environmental impacts also affect the well-being of the people residing in and around mining towns.

A considerable percentage of global energy is generated from coal (Pudasainee et al., 2020). Developing countries and underdeveloped countries are heavily reliant on coal for power generation which makes coal mining an essential resource for power generation and economic growth. A continuous power supply contributes to the country's stability and attracts foreign investment (Akinbami et al., 2021). Pudasainee et al. (2020) further state that coal is a non-renewable resource and that world coal reserves are depleting, with most high-grade coal being mined out. The use of coal for power generation has been forecasted to continue for the next three to four decades while countries and organisations are introducing renewable energy. Seriti, Exxaro, and Thungela Resources are the leading coal producers in South Africa, with most of their operations based in Emalahleni. According to Mining Weekly, Seriti and Exxaro resources are committed to just energy transition to shift from coal to renewables (Mining Weekly, 2021). Just energy transition in the South African context is the transitioning of coal used for power generation to a cleaner energy source focusing on renewable energies (He et al., 2020). Thungela Resources has indicated that they are interested in financing cleaner coal (Bloomberg, 2022). Panel discussions during the Investing in African Mining Indaba in 2022 concerning just transition acknowledged the need to transition from coal to cleaner energy because there is a need to take action to save the planet (Manook et al., 2022).

The government of South Africa, through the National Environment Management Air Quality Act 39 of 2004 (*NEMAQA Act*), has committed to reducing the emission of air pollutants and monitoring the effects of air pollution (Tshehla & Wright, 2019). South Africa is, however, facing a challenge to balance economic growth, high demand for electricity, and a need to produce fewer carbon emissions (Akinbami et al., 2021). According to Hanto et al. (2021), coal is one of the energy sources currently in demand up to 2050.

## **1.2. Problem statement**

The Presidential Climate Commission has established a just energy transition framework to deal with practical issues to address employment, the economy, skills, support, and governance approach (Presidential Climate Commission, 2022). The framework was accepted by the President of South Africa, Cyril Ramaphosa, on behalf of South Africa. The adoption of just energy transition was motivated by evidence of climate change experienced in South Africa in the form of extreme floods, drought, and other extreme weather like heat waves (Chersich & Wright, 2019). Extreme weather harms human health

and threatens food security. Furthermore, the Presidential Climate Commission (2022) notes that its aim in South Africa is to: Cease the risk on climate due to emissions and to manage potential risks to people which arise due to just energy transition. Some of the main risks to be addressed are socio-economic, environmental, and technological implications of climate change. (p. 6).

The South African government seeks to reduce its carbon emissions, which would significantly influence coal mining productivity to curtail carbon emissions (Azevedo et al., 2018). When coal mines reduce their productivity, the impact is felt by employees who may be retrenched, and in turn, contributes to a high unemployment rate (Odell et al., 2018). Odell et al. (2018) further add that countries benefit from tax and royalties paid by the mines based on their profits and productivity. If coal mines reduce productivity, the profit made also reduces, automatically reducing the tax collected within the country. A reduced tax collection hurts the country's economy and infrastructure development due to fewer funds available to grow the economy. The challenge faced by South Africa when implementing just energy transition find a balance between economic growth, socio-economic challenges leading to unemployment, and having a sustainable future by preserving the environment (Mpfu, 2022)

Limited research has been conducted on coal mines transitioning to using renewable energies (Chang et al., 2017). Perceptions and attitudes of senior management of coal mines in South Africa towards just transition are not ascertained and analysed through scientific research to give impetus to the strategic direction and sustainability of coal mines. Not increasing readiness levels and negative perceptions will impact just transition, future growth, and job losses, which all threaten the organisation's existence (Hanto et al., 2021). Additionally, this will constrain the organisations' ability to innovate, compete, and ensure relevance as an organisation in the mining industry. A socio-economic transition framework must be adopted in line with the Just energy transition Presidential Climate Commission, which addresses all challenges resulting from the change. Measures must be put in place to reduce global carbon emissions to less than 1.5°C to reduce the impact of global warming and to ensure environmental sustainability.

### 1.3. Justification and significance of the study

Power generated using coal in South Africa will remain relevant for the next three to four decades, which will delay the transition from coal to renewable energy (Akinbami et al., 2021). The continuous use of coal will have a negative impact on environmental sustainability. According to Droubi et al. (2022), democracy is necessary even though it might not be a sufficient condition for a just transition. There is a need to include as many stakeholders as possible to allow for justice when transitioning from fossil fuels to clean energy. The chief executive officer (CEO) of the World Coal Association, Michelle Manook, stated that just transition should not be rushed without weighing the impacts and benefits in South Africa. The coal-fired power plants in South Africa employ 113,000 permanent employees, and the coal mines employ 92,000 permanent employees who will be impacted by just transitioning from coal to renewable energy. She further added that there is a need for a dialogue between the coal producers and those supporting renewable energy to discuss a holistic approach to transition from coal to renewables. Nombasa Tsengwa, Exxaro's CEO, noted that just transition must not leave anyone behind, and there is a need to educate the community to understand the need for just transition. Mosa Mabuza, the CEO of the Council of Geoscience, suggested a dialogue to clarify if just transitioning from coal to renewables means "no coal". Nikisi Lesufi, the Minerals Council of South Africa senior executive added that South Africa should not compromise its energy and job security in moving to a low carbon economy. The major coal producers in South Africa, Exxaro and Seriti, with a state-owned power utility (Eskom), signed a Memorandum of Understanding (MoU) on 25 October 2021 to develop renewable energy projects (Mining Weekly, 2021)

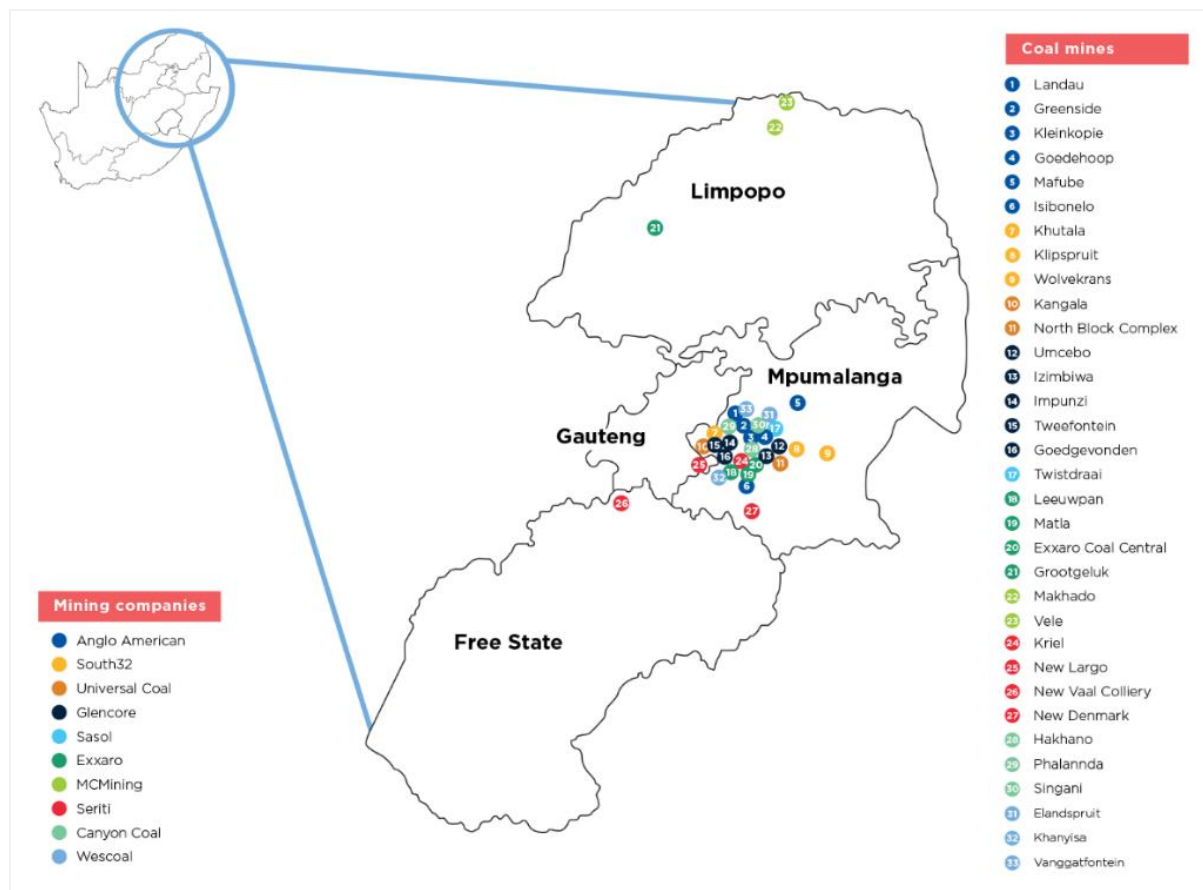
There is an acknowledgement from coal mining industry leaders on just transition. Mining organisations like Anglo American coal and South 32 have opted to diversify from coal and focus on other minerals (Burton et al., 2018). There is a need to influence all senior leaders in the coal industry to fully rally behind a shift from fossil fuels to green energy like solar and wind (Mpofu, 2022). July Ndlovu chairman of the World Coal Association and CEO of Thungela Resources, stated that "30% of the world population still depends on coal for energy, and coal will remain relevant for years to come" (World Coal Association, 2020, p.2). Upham et al. (2022) encouraged that consultation must be done with different stakeholders to get their views on just transition and how it will mitigate job losses. Steyn

(2022) emphasised that just transition will not happen independently without coal, and coal will remain an essential mineral not only for energy generation but also for still making.

#### **1.4. Selected study area**

South Africa's first mine was constructed in 1852 in Springbok (previously known as Springbokfontein) in the Northern Cape Province, where copper was mined (Casey, 2022). Coal mining commenced in 1864 in Molteno, Eastern Cape Province. The central Witbank coalfields which is coal mined in Mpumalanga were discovered 15 years later, in 1879. The South African coal deposit is mainly in the Mpumalanga Province, Limpopo Province, Free State Province, and Gauteng Province (Africa, 2022). This study selected Mpumalanga as the focus area due to the concentration of mines between Seriti, Exxaro, and Thungela Resources. According to Ullah et al. (2018), 80% of South Africa's coal is produced in Mpumalanga.

Figure 1. 7: Location of coal mines in South Africa

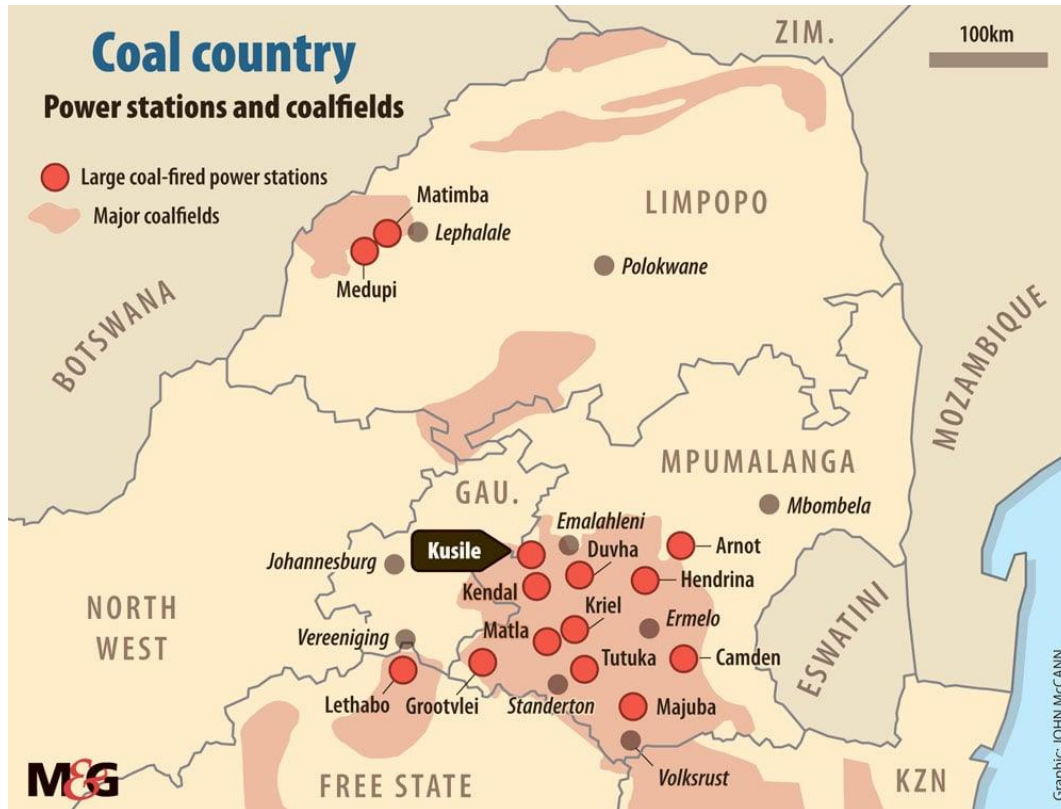


(MiningforSchool, 2022)

Figure 1.2 presents a total of 33 coal mines registered and listed at the Department of Mineral Resources (DMRE). Figure 1.2 confirms the 80% concentration of coal mines in the Mpumalanga Province. Thungela mines are represented by a blue dot, and these mines were formally known to be Anglo American’s operations; Exxaro is represented by a green dot; and Seriti is represented by red and yellow dots (the yellow dots were mines belonging to South 32 before they transitioned away from coal). Mpumalanga was selected as a study area for the concentration of coal mines and power stations, portrayed in Figure 1.3, which are the main polluters in South Africa during the power generation process (Akinbami et al., 2021). In the power station and coal field map, the peach colour represents the coal deposits in South Africa. The coal deposits match the presence of coal mines displayed in Figure 1.2.



Figure 1.3: South Africa Power Stations and Coalfields

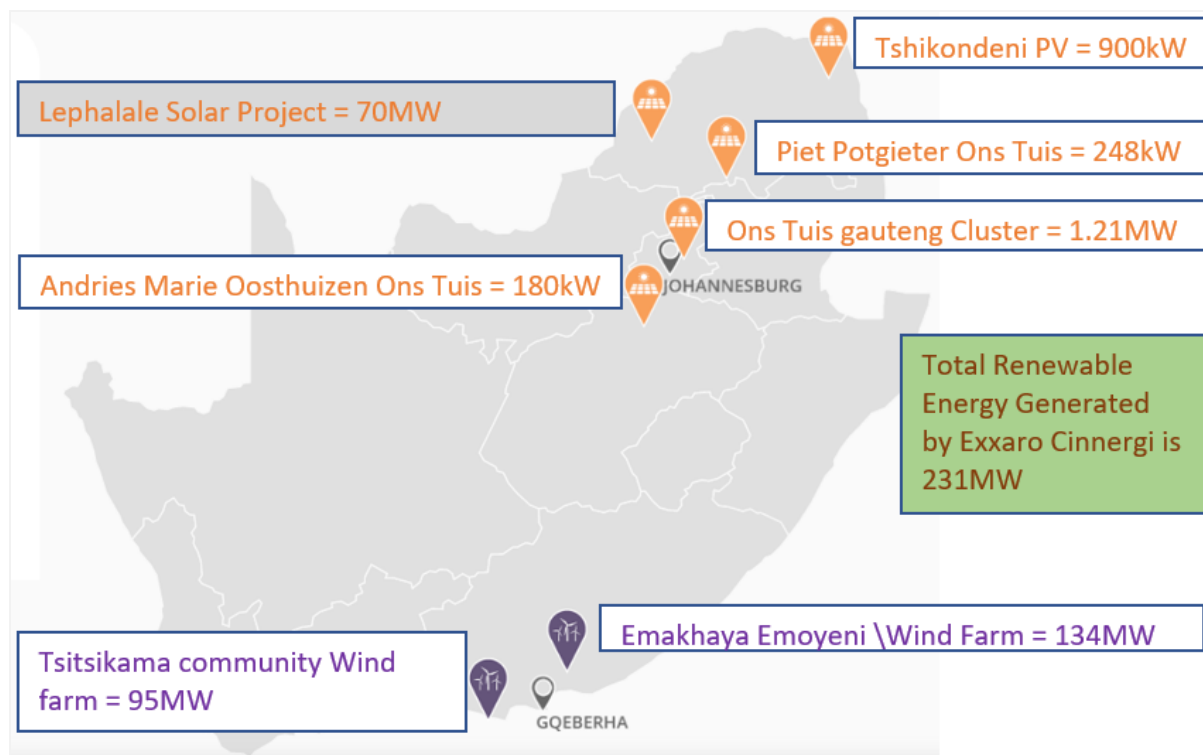


(Bing, 2022)

Coal-fired power stations have been identified as the biggest polluter of the environment in the Mpumalanga Province of South Africa (Langerman & Pauw, 2018). There are 10 coal-fired power stations in Mpumalanga as portrayed in figure 1.3. The power stations are Majuba; Tutuka; Camden; Matla; Kriel; Kendal; Kusile; Duvha; Hendrina and Arnot. Langerman and Pauw (2018) further added that air pollution has a devastating impact on health and respiratory illness for the population of Mpumalanga. An intervention must be in place to reduce the health effects of burning coal. Just Energy Transition is perceived as an intervention to lessen air pollution’s impact and sustain the environment in Mpumalanga and South Africa.

Exxaro is advancing in renewable energy generation. They have implemented 7 renewable projects since its inception in 2009 through Cennergi as displayed in figure 1.4. Cennergi is a South African renewable energy company owned and operated by the diversified mining company Exxaro Resources (Exxaro, 2022). Out of 7 renewable projects, 6 are in operation and one is in the development stage.

Figure 1. 8: Exxaro's renewable energy portfolio



(Cennergi, Portfolio, 2022)

The total energy generated by Cennergi is 232MW per day (Cennergi, 2022). Lephalale Solar Project which is in the development stage is planned to have a capacity of 70 Mega Watt (MW). This will result in a total renewable power generation of 301 MW from Cennergi. The current total energy generated by Cennergi is powering 220 000 households per year. An added benefit is the avoidance of 730 000 carbon dioxide emissions (CO<sub>2</sub>e) per year (Cennergi, 2022).

Exxaro has shown interest in the green hydrogen. They have partnered with a Germany company, Enertrag who has been in green energy for more than 2 decades (Engineering News, 2022). Their focus is to expand their growth in renewable energy by adding hydrogen on their current solar and wind renewable energy portfolio.

# CHAPTER TWO: THEORY AND LITERATURE REVIEW

## 2.1. Introduction

Relevant literature will be used for the proposal reviews to identify gaps in the current body of knowledge, including debates in the just transition of organisations from coal to renewable energy options. Just transition is a concept that is receiving more attention in the literature (Heffron, 2018). Just energy transition as defined by Heffron and McCauley (2022), is a system change in impact from the current energy sector to sustainable energy, which considers the long-term impact of society to achieve low-carbon energy. In the coal energy sector, it will mean transitioning from fossil fuels energy to renewable energy. The intent is to reduce the amount of carbon emission to a global desired target of below 2°C (Wang & Jiang, 2019). Heffron and McCauley (2022) explained that:

There are different perspectives in terms of what just energy transition means and what it needs to focus on, however, a “just”, just energy transition must focus on socio-economic, environmental and climate change, and general societal impacts of an energy project. (p. 4)

The socio-economic transition came about as a framework to focus on what can be done to protect employment and sustain former employees’ lifestyles to ensure a minimal impact that balances sustainability (Morena et al., 2020). According to Wang and Lo (2021), Just energy transition has divergent interpretations depending on the affected or involved individuals, and they define Just Energy Transition: a long-term technological and socio-economic process of a structural shift that affects the generation, distribution, storage and use of energy and causes rearrangements at the micro (innovation), meso (social networks, rules, and technical elements) and macro (exogenous environment) levels, while also ensuring that the desired socioeconomic functions can be accomplished through decarbonised and renewable means of energy production and consumption, safeguarding social justice, equity, and welfare.

This study focuses on Just energy transition from fossil fuels to renewable energy. The socio-economic transition is the most suitable framework for a holistic view of the need to transition and protect people during just energy transition. The literature has four main focuses: the barrier to the just energy transition; the benefits which can be realised as a result of implementing just energy transition; the governance process of Just Energy

Transition; and the readiness of South Africa and the coal mining industry for Just Energy Transition.

## **2.2. Just energy transition**

Tschakert et al. (2021) associated the word just by linking it to justice to address the climate emergency. The study of justice can be well explained by focusing on energy justice; environmental justice and climate justice with an intent to address the unknown but predicted catastrophic climate future. The focus is to influence the world to shift into a low-carbon economy and do justice to the future of climate. According to McGrath and Deneulin (2021), the human development school of thought, which celebrated its birthday in December 2020, indicated that the theory of climate justice has existed since 1970; however, the target focus was formalised in 1990. “The intent of human development challenge is to redress both social and planetary imbalances” (Folke et al., 2021). Humans are said to have more influence on the future of the climate, and they dominate the world (Folke et al., 2021). The past focus was to enhance self-development while ignoring the impact on the climate. Human beings cannot ignore the challenges that the planet is facing as these risks the existence of humans on earth (McGrath & Deneulin, 2021). Humans have the authority and ability to make a difference and sustain life on earth.

Some organisations still need help to deal effectively with just transition, although there are success stories. The photography organisation, Fuji Film, opened a pharmaceutical wing in their business by realising knowledge convergence through boundaries vision (Kodama & Shibata, 2016). A Dutch Company, DMS, started 120 years ago as a coal mine, and today, it is a biotechnology industry leader (Accenture, 2019). The paper industry is threatened by the digital industry. Similarly, the coal industry is threatened by renewables, and government’s demands for producing low carbon emissions are high. Communities such as Green Peace and environmental advocacy groups are more active and vocal in enforcing organisations to close. In South Africa, Exxaro, a coal mining company, has set an excellent example of an organisation that can transition to other renewable energy options, such as wind and solar, which are abundant in South Africa (Exxaro, 2020).

World leaders are challenged to re-focus their strategies to investigate less carbon emission energy sources to address climate change (Lange & Cummins, 2021). Lange and Cummins (2021) listed three challenges faced by states concerning the need to

decarbonise the energy sector; the need to focus on renewable energy technology for all future projects and have a low-emission target; and get a buy-in from the public on the transition to cleaner energy.

### **2.3. Socio-technical transition as a framework**

Although just transition continues to take place, many frameworks have been developed to address the issue of environmental, labour, and social justice and can be adopted for the transition from coal to renewable energy (Harrahill & Douglas, 2019).

Wang and Lo (2021) listed five key themes of just transition: just energy transition as a labour-oriented concept; an integrated framework for justice; a socio-technical transition theory; a governance strategy; and just transition as public perception. This study will adopt socio-technical transition as a framework. Just transition, as a theory of socio-technical transition, refers to profound structural changes in systems that involve long-term and complex reconfigurations of technologies, policy, infrastructure, scientific knowledge, and social and cultural practices. It refers to a significant change of great magnitude, potentially changing people's lives. An example of such change is a switch from using fossil fuels for electricity generation to instead using renewable energy. According to the Minerals Council South Africa, as of 2019, the coal mining industry in South Africa employs over 92 000 people. The transition from coal to renewable energy has potential job losses for coal mine employees (Wang & Lo, 2021). A study by Normann and Tellmann (2021) in the petroleum sector suggests that just transition needs to be inclusive of all the stakeholders.

According to Fuenfschilling and Binz (2018), the socio-technical transition requires a shift from one system to another. Just transition should be applied in different sectors to achieve low carbon emission targets (Kuramochi et al., 2017). Kuramochi et al. (2017) looked at different sectors that can play a role in the reduction of carbon emissions, which includes low-carbon power generation; ceasing of new coal power plants; stopping the production of fossil fuels passenger cars; agreeing on a 1.5°C-consistent vision for aviation and shipping; marine renewable energy; reducing emissions from agricultural forestry sector; and accelerating research and planning for negative emission technology. For this research, the focus will be on just the transition from coal to renewable energy.

Many renewable companies employ stakeholder engagement personnel on a full-time basis to ensure that there is sufficient consultation and alignment between communities,

government structures, and employees (Funder et al., 2021). The consultations have yielded a positive result and has shown stability during project implementation. According to Salvioni and Alex (2020), the success of an organisation or a project depends on how much internal and external stakeholders are informed and involved in the process. “There are added benefits to involving stakeholders which include employee motivation, reputation enhancement, development of intangible assets, the establishment of community goodwill, and organizational identity” (Salvioni & Alex, 2020). Stakeholder engagement became mandatory for most organisations, and the benefits of the positive impact can be seen through organisational stability and healthy business continuity.

## **2.4. Just energy transition barriers**

Just energy transition intends to benefit and sustain the environment by reducing the amount of carbon released into the atmosphere and ensuring the remaining carbon is absorbed to achieve net zero carbon (Allen et al., 2022). Net zero carbon is the balance between carbon emitted into the atmosphere and the carbon absorbed or removed from the atmosphere to have no excess carbon into the atmosphere (Allen et al., 2022). When excess carbon is released in the atmosphere, it causes damage to the health and environment, threatening life on earth. Just energy transition must happen to sustain the environment for current and future use. South Africa faces its own challenges in achieving a sustainable and healthy environment. Such challenges include: nature; the people responsible for driving the change to a sustainable future the reliance on coal for power generation; reliability of renewable energy; socio-economic challenges; economic impacts; and infrastructure challenges.

### **2.4.1. Reliance on coal**

South Africa has abundant coal reserves, which makes it easier for the country to generate its power from coal by burning it at the power station to generate electricity. Thopil et al. (2018) confirmed that it is still economical to use coal while introducing renewable energy sources. Access to coal for energy generation is simple due to the abundance of coal mines in the Mpumalanga Province. The added benefit of using energy generated from coal, in this case, electricity generated from coal-fired power stations, is its ability to provide reliable baseload power. Renewable energy sources have yet to produce baseload energy due to their low capacity. Renewable energy sources cannot produce the continuous and reliable power required in South Africa (Thopil et al., 2018). According to Simpson et al.

(2019), 92% of the power generated in South Africa comes from coal-fired power stations produced by Eskom. Eskom is South Africa's and Africa's most prominent public electricity utility responsible for producing and distributing electricity to South Africa and neighbouring countries (Lawrence, 2020). South Africa has 13 coal-fired power stations linked to the distribution infrastructure to deliver electricity to most parts of South Africa (Girmay & Chikobvu, 2017). "South Africa is likely to continue to rely on electricity generated from a coal-fired power station for the next 30 to 50 years due to the active, long-term contracts which have been signed between the coal producers and (Eskom)" (Simpson et al., 2019). The reliance on an abundance of coal in South Africa is a barrier to just energy transition because the country has the option to get energy other than renewables.

The coal mining industry in South Africa has been in existence for more than a century (Carvalho, 2017). The long-term existence allowed the country and the coal miners to master the means of optimally extracting coal reserves in a cost-effective manner. Mining is considered as one of the best industries to work in because mining is executed well in South Africa. The mining industry provides permanent stable jobs in South Africa. Coal mine owners are proud to own coal assets for their favourable return on investment. Every coal miner aims to exceed the set production targets creating competition with other coal mining companies. The excitement arising from reaching targets and providing good employment challenges the need to transition from coal to renewable energy. Coal mining companies will likely mine until the coal reserves are depleted and not close the mines (Carvalho, 2017). The focus of every coal miner is to optimise production and make money, and the need to transition will be considered once all the coal mining targets are achieved. The confidence and profitability achieved through coal mining can slow down just energy transition (He et al., 2020). Jakob et al. (2020) acknowledge that while it is necessary to sustain mining production, it is necessary to transition to sustain the environment.

Global coal demand has resulted in record-high prices (Ahmad & Zhang, 2020). The demand placed coal mining in a better position to sell all coal produced and make good profits. Most of the closed mines have been reopened in South Africa for the mining companies to take advantage of the good coal price. The existing coal mines are increasing their production to perform at their optimal limit to benefit from the high coal price. It has yet to be determined how long the coal price will remain this high. If the demand for coal continues, there will be no motivation to scale down on coal mining, and it threatens the just energy transition.

### **2.4.2. Reliability of renewable energy sources**

The reliability of renewable energy sources in South Africa is questionable. Major industries and mining companies need a continuous power supply to sustain their productivity. The independent use of renewable energy has yet to prove its ability to provide baseload energy. Many households have some backup energy systems, but they still rely on power supplied by Eskom. Battery storage has the potential to provide a solution to a continuous supply of energy (Simpson et al., 2019). The cost of battery storage and the storage capacity size can be seen as a hindrance to fast-track JET. South Africa produces 5.5% from renewable energy sources from wind, solar and biomass. Dhlabeng Municipality is the only municipality that makes use of renewable energy. It supplies the community of Bethlehem with electricity using hydro energy. A European country experienced a blackout after they switched off their power stations and relied only on renewables. In South Africa, the concept of relying only on renewables will not gain momentum and has the potential to discourage just energy transition. Renewables need to prove continuous supply and reliability.

### **2.4.3. Socio-economic challenge**

The coal mining industry in South Africa is one of the major employers of both skilled and semi-skilled workers. The coal mining industry in South Africa employs more than 92 000 employees, according to Mineral Council South Africa (2019). The industry contributes to the country's economic growth (Joshua & Bekun, 2020). Another benefit of the coal mining industry in South Africa is that it provides sufficient coal to Eskom for energy generation. The coal mining industry plays a major role in ensuring that power is generated and that economic activities continue. It ensures Eskom's ability to supply baseload energy to the country. The introduction of just energy transition threatens the employment of coal mine workers. It is also perceived that the renewable energy industry requires fewer employees to produce an equivalent amount of energy due to the technology required for power production. The community of Mpumalanga may not support just energy transition to protect their employment.



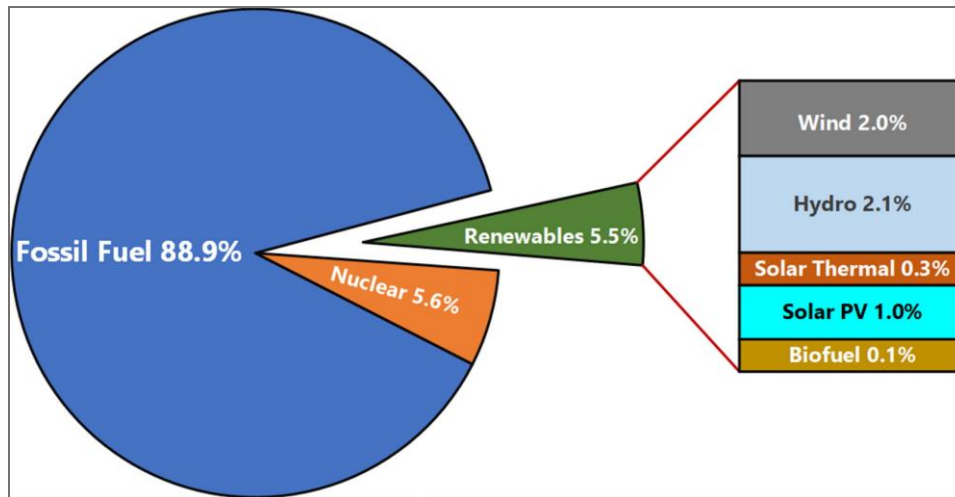
#### **2.4.4. Economic impact – ghost towns**

“The excitement and fanfare that surrounds the opening of a new mine is never present when it finally closes” (Bainton & Holcombe, 2018). A shared future impact of mining is the ghost towns left post-mine closure. Ghost towns are towns which were built solely for mine workers and used to be economically active during mining operations and have now lost their economic activities after mining has ceased (Bainton & Holcombe, 2018). The mine closure cost is excessive, and many mines want to abandon the closure liabilities (Gueye et al., 2021). Most mining companies spread out the cost of closing a mine throughout the life of a mine. Any abrupt closure of a mine will result in abandoned mines that are not rehabilitated and closed correctly. If not managed properly, the introduction of a just energy transition if not managed properly can lead to the abrupt closure of coal mines to reduce carbon emissions. The liability of a closed mine lies with the mine owners (Bainton & Holcombe, 2018). The Life of Mine Plan (LoMP) is compiled to last until all mineable reserves are depleted. Closure costs are linked to the LoMP. Staggered closure costs may be attractive in mitigating abrupt closures of mines; however, this discourages the scaling down of coal mining, which automatically delays the purpose of just energy transition.

#### **2.4.5. Infrastructure issue**

According to Akinbami et al. (2021), the South African power supply comes from coal-fired power stations contributing 88.9%; nuclear power contributing 5.6%; and renewables contributing 5.5%, as portrayed in Figure 1.5. The renewables comprise 2% wind, 2.1% hydro, 0.3% solar thermal, 1.0% solar PV, and 0.1% biofuels. The main power supply is generated from fossil fuels. Having diversified power sources in South Africa, the country is still experiencing load shedding, which started in 2007 leading to regularly scheduled power outages to reduce the energy demand placed on the South African national energy supplier, Eskom (Conradie et al., 2021). South Africa is still experiencing load shedding in 2022. Load shedding places the country in a difficult position with the need to reduce carbon emissions and continue powering the country. The need to deliver power to households and industries supports economic growth and ensures happy citizens (Jakob et al., 2020). The current electricity deficit encourages South Africa to continue to burn coal, which has the potential to delay just energy transition from fossil fuels to green energy.

Figure 1. 9: The energy mix in South Africa



(Akinbami, Oke, & Bodunrin, 2021)

Just energy transition is a good concept that must be adopted by all countries to achieve net zero carbon for the sustainability of the environment. According to Fankhauser et al. (2022), net zero is often understood to mean net zero of carbon dioxide (CO<sub>2</sub>) equivalent emissions aggregated using the 100-year 'global warming potential' metric. South Africa relies mainly on fossil fuels energy, which presents barriers towards just energy transition. The primary barrier to just energy transition in South Africa is the abundance of coal reserves easily accessible to organisations and individuals for power generation. Renewable energy sources are perceived as not being reliable in producing baseload energy. The unemployment rate in South Africa also presents fears of an increase in unemployment posing as a barrier to just energy transition.

## 2.5. Benefits of just energy transition

Multiple benefits encourage just energy transition. The main benefit is to preserve the environment. Renewable energy is a new phenomenon which introduces new industries. Introducing new industries encourages innovation and has the benefit of creating new businesses, which come with new skills and new employment opportunities. Organisations that enter the renewable energy industry benefit a stable and sustainable income. Renewable energy sources provide alternative power generation, which supports economic growth.

## **2.6. Governance on just energy transition**

Different policies that influence just energy transition in the coal mine sector in South Africa are required to introduce an energy mix intending to reduce GHG emissions by using solar, wind, and water energy (NDP, 2018). The government of South Africa has set a new target to reduce carbon emissions by introducing renewable energy through just transition (Mutezo & Mulopo, 2021). The set target was published in a government notice through the Integrated Resource Plan (IRP) to reduce a total emission of 5 470 million tonnes of carbon dioxide (CO<sub>2</sub>) by year 2050. According to Norman et al. (2022), more than 100 countries across all continents have committed to zero GHG emission targets. Effective low carbon transition (LCT) requires practical, critical, and just policy implementation. Norman et al. (2022), add that it could potentially restructure society and the country's economy. Decarbonisation is seen as a good deed by all humans and giving it more attention will rescue this vulnerable planet exposed to high carbon emissions. While setting up targets for LCT, the societal impact might be more than what can be seen on the surface and potentially create more vulnerable groups. It is important to take people along and not leave them behind by reaching out to all citizens and ensuring they understand just energy transition.

The supply of electricity is perceived as a human right and must be sustained even during the implementation of just energy transition. The governance approach must ensure that there is an improved supply of power to all consumers. The intent of just energy transition must be to improve and not to worsen the energy supply, which impacts people's lives. The government of South Africa has introduced carbon tax to reduce the impact of carbon emissions. This process aims to reduce the carbon from current activities for South Africa to contribute to the global mission to reduce carbon.

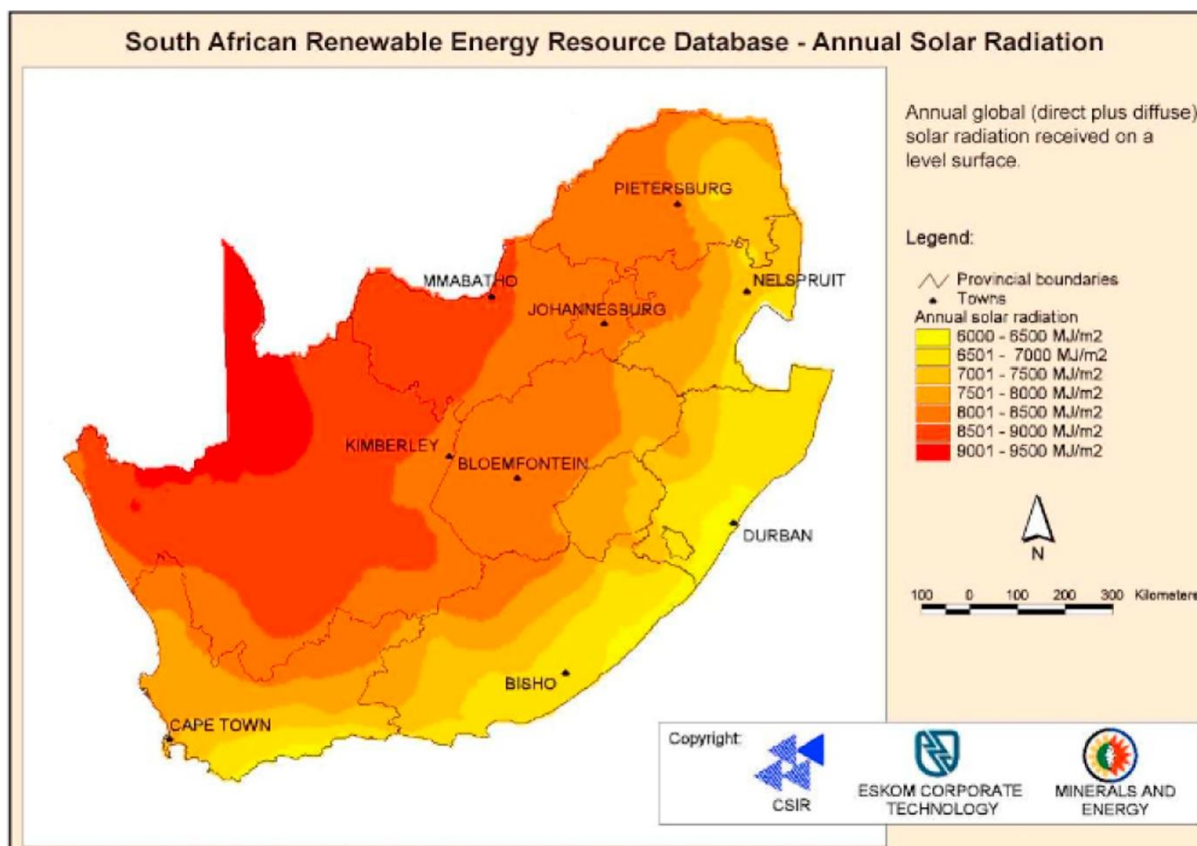
## **2.7. South Africa readiness towards just energy transition**

The coal mining industry's readiness to transition from fossil fuels to renewable energy is debatable. However, there are many aspects to be considered in assessing the readiness of the coal mining industry to transition to green energy. The Presidential Climate Commission addresses all possible actions to be considered before just energy transition can be fully rolled out. A big step to indicate the country's readiness is the Memorandum of

Understanding signed in 2021 between Exxaro, Seriti, and Eskom, which is indicative of the commitment to and support of just energy transition.

South Africa's landscape and weather are conducive to just energy transition. The country has a great chance to achieve 100% power generated from renewable energy by 2045. According to Hanto et al. (2021), this target can be achieved if coal used for power generation is scaled down from 2025. Environmentally, South Africa is at an advantage in implementing renewable energy, including solar, wind, and biomass (Akinbami et al., 2021). Pan and Dinter (2017) confirm that South Africa has the best spots for solar radiation in the world and has the potential to produce an optimal yield of solar energy. Aliyu et al. (2018) identified four main sources of renewables in South Africa: hydropower, solar, wind, and biomass. The possibility of hydropower has received little attention in South Africa. According to Aliyu et al. (2018) South Africa has a high solar radiation potential, as portrayed in Figure 2.2. The area with the dark red shading (which is mainly in the Northern Cape) has the potential to produce optimal solar radiation for renewable energy.

Figure 1. 10: South Africa solar radiation map



(Aliyu et al., 2018)

The most significant wind energy production prospects were identified in South Africa (out of all Sub-Saharan countries), where wind speeds range from 7.29 to 9.70 m/s recorded in Cape Agulhas. Biomass used as a renewable energy source is gaining momentum in South Africa. The generation of biomass has some challenges as it competes with food-producing farmers over land and that priority has been on food production (Aliyu et al., 2018).

The readiness to transition in South Africa was questioned due to a lack of collaboration. Most companies start new businesses, and they want to do it alone. There needs to be more understanding of the benefit of collaboration when venturing into new businesses. If companies can work together to establish renewable businesses, the combined experience can lead to a stable and successful business.

The lack of skills concerning renewable energy development places South Africa at the middle mark in terms of readiness for just energy transition. Renewable energies are new and use materials that are different from coal-fired power stations, however, most skills are aligned with current economies rather than renewable energies. A skills review and adjustment are necessary to ensure that the right people have the appropriate training.

## **2.8. Perception, attitude, and knowledge towards transition**

The climate change emergency requires an investigation of all stakeholders' perceptions, attitudes, and knowledge towards just transition. There is an acknowledgement that the world is still in the initial stage of transition, and more work must be done to make people aware of the urgency and need to transition (van Langen et al., 2021).

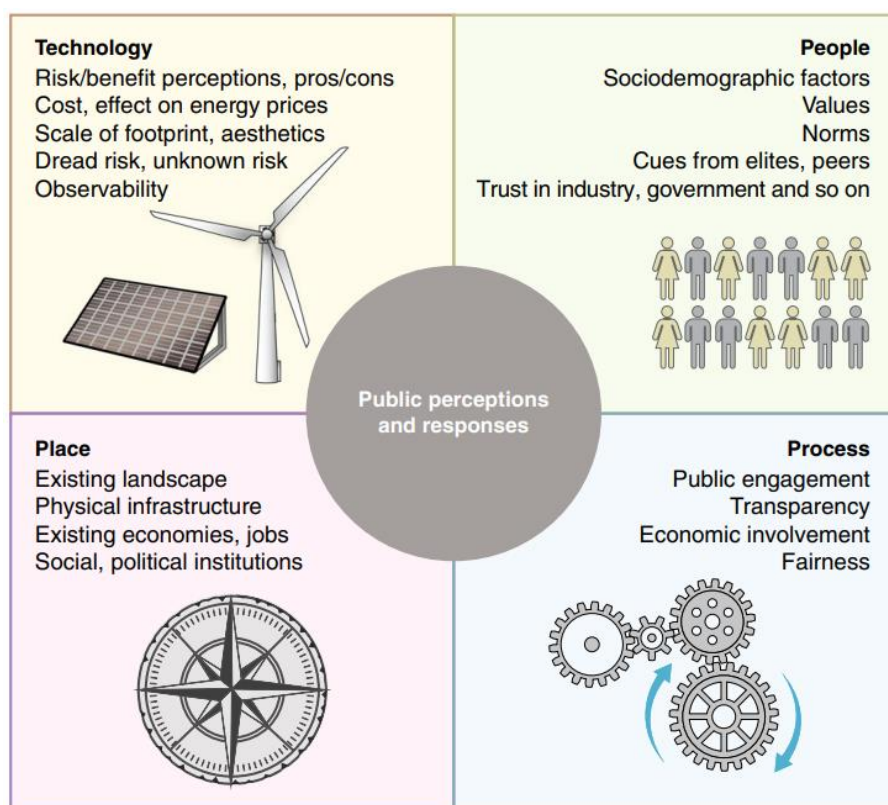
### **2.8.1 Perceptions towards transition**

Understanding the community's perception towards just transition to low carbon emissions (Wang & Lo, 2021) is essential. The success of just transition projects depends on the support and buy-in from the community. Knowledge of the demographic influences the success during the implementation of just transition projects (Carley & Konisky, 2020). People between the ages of 18-25 years will be more aware of renewable energy, which is mostly influenced by the information they get from university and social media. People with higher qualifications are aware of just transition. People that earn higher salaries are most

likely to invest in renewables, but lower-income earners are unlikely to invest in renewable technology. More environmentally aware people are most likely to incorporate this new way of living.

Boudet (2019) used a diagram to summarise the perception and responses towards new energy technology. The four focus points on the diagram are split between technology, people, place, and process. This diagram is applicable to research for just energy transition from fossil fuels to renewable energy. Figure 2.3 introduces new skills and technologies for the new way of energy generation.

Figure 2.1: Factors affecting public perception and response to new technology



(Boudet, 2019)

### 2.8.2. Attitudes towards transition

People’s attitude towards transition has the power to make or break the project. The societal attitude of the community has the power to influence the policy on transition (Hainsch et al., 2022). A consultation must be conducted that involves all stakeholders and

the community in assessing attitudes toward just transition. A positive societal attitude is required to successfully implement just transition from GHG emission projects to green energy projects.

### **2.8.3. Knowledge level towards transition**

Personal knowledge on the subject matter of just transition plays a role of support during just transition discussions (Gasparatos et al., 2017). The community must know the benefits of transitioning from carbon emissions to renewable energy. The impact of not transitioning or delaying transitioning must be made clear to the public. After a full consultation with the public, the technology used for just transition must be shared with the public to get their buy-in. The impact and benefits of such technology must be made available.

## **2.9. Conclusion**

Based on the literature review, there is enough evidence that the climate is getting warmer, and an intervention is needed to slow down the risk of global warming (Liu & Raftery, 2021). Just energy transition from coal to renewable energy sources was identified to reduce the catastrophes of global warming by reducing GHG emissions. There is, however, more work still to be done to ensure a smooth just transition by ensuring adequate policies addressing just transition. Consultations should be conducted with all stakeholders; reskilling of currently employed mine and power station employees is done; and just transition must form part of the government strategy. Just transition in the coal mining sector will take place sometime. The immediate transition will be towards clean coal. The public perception, knowledge, and attitude must be assessed to understand people's feelings towards and to identify the risk of just transition implementation.

# CHAPTER THREE: RESEARCH AIM, OBJECTIVE, AND QUESTION

## 3.1. Research aims and objectives

The aim of the study is to investigate social perceptions, attitudes, and awareness of senior coal mine managers towards just transition. The aim is to look specifically with a focus on coal mines. In order to achieve the aim of this study, the following objectives were formulated: In an attempt to understand this transition in the mining sector, a socio-technical framework will be employed.

## 3.2 Research objectives

This study seeks to meet the following objectives:

- i. To describe the perception and attitudes of senior coal mine managers towards just transition.
- ii. To investigate and describe the level of awareness amongst senior coal mine managers towards just transition.
- iii. To assess the readiness level of senior managers towards just transition.

## 3.3. Research questions

For this research, the following questions have been formulated:

- i. What are the perceptions of senior managers towards just transition?
- ii. What are the attitudes of senior managers towards just transition?
- iii. What are the levels of awareness of senior coal mine managers towards just transition?
- iv. How ready are senior coal mine managers for just transition?



## **Chapter four: Research design and Methodology**

### **4.1. Research design**

According to Abutabenjeh and Jaradat (2018), when conducting research, one of the critical steps is to design a study that will guide the process of answering the research question. The process includes planning an approach to collect and analyse data to understand a topic better. The stages that were followed in the process were to pose a question and then collect data so that the questions could be answered and present an answer (Abutabenjeh & Jaradat, 2018).

The aim of this study was to assess the perceptions and attitudes of senior managers of South African coal mines towards just transition. The readiness level of senior managers of different coal mining companies was assessed towards just transition. South Africa's readiness plan towards just transition was assessed and aligned with coal mines' just transition from coal-fired to renewable energy. A qualitative research method was applied to gain an in-depth understanding of the perception and readiness of senior managers of coal mines towards just transition.

### **4.2. Methodology**

Research methodology simply refers to "how" a study was systematically designed. The subsequent questions were about the type of data to be collected, whom the data was collected from, how the data was collected, and how it was analysed (Haven & Van Grootel, 2019). Using statistical and mathematical analysis, a quantitative research method originates from close-ended questions that assess sources like questionnaires, tests, and surveys (Hafsa, 2019). Qualitative research requires data derived from open-ended questions without pre-designed replies to be explored, and it is conducted via an interview, structured focus group, or via observation. This study followed the qualitative research method. The reason for selecting a qualitative study for research in just energy transition and renewable energy options is because this research is a new phenomenon in South Africa that requires in-depth understanding, including lived experiences. A qualitative research method outlines guidelines for appraising, interpreting, and applying qualitative data (Guha et al., 2021).

### 4.3. Research area

The research area is in Mpumalanga due to the coal mines having up to 80% of the total coal mined in South Africa. Exxaro, Seriti, and Thungela Resources operate near one another, making them experience similar environmental and socio-economic challenges.

This part of the study summarises the outcome of the analysed data. Senior employees from three major coal mining companies were interviewed. The strategies of the three mining companies are different. Company one (Exxaro) has embarked on renewable projects since 2009 and is still keen to grow its portfolio in the renewable space. The company that runs the Exxaro renewable project is called Cennergi and produces 232MW of power using wind and solar energy. They acknowledge that renewable energy projects require capital and have, classified them as low-risk and low-return projects. Moreover, the risk of failure is minimal compared to an investment in natural resources, which has the potential for great returns and a considerable risk of failure. As a result, mining projects cannot be compared with renewable projects.

Company two (Seriti) only entered the renewable space on the 15th of August 2022 when they announced the purchase of Windlab Africa to be a part of Seriti Green. Seriti will commence with renewable energy projects soon, which will be implemented in the Mpumalanga area. The strategy to focus on Mpumalanga is aligned with the available mined-out and rehabilitated land as well as the power distribution network. The Northern Cape Province is currently at maximum capacity of the power distribution network and may need to realise the benefit when new projects are implemented in the province. The majority (80%) of South Africa's power stations are in the Mpumalanga Province, and there is an excess of 32 Giga Watt (GW) of capacity, which is immediately available for renewable energy producers (Engineering News, 2022).

Company three's (Thungela Resources) strategy does not focus on renewable energy for commercial purposes. This organisation focus is to mine coal until all their coal reserves are depleted and not renewable resources. Thungela wants to remain a mining company which mines coal and other mineral deposits.

In summary, company one actively provides renewable energy sources to the South African power grid. Company two has just commenced their renewable energy project for commercial purposes. Its intent is to grow big in the renewable space. Company three has no interest in the renewable business and will focus on mining coal until coal deposits have been depleted.

#### **4.4. Population**

According to Abutabenjeh and Jaradat (2018), a research population refers to a group of people with similar characteristics or individuals bound by a similarity. Abutabenjeh and Jaradat (2018), further talks to the group of people where a study was conducted, and a conclusion was drawn. The population for this study included senior managers who work at Seriti, Exxaro, and Thungela Resources to understand their perception and attitude towards just transition from fossil fuels to renewable energy.

There are 28 recognised coal mines in Mpumalanga and 33 coal mines in South Africa, as portrayed in Figure 1.2 in section 1.4. Out of the 28 mines in Mpumalanga, six mines belongs to Thungela which are labelled as number one up to number six represented in blue colour. Thungela mines are listed under Anglo American who was Thungela's mother company before they diversify away from coal mining. Seven mines belong to Seriti which are number seven up to number nine represented in yellow and number twenty-four up to number twenty-seven represented in red colour. The Seriti mines in yellow used to be owned by South32 before they transitioned away from coal mines. Three mines belonging to Exxaro in Mpumalanga are number eighteen up to number twenty represented in green colour. There are 10 coal mining companies in South Africa. The researcher selected only three mining companies due to the active relationship with the senior managers from the different companies. Due to the limited time allocated for this research, the researcher could not include all 10 coal mining companies in South Africa.

#### **4.5. Unit of analysis**

A unit of analysis focuses on the main content of the research, and the collected data is interpreted to draw a conclusion (Abutabenjeh & Jaradat, 2018). The application of the conducted research was classified. The unit of analysis is defined statistically as the “who” or “what” for which information is analysed and conclusions are made (Sedgwick, 2014, p.1). In this study, the unit of analysis was the individual level of the senior managers of Seriti, Exxaro, and Thungela Resources in the Mpumalanga Province, Emalahleni. According to Li et al. (2017), the unit of analysis deserves special attention from researchers for an in-depth understanding of the research. The senior managers were selected for their adequate experience in the industry and the authority they possess within the organisation. The interviews allowed senior managers to reflect on the topic of just transition from coal to renewable energy within Seriti, Exxaro, and Thungela Resources.

#### **4.6. Sampling method, criteria, and size**

According to Johnson et al. (2020), different sampling strategies are used during qualitative research, with purposive sampling being the most widely used. The benefit of purposive sampling is the intentional selection of the participants to optimise data sources in answering the research questions. Random sampling was not applied as part of the selection process for this qualitative research as it is not designed to select the most appropriate participants who will answer the research questions (Johnson et al., 2020). Some participants in this study were more knowledgeable than others and such findings were documented in the analysis report. Purposive sampling was applied where relevant senior managers with roles that connect with the research question were selected, which included the VP of Operations, VP of Renewable Energy and Innovation, VP of Safety and Sustainability, and the CEOs. A General Manager was selected according to the years of experience and diversified exposure from working for both local and an international coal mining company. Another consideration for this general manager was the proximity to the renewable energy pilot operation to execute the agreement as per the MoU between Exxaro, Seriti, and Eskom (Mining Weekly, 2021). It was a challenge to access all participants within the expected timelines due to their work commitments. Time and resources also contributed as reasons why purposive sampling was selected.

Saturation is described as a parameter to judge when to cease sampling (Sebele-Mpofu & Serpa, 2020). According to Sebele-Mpofu and Serpa (2020), there are a number of factors

that determines when saturation can be reached, and the scope and breadth of the study have a major influence. Some researchers have indicated that saturation can be reached at the fifth participant. In order to ensure a sufficient number of participants, a maximum of 13 participants were interviewed to confirm saturation.

#### **4.7. Measurement instrument**

The study made use of a questionnaire to guide the interview process. Section A consisted of three questions, which pertained to qualifications and work experience and the organisation. Section B initially consisted of eight questions and was modified to fourteen questions guided by the conversation. These questions were used as a guideline when conducting in-depth interviews with the identified participants. Interview guideline questions are attached as Annexure A.

#### **4.8. Data gathering process**

Data gathering requires a method where interviews are conducted, participants are observed, and documents are analysed to collect data (Busetto et al., 2020). A qualitative interview a conversation with a goal (Busetto et al., 2020). The interview was used to gain insight into the participants' experience and perception, not their behaviour. For this research, a semi-structured interview was applied using an interview guide with open-ended questions. Senior managers of Seriti, Exxaro, and Thungela Resources were interviewed individually to assess their perception and readiness to just transition.

Observation assesses the behaviour of the participant. Two of the interviews were non-participative, where the interviewer requested to switch off their cameras to increase bandwidth to cater to load-shedding challenges. During such interviews, only vocal expression could be noted. None of the interviews made use of an external observer; the only parties present were the participants and the researcher. The interviews were recorded and transcribed following the interview process via Microsoft Teams, where both the *record* and *transcribe* functions were used. The transcribe function on Teams offered the researcher the opportunity to focus on the interview and not have to do multiple tasks, which have the potential to divert attention. Out of 13 interviews conducted, three were in-person interviews where the researcher made use of headsets to maintain the use of Teams which allowed for transcription to take place. The participants and the researcher stayed in one boardroom where eye contact was maintained.

#### 4.9. Analysis approach

This research used thematic analysis; the standard form of analysis used when conducting qualitative research. Thematic analysis is a method of analysing, identifying, and reporting patterns within the collected data (Castleberry & Nolen, 2021). Collected data were analysed by searching across all data to produce a report with repeated patterns into usable themes to reach a conclusion (Castleberry & Nolen, 2021). Five steps were used to analyse the data, which started by compiling gathered data; transcribing all collected data, which was recorded via Teams; arrange data to distinguish between the participant and a researcher; highlighting all critical points giving it a theme and a code; disassembling; reassembling; interpreting; and concluding.

**Compiling** entails transcribing the collected data to make available all the data. Data was collected using Teams recordings with the transcribing function. The collected data was listened to, read, and transcribed by the researcher be intimately familiar with the data and collate responses. The researcher became familiar with the data and ensured consistency and an organised format.

**Disassembling** “involves taking the data apart while “creating meaningful groups” (Castleberry & Nolen, 2021). The collected data was compiled and organised using coding. “Coding is the process where raw data is converted into useful data when themes and concepts are identified as connecting to each other” (Castleberry & Nolen, 2021). Differences and similarities were identified during the coding process in the data, and notes were made to indicate the findings

**Reassembling** allows for the codes to be put into context to create themes. Themes captured all important data from the research questions to create a pattern. The researcher did not rearrange data to fit the theory but captured all data as received. A quality check was done using the following questions adapted from Castleberry & Nolen (2021): What are the explicit and implicit reasons why just energy transition is happening? How is the just energy transition happening?

With the gathered data, an assessment was made to identify whether the info was a theme or just a code. If it was a theme, further questions were asked: What was the quality of this theme and was it telling the researcher something useful about the dataset and the research question? What do the boundaries of this theme include and exclude? Is there meaningful enough data to support the themes? Are the data too diverse and wide-ranging? Does the theme lack coherence?

**Interpreting** data happens in the initial steps of compiling, disassembling, and reassembling. This process is crucial as data collected without interpretation remains useless and cannot speak for itself. There were no questions or steps to be followed during data interpretation; however, the researcher ensured interpretation was complete. The researcher ensured a fair, accurate, and credible interpretation.

“**Concluding** a thematic analysis involves the collection of raw data which formed codes and codes formed themes and thematic maps” (Castleberry & Nolen, 2021). The conclusion involved responding to a research question, perception, and attitude of senior managers towards just transition.

#### 4.10. Quality controls

According to Cichy and Rass (2019), data quality can be defined as the ability to collect and store data with the purpose of retrieving it at the required time and data is elaborated using software and or manual process. Quality control was done by consolidating research data, which was surveyed to confirm data quality and accuracy. Validity and reliability, which was part of the quality controls, were explored. Validity and reliability were measured by having the different participants answering the same questions to assess if the same results could be achieved (Story & Tait, 2019). The validity measured whether a question was measuring what was intended to be measured, which was to assess the perception and attitude of senior coal mine managers towards just energy transition.

A pilot study was conducted to assess the depth and width of the questions. Two interviews were conducted with a corporate group finance and lead renewable energy as well as a mining activity engineer to ensure the list of guiding questions was sound. The researcher tested all the research questions and piloted them before the formal interview with each participant took place. There were no significant changes made to the questionnaire after the pilot interviews concluded. As a result, the questionnaire was adopted.

There were no recommendations made to amend the questionnaire, however, it was suggested to include a question on what is viewed as a sustainable, workable solution for the community of Mpumalanga with the introduction of just energy transition. The three additional questions were added as a result of participants having added comments about the questions asked during the interviews.

The researcher assessed whether or not participants responded the same. The questions were reformulated to ensure that all the participants understood the questions. The recorded interviews were listened to, to confirm the transcription during the interviews. The researcher transcribed and interviews and did not make use of a third party.

#### **4.11. Limitations**

The researcher is a mining engineer and is a member of the South African Coal Managers Association (SACMA) who also served in the SACMA council from 2011 to 2012. The researcher has over 15 years of coal mining experience and over 10 years of management experience. The SACMA allowed the researcher to build a network over the years, which made it easier to get participants from other coal mining organisations outside of the researcher's organisation. There was more willingness to participate in the interviews from the researcher's employers. The limitations were experienced with the participants from two coal mining companies who had requested for their interviews to be moved from July to August so that they could conclude their half-year performance results. Four interviews were delayed and the last interview was conducted on 22 September 2022. These delayed interviews contributed to delays in data analysis. Eight out of 13 interviews were conducted online via Teams, the majority of which were with external organisations. Covid-19 also influenced decisions to conduct most of the interviews via Teams for participants' convenience. There was no disruption during the interview process with regard to community protest. An interruption happened in two interviews where there was load shedding, and an alternative date had to be arranged to conclude the interviews. The researcher had to conduct some of the interviews in the evening to accommodate the three participants who requested later interviews. The researcher did not have the time and resources to only focus on this study due to full-time employment. A time balance had to be maintained between work, research, and family commitments.



# CHAPTER FIVE: PRESENTATION OF THE FINDINGS (RESULTS)

## 5.1. Introduction

This chapter outlines the findings from the interviews conducted and it is linked to the gathered theory on just energy transition. The aim of the interviews was to assess the perception and attitudes of senior coal mine managers towards just transition; to investigate and describe the level of awareness among senior coal mine managers of just transition; and to assess the readiness level of senior managers concerning just transition. Out of 13 interviews conducted, all senior managers were aware of the phrase just energy transition, including.

After having conducted a thematic analysis of the interview transcriptions, a total of four findings were identified. The first finding concerns the need to assess any barrier towards just energy transition. The second finding addresses the benefits from implementing just energy transition. The third finding notes the lack of governance related to implementing just energy transition. The fourth finding relates to readiness for just energy transition. For the purpose of data analysis and to ensure that there is flow in reporting the findings, barriers and benefits of just energy transition were separated.

The following main questions were relevant during interviews, and these include the readiness of the coal mining industry to transition from fossil fuels to renewable energy, taking into consideration the unemployment rate of 34.5% in the first quarter in South Africa (SANews, 2022). All three mining companies in the study are ready to transition, however, they are not at the same level, and their strategy for transition is also different. Exxaro is ahead, and they have started to produce green energy for commercial purposes through Cennergi in 2009.

*(Researcher: How long have you been in the renewable space?)*

*“Participant: So we started Synergy in 2009 as a joint venture with And building the joint venture with Tata Power, maybe two to 10. And then 2012, 2013 Bird 4. I think it was in window 2 for the building of wind generation assets in in the Eastern Cape. We were successful with the birds and they were eventually commissioned in 2016 I think. And generating 239 megawatts of wind power, which is supplying into the grid”* . The second question asked how the community of Mpumalanga is kept abreast of just energy

transition. A general feeling is that the Department of Mineral Resources and Energy must take the lead, however, Exxaro and Seriti have started to inform the community about just energy transition. The third question asked where coal mining in South Africa will be 25 years from now. All participants feel that South Africa will continue to mine all available coal. Coal mining will continue until 2060. The fourth question explored what the coal mining companies were doing to transfer skills linked to just energy transition. Responses to this question differed for each of the three coal mining companies. Exxaro focuses on different skills type for future businesses linked to technology and future forecast of the world. Seriti kept coal mining and renewable energy separate and did not want to mix them. There will not be a transfer of employees from their coal mining sector to their renewables sector. Thungela's feeling is that DMRE must take the lead and legislate transition. They will ensure full compliance with the regulator. Information will be visible on what is happening in the coal mining industry with regard to Just energy transition.

## 5.2. Biography of participants

A total of 13 senior managers combined from Seriti, Exxaro, and Thungela Resources were interviewed on the topic of just energy transition from fossil fuels to green energy, where their perceptions and attitudes were assessed. A breakdown of the list of senior managers who participated in the interview is portrayed in Table 1 and is presented according to their titles to protect their identity.

*Table 5. Error! No text of specified style in document..1: Demonstration for the population of senior managers for Seriti, Exxaro and Thungela resources*

<b>Title</b>	<b>Exxaro</b>	<b>Thungela</b>	<b>Seriti</b>	<b>Number of years of experience in the mining industry</b>	<b>Number of years in current role</b>
Chief Executive Officer (CEO)			1	19	5
Chief Operational Officer			1	21	3
VP (Vice President) Finance			1	18	6
VP Legal			1	14	2
VP Stakeholder Affairs			1	29	5
VP Stakeholder Affairs		1		11	4

VP Stakeholder Affairs	1			22	9
VP Safety and Sustainability	1			36	10
VP Technology and Innovation			1	5	1
Head of Corporate Affairs		1		17	2
General Manager			1	18	6
Corporate Group Finance and Lead Renewable Energy			1	5	5
Mining Activity Engineer			1	15	6
<b>Total</b>	<b>2</b>	<b>2</b>	<b>9</b>		
<b>Sub Total</b>	<b>13</b>			<b>230</b>	<b>64</b>

Seriti's CEO has 19 years of experience in the mining industry and has been the CEO for five years; their CFO has 21 years of experience in the mining industry and has been in their current role for three years; the three VPs have 18, 14, and 21 years of experience in the mining industry, respectively and culminate 13 years of experience between them in their current roles. All three VP stakeholders from Exxaro, Thungela and Seriti were interviewed. The experience of VP Stakeholder Affairs from Seriti has 29 years of experience in the mining industry with five years of experience in their current role. Thungela Resource's VP has 11 years of experience in the mining industry and has four years of experience in their current role. The VP from Exxaro has 22 years of industry experience along with nine years of experience as VP Stakeholder Affairs. The industry experience that Exxaro's VP Safety and Sustainability has is 36 years, with 10 years of experience in their current role. Seriti's VP Technology has 5 years of mining industry experience with one year's experience in their current role. Thungela Resources' Head of Corporate Affairs has 17 years of mining industry experience and two years Of experience in their current role. Seriti's General Manager has 18 years of mining industry experience and has six years experience in their current role. The Corporate Group Finance and Lead Renewable Energy has 5five years of both mining industry experience and in their current role. A mining activity engineer has 15 years experience and six years spent in their current role.

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The combined mining experience of all participants is 230 years and their total experience in their respective current roles is 64 years. All participants have a minimum of five years experience in the mining industry and nine out of 13 have more than 15 years of experience. Participants have witnessed coal prices rise and fall in the past 15 years, including the global economic growth in 1998 and the great recession in 2008. The coal dropped to below 50 US Dollars (\$) and below \$70 in 2008, which is considered uneconomical in South Africa. The three coal mining companies in this study have shown resilience and were able to sustain their coal mining operations. The participants have mastered the coal mining process and they are experts in their field. It will not be easy to transition from mining of fossil fuels to renewable energy knowing that change is very hard for most people.

The interviews were conducted between the month of July and September 2022 after getting the ethical clearance approval on 6 July 2022. Table 5.5 portrays the interview date and duration. A total of 9 interview slots were secured prior to the ethical clearance to guarantee slots and to minimise last-minute arrangements. The pre-booked interviews were scheduled from the 18th of July with an anticipation that the ethical clearance would

have been approved. Out of the nine secured interviews only four took on the secured dates. The rest of the interviews took place on the newly extended dates due to the participants' commitments. The duration of the interviews was between 21 minutes and 1 hour and 17 minutes. On average, the interviews lasted for 40 minutes.

*Table 5. Error! No text of specified style in document..2: Just energy transition interview date and duration*

Interview dates and duration		
Date	Minutes	Seconds
15-Jul-22	21	32
15-Jul-22	25	59
15-Jul-22	46	10
18-Jul-22	24	54
18-Jul-22	51	2
18-Jul-22	40	46
01-Aug-22	34	10
04-Aug-22	26	21
05-Aug-22	43	16
29-Aug-22	44	57
12-Sep-22	43	32
14-Sep-22	39	29
22 & 29 Sep 22	36	35
	40	44
Total	512	447
Average	40.0	

### **5.3. Barriers towards just energy transition**

The outcome of the interviews have shown that there are multiple barriers to just energy transition in the South African coal mining industry. The barriers range from South Africa relying of coal for baseload power supply; the unreliability of renewable energy sources when the weather does not support optimal power generation; the socio-economic challenges linked to unemployment; risk of economic shrinking if coal mines are closed; and the infrastructure, which is not adequate to transport power generated from renewable sources, across South Africa.

#### **5.3.1. Reliance on coal/coal dependency**

According to Participant A, power generated from coal is reliable and it provides South Africa with baseload energy. South Africa needs a reliable source of energy that can replace energy generated from fossil fuels in order to transition to greener energy. According to Participant A, South Africa will still rely on coal for its energy production and coal will still be mined for a long time. Renewable energy sources have low capacity and cannot produce continuous and reliable power required in South Africa. Coal-fired power stations will continue to burn coal until they reach the end of the power station's capacity. The burning of coal for power generation in the case of South Africa is dependent on the life of the power station and not the life of the mine because coal can be transported to the power station from different coal mines in South Africa.

South Africa is misunderstood from a global context, 80% of our power comes from coal. That's unlikely to change anytime soon. In order for us to responsibly grow South Africa, coal is going to remain a very important part of the energy mix in terms of supply and coal to Eskom and that needs to be mined safely and responsibly, and that's where we play. So I think in time with the percentage of coal required by Eskom and required by South Africa reducing over time and notwithstanding that situation, coal will still be required and there will still be a need for miners like ourselves to have to mine that coal. (Participant A)

Furthermore, Participant B believes that because there is an abundance of coal in South Africa, the country will still use coal 25 years from (and possibly beyond) now and the source of energy will consist of coal and other renewable sources.

I still think that coal will be there in South Africa in the mixture of our own energy in South Africa. Why I'm saying this is because of the fact that, firstly, we have a country that is naturally endowed with coal and, with the ability as well to transition on to the renewable

energies. So in 25 years, for instance, I think we'll probably have maybe two or three Eskom power stations and the rest will have been retired. (Participant B)

Participant H states that the demand for coal will remain high not only in South Africa but across the globe. However, Participant B acknowledges that there will be a reduction in the amount of coal used after two to three decades. The abundance of coal in South Africa and market availability work as motivating factors for coal mining companies to continue with coal mining.

I think it will be slightly smaller than what it is now. But I think it will still be going on. There will still be a demand in Asia. So, I think my view is that the demand in the US, in the West and Europe, US Europe, that will probably come off but I think in particular of India and China Southeast Asia coal is still going to be very much very used. There's still gonna be a demand for it. (Participant H)

Furthermore, Participant A expresses pride in being a 'coal miner' who has all the intention to excel in the mining of coal in South Africa. Participant A acknowledges the need to transition to greener energy for the sustainability of the future. Consequently, Participant A will proudly continue to mine coal and simultaneously, introduce green energy projects within their organisation. Participant A understands the impact of carbon emissions and the need to sustain the environment for future use.

It gives us the right stakeholder perception, the right messaging we're not afraid of coal. We're not shy of coal. We're not embarrassed about coal. We're proud of coal and we wanna do it well. But we also want to recognize that there is a change, and we want for our kids and our grandkids. We need to contribute to the prospect of them having a similar world to that that we enjoy today. (Participant A)

In conclusion, South Africa has an abundance of coal and its landscape and weather support renewable energy sources. Coal mines will not close and coal-fired power stations will continue to run. Renewable energy projects will be introduced in the mix of coal-powered energy sources. As the coal mines scale down as a result of the availability of coal, renewable energies will gain momentum, but it will not replace coal within 25 years from now.

### 5.3.2. Reliability of renewable energy sources

The current power shortage and fear of renewable energy being unreliable sources which cannot produce baseload energy remains a threat to Just Energy Transition in South Africa. According to Participant C, renewable energy is not reliable, and it cannot provide sufficient power, increasing the risk of load shedding.

I think it's for a good purpose and it's a good drive. The reasons behind it. I'm just worried about the reliability part of it. I mean already we are living in an era that's coal is abundant, but we're still struggling to generate electricity 100% in terms of availability. Now, imagine having to rely on this biomass, hydropower, wind energy, solar, these natural things that you can't even predict in terms of their frequency instead. (Participant C)

Participant B believes that South Africa needs a reliable baseload source whilst implementing renewable energy projects. Renewable energy alone will not sustain the power demand in South Africa. Coal mining and coal consumption will remain part of South Africa's source of energy generation while the country establishes renewable energy projects. "but I think we will have to come up with other creative ways with respect to maybe going a bit on nuclear to create the baseload is whilst we advancing on the renewables." (Participant B).

According to Participant A, to transition into renewable energy sources, batteries for power storage are required to keep the energy users going until the next cycle of renewable energy generation. "And what happens if the sun doesn't shine or the wind doesn't blow. You need a battery to store that power to push you through to the next cycle" (Participant A, 2022).

According to the researcher, Just Energy Transition is necessary to sustain the environment and to lessen the amount of carbon released during the process of burning fossil fuels for energy generation. However, it is noted that renewable energies cannot produce continuous baseload energy, which poses the risk of load shedding. Battery storage for power generation from renewables will become necessary to sustain the supply of power when there is no sufficient natural sources generating power such as the solar energy, which requires light and will not generate power at night.



### 5.3.3. Socio-economic challenge

The introduction of Just Energy Transition has created fear in both the employed and non-employed residents of Mpumalanga. There is a growing fear that the current employees employed by Eskom, the main power producer in South Africa, and employees working for coal mines and support services employees will lose their jobs when the country transitions from fossil fuels power generation to renewable energy as its power source. According to Participant D, solar farms do not require the same number of employees as required by coal mines and power stations.

A lot of people, there will be a lot of job losses. I think the coal, the last thing I've been reading a few years ago. The coal supply, coal supply chain employees was 40,000 people in Mpumalanga that's from people who work at the base stations to the mines to the engineering firms, the fuels suppliers, equipment suppliers and so and it's not going to be like for like. So, a solar farm doesn't use at all the same number of people as a power station or a coal mine. (Participant D)

Participant C understands the need to transition from coal to renewable energy because it is aligned with sustaining the environment, however, Participant C has indicated fear of losing their job when transition takes place because as technology improves, less people are required to do the job. The assessment of whether the introduction of renewable energy really employ less people as compared to the coal mining employees.

So, I think ethically is the right thing. To do. We are moving in the right direction. Umh, maybe a bit of concern maybe for everyone is like okay, fine, like me being in the mining industry, in a coal mining industry, which is a non-renewable resource, in terms of maybe future job opportunities. Or, or maybe the industry may be streamlined into because as they improve things, the technology improves as well. Meaning that there'll be less people that are needed to actually do the job that we're currently doing. (Participant C)

Participant E adds that if the South African government decides to close down the coal mines and shut down power stations, there will be a bigger social impact on communities that are dependent on mines and power stations for jobs. Participant E recommends that the government must not rush into making decisions linked to abrupt stoppage of coal-fired

power stations or coal mines as this will exacerbate the current high unemployment rate in South Africa.

And in my mind, that entails we know how we think about shutting down critical coal power stations, the mines that are attached to it, and the ripple effects that will have on the communities that are dependent on these coal-fired power stations and mines to for livelihood and economic activity (Participant E)

Participant F further adds that the impact is not only on employees but the communities around Mpumalanga and stakeholders. “But you must understand that the journey that we will travel as we transition, we will impact employees, communities, and other stakeholders” (Participant F, 2022).

According to Participant B, the impact of closing the mines will not be felt by Mpumalanga residents only but the entire South Africa will lose a lot of money. The mining industry has been the backbone of the South African economy for a century, and it continues to add value to the economy. Coal mining also has an added benefit of providing a reliable power source, which promotes sustainable uninterrupted productivity.

We have to take into consideration and in cognizance of the fact that there are social issues that are going to prevail in that, if for instance, in the context of South Africa, you have to retire or shut down all the coal-fired power plants. That in itself has a dire consequence on millions of people in South Africa. (Participant B)

The government is facing a challenge of job creation and there are debates as to who must create employment between the private and public sectors. While this debate is continuing, the struggle against high unemployment remains a challenge. A phased-in approach is required to avoid premature stoppage of coal mines (which runs the potential risk of high unemployment and instability due to protest action).

#### **5.3.4. Economic impact**

The introduction of just energy transition has presented some economic challenges to sustaining current coal mining operations. According to Participant G, there has been some migration of employees from the coal mining industry to other different mining commodities to ensure that they remain employed. This risk leaves the coal mines with less experienced and knowledgeable employees and threatens the optimal operation of current coal mines.

The introduction of a just energy transition in South Africa must balance economic growth and sustain the environment. “Prematurely of people from you know, coal and seeking other opportunities where they feel they have a much longer security of employment” (Participant G, 2022).

There is growing fear that the introduction of renewable energy sources will result in premature closure of coal mines. According to Participant E, there is evidence that South Africa has not mastered the mine closure process to ensure that there are economic activities around closed mine towns but instead, the towns become ghost towns.

We've seen we've seen a ton of them in the US, right? So, if you do that, if you do your research, you'll see that there's a lot of like, previous coal towns in the US that are currently ghost towns and there's no job replacements for those people and then destitute, right? So what are we going to leave behind is my question. Oh, when we transition from coal to renewable, exactly, yes. (Participant E)

Participant H believes that when coal mining companies are operating at an area, they must ensure that they grow with the community by implementing projects that will remain sustainable post mining operations. They must not just talk about Energy, Society, and Governance (ESG) yet their adopted model will still leave a ghost town.

So usually, when you start talking about, like maybe your ESG it looks like being in there for the long haul. So, this also kind of forces corporates to say you can't just come and do one monumental thing there. You need to be developing yourself with the community so that when you finish your mining, you don't create a ghost town. You created a sustainable community which can thrive even beyond mining, because already how you were mining and the projects you've initiated with the community are those that will have them to self-sustaining. So, I think it's got both of us social part of it, but also the impact of the carbon that we generate. (Participant H)

Participant I encourage that before South Africa could stop any coal mining, learnings must be adopted from Carletonville. The community of Carletonville does not have economic activities post closure of Harmony Gold mines and it is a good example of a ghost town in South Africa.

We have seen Harmony Gold Mine in the Carletonville Area and the gold industry, there are learning lessons in those industries, to look to say what is it that they did or what were the lessons? We're sitting with our audience right down the road. You know, we know how

it was mined. We know what happened and it's a ghost town today. There's not any other economic activity in this space that we're looking at. (Participant I)

According to Participant H, the coal mining industry in South Africa is one of the big employers within major industries. The existence of coal mines have a positive contribution towards economic growth in South Africa.

Coal is a big employer in South Africa. It's a big employer in other countries as well. You know, there's a lot of not only employment, but other small SMEs and other businesses that are dependent on it. So, you know, when we stop the coal industry it's it's gonna have a massive impact on people's livelihood. (Participant H)

### **5.3.5. Infrastructure barriers**

There are shortages of power distribution lines infrastructure in the Northern Cape (NC). The NC has the potential to produce optimal solar radiation for renewable energy, which supports solar renewable projects. According to Participant A, the country might not realise the optimal results on renewable energy due to gaps in infrastructure. Renewable businesses will be forced to implement their project in and around Mpumalanga to have access to feed the renewable energy into the grid.

just energy transition has numerous dependencies, and those dependencies are not addressed, so I'll give you an example. Eskom needs to expand its transmission network by 8000 kilometres. In order to bring power in from the areas or the newer renewables areas which are not necessarily in the old coal-fired power station areas and until such time as that transmission is in and is not going to be enough grid capacity or transmission capacity to bring in all of the renewable power. So even if we had the money today. And we wanted even if there were billions of rounds today, to build big renewables facilities, it still wouldn't work because there isn't enough transmission. Participant A)

South Africa must assess the need to transition from fossil fuels to greener energy and not act based on the pressure from other nations. The government of South Africa and Department of Mineral Resources and Energy (DMRE) have an obligation to provide successful mine closures and sustain mining towns before any coal mine can be closed for the purpose of a Just Energy Transition. Rushing into implementation will risk instability of the current operating coal mines, thereby increasing employees' migration to other mining commodities. Organisations will not be motivated to complete their committed Social and

Labour Plan (SLP) projects and exacerbates the risk of leaving a ghost town. just energy transition

#### **5.4. Benefits of Just Energy Transition**

All of the participants acknowledge and are in agreement that there is a need because it is the right thing to do for the environment and for the future generation. Just energy transition must be embraced and supported. A positive attitude was observed from all participants to transition, it was evident that there has to be a balance between employment and Just energy transition.

##### **5.4.1. Opportunities for alternative power generation businesses**

According to Participant A, big industries like mining require a continuous supply of power for an uninterrupted operation. The need for sustainable power supply from renewable energy encourages innovation in new industries.

Wind and solar is well proven cheaper than coal fired. It's great. The big challenge is to see where the big industry, which needs consistent power, miners like ourselves and big industrials, whether the technology improves such that those renewable and opportunities become substitute for baseload. (Participant A)

##### **5.4.2. Environmental preservation**

A benefit of transitioning from fossil fuels to green energy is to reduce the risk of extreme weather and health issues caused by excessive carbon emission according to Participant D. Just Energy Transition must be done to sustain good health and the preservation of the ecosystem.

I mean explicitly it should happen because we are putting the future existence of our species at risk. You can see that starting already extreme weather, Healthcare, environmental, diseases caused by high levels of emissions. So, the explicit reason is human health. And the sustainability and the preservation of healthy ecosystem. Those are the explicit reasons. (Participant D)

Participant F, states that, for the world to sustain the next generation, global warming must be curtailed. Climate change presents a threat to the existence of humans and life on earth. It is almost mandatory to act and take measures to reduce the impact of climate change and global warming to sustain a healthy living environment.

Well, for the world to survive for the coming 100 or 200 years for the next generation to survive. Number 3 to ensure that global warming is curtailed, we need to curtail it. That is imperative that we must have energy transition. (Participant F)

#### **5.4.3. Guaranteed return on investment**

Participant G confirms that there are guaranteed returns when embarking on renewable energy projects for commercial purposes. He adds that it gives low returns, and it is also a low-risk business. When comparing mining business to renewable business, the renewables business is more stable, and it is not always affected by global fluctuations.

Renewables provide long term, secure and relatively predictable returns. Compared to minerals which you know it's a cyclical industry and when times are good, they're very good from a return perspective. And when times are bad, we suffer. You know you have to tighten your belt. All sorts of expressions come up like back to basics tightening your belt. (Participant G)

#### **5.4.4. Employment opportunities**

The introduction of renewable energy projects presents an opportunity for the creation of new jobs in new industries according to Participant A. Some of the renewable projects are big projects which result in long-term job creation.

But you know, there is potentially a very significant project pipeline available which could sustain a material number of jobs over an extended period in that civils construction assembly space. And I think that's where the difference is gonna be. Participant A)

#### **5.4.5. Economic growth**

Participant G adds that other business streams like supply chain and manufacturing will also benefit from new opportunities created by the establishment of renewable energy projects. Other alternative economies will be a result of the reuse of mined out and rehabilitated land for agriculture and farming purposes.

Uh, those employees that are involved with your customers that are involved with your suppliers and it will be a little bit more removed from the core business and there's not much you can do, but from a community development perspective, what we are looking at

is how we can build or rebuild alternative economy through agriculture and the use of land, as well as the use of the assets. (Participant G)

The introduction of renewable energy projects present opportunities in different sectors for both business and employment opportunities. Renewables further contribute to the potential reduction of load shedding in South Africa. It further contributes to the reduction of carbon emission towards achieving a net zero carbon. The carbon reduction will sustain the future generation. Guaranteed returns make it an attractive business opportunity, which creates an alternative economy for South Africa.

### **5.5. Lack of governance on Just Energy Transition**

An active legislation on just energy transition is a key enabler to successful renewable projects implementation. However, the introduction of legislation must not discourage the anticipated project and make it too strenuous to execute. The introduction of Just Energy Transition projects in South Africa must be compatible with other existing regulatory and legal frameworks.

#### **5.5.1. Do not leave people behind**

People are a critical part in ensuring that Just Energy Transition is a success. According to Participant F, it is mandatory to make sure that all people are afforded economic opportunities (employment, investment, etc.) when implementing Just Energy Transition. It must not be only for the knowledgeable and elite, but all citizens must be made known of the need to transition in addition to the benefits and impact of Just energy Transition.

So, for me, the ethics and the philosophy around it needs to change the narrative needs not to the pet peeves, at the level where me and you understand this topic must go down to a level where your street sweeper and where your normal neighbour and unemployed youth can understand and participate in this discussion. (Participant I)

#### **5.5.2. Local manufacturing**

South Africa must maintain the current trade surplus to remain competitive in the global economy. According to Participant A, the South Africa must encourage local manufacturing

and local content to ensure maximum participation in the country's economic growth. When manufacturing is done locally, more jobs will be created, which in turn, benefits the greater nation.

So, government's gonna require local content, it's going to want people to build factories and assemble renewables equipment in South Africa. So, I think that's all great and fantastic. And uh, from a job perspective to the extent that it doesn't prejudice the beneficial economics of the overall generation cost of the projects. (Participant A)

### **5.5.3. Adequate supply of electricity**

Government must ensure that the supply of electricity to all South African residents is mandatory. According to Participant K, the availability of electricity provides a greater health and social benefit to all the people. In the process of supplying electricity, cognisance must be made to reduce the effect of carbon emission for future environmental sustainability which is long-term focus.

So, in terms of it just transition in South Africa, I think the social element has a much greater role to play social and environment in that, in my understanding or in my world view of this, having massive amounts of electricity generated, umm and supply reliable energy to the entire electrical energy, to the entire population, it is of a greater health and social benefit to the population. Then the effects of carbon emission in the country, so that's an incredible tension because the one is near term dated and the one is long term dated. (Participant K)

According to Participant G, the electricity supply deficit is impacting on South Africa's socio-economic development which is critical for the growth of the economy. It is the responsibility of the government to make sure that all necessary resources are available to grow the economy of the country. The continuous supply of adequate power to businesses encourages business development and growth of the economy.

Power Security is a social responsibility and Social Security. The impact of energy reliability and energy security on the socio-economic development is absolutely critical. We are seeing how current rolling blackouts are having a huge impact on South Africa. (Participant G)



#### 5.5.4. Pre-implementation legislation

Participant H believes that South Africa must learn from other countries on the journey to transition from fossil fuels to green energy. The learnings must be taken into consideration to put together a fit-for-purpose process designed for South Africa. The designed process must be legislated, and compliance monitoring must be done. It must be noted that the process will not be smooth. There will be challenges along the transition journey. A framework is available in South Africa and it must be implemented to realise the benefits as addressed above.

Holland and they closed down their coal industry 30 years ago. They still have such big societal issues, and they had the financing available. They had plans in place all of that and if we learn from what they did, like it's just not easy to shut down the whole industry. But there's always going to be social and economic fallout. So even if we start today, it's never gonna be enough. (Participant H)

Participant L adds that some learnings can be gathered from Carletonville. The country has been mining for over ten decades and still struggle to close mines or to provide mine closure certificates for the rehabilitated and closed mines. Mine closure is another gap which must be revisited and reviewed the current legislation. This will guide the process when just energy transition is ramping up and coal mines are scaling down.

Look, I think that transitioning communities, so you have to do is drive to Carletonville. But the town of Carletonville and that's got nothing to do with the fact that gold mining has stopped. And life of mine has been reached in South Africa alone. We still haven't figured out how to close mines. (Participant L)

Participant L adds that:

In South Africa, feel that if we haven't been able to have a successful mine closure model. We fought from a model that's going to transition us or communities to a place where we like, so we transitioning away from fossil fuels to renewable energy. (Participant L)

South Africa must evaluate and understand the need to transition from fossil fuels to green energy. Participant G thinks that the key for South Africa is not to respond to pressure but understand the context for the country. The government of South Africa must have a process to evaluate the legitimacy and benefits of transition, which must be passed by the relevant bodies.

And I think for me, the most important message is that you know. To the point of context matters is important. And therefore, in terms of how we as a country and a continent transition, we need to do it in a way that considers our context. And not the context of others. Were involved in this global transition to low carbon. I think that's a fair approach because they're not compromising their economic growth. (Participant G)

#### **5.5.5. Decarbonisation**

An understanding of what is decarbonisation is in the context of coal mining sectors and the type of scope it is linked with was discussed.

Participant G believes that the best way to attempt decarbonisation in coal mines is to break down the target into different levels from scope one, scope two, and then scope three. Scope one and two of decarbonisation focus on improvements on the mine to reduce carbon emissions. Scope three is the end-user of coal, which is Eskom, and how they can burn coal and not impact the environment. Currently, Eskom is the biggest polluter of the environment during coal burning processes

Umm, I think it's about how and where there are opportunities to improve. Some of the ESG qualities of the business and not necessarily the coal but the business. So, when you decarbonize a coal mining? You really impacting on scope one and scope two, and for a coal business, that's the smallest portion of your emissions. The biggest portion is Scope 3. Uh, what that decarbonization does in terms of scope 1 and scope 2, it also reduces your costs. So, you become a little bit carbon efficient and certainly much more cost efficient because you're not buying expensive electricity from Eskom in terms of scope two. And as a tied mine, when you do that, you're first giving back that electricity to Eskom and you reducing the cost, which means that Eskom costs are also reduced because it's the way that the tied mine works is based on a cost plus basis. So, if you reduce the cost of your business, you in effect reducing the cost for Eskom. And when you reduce both scope one and scope two and improve the efficiency of the business, that's a benefit that flows directly to Eskom as a cost plus mine. (Participant G)

#### **5.5.6. Diversification of carbon emission reduction**

South Africa must explore every possible solution to reduce carbon emission. According to Participant K, there are many possible solutions to reduce carbon emissions and they range from less carbon equipment selection to planting trees that then absorbs more

carbon. The intent is to offset carbon emission to achieve net zero carbon. Different technologies currently in place to introduce renewable sectors.

Well, I think while we mine coal, we can do it a lot cleaner. So, the equipment that we use can be a lot more. Well, we can look at how we reduce the co2 emissions from the equipment that we use. We can look in terms of how we offset our co2 emissions with green projects that we run in terms of like planting trees, growing greens, that really upset to just ensure that we create, or we introduce and manage going forward the biodiversity that we introduce into the dams and the lakes and the streams in our mines and so far. (Participant K)

#### **5.5.7. Transparent just energy transition**

The success of Just Energy Transition relies on the transparency of the process. Participant G, states that all the impacts of Just Energy Transition must be made known to the public whether they are positive or negative. Where there are negative impacts, such must be addressed to minimise the impact. It needs to be a top-down approach not only from the mines, but the government must drive it.

In the way that that energy transition takes place, it must consider the potential negative impact and intentionally address and minimize those negative impacts such that the transition and it's socioeconomic consequences has a net positive effect on people who are dependent on coal and demonstrates justice. (Participant G)

What is South Africa doing to ensure there is no ghost town after coal mining? To mitigate some of the risks of leaving a ghost town, the renewable projects can be implemented in the mined-out area of Mpumalanga and reskill the current coal mine employees on the renewable space.

#### **5.6. Readiness towards just energy transition**

Evidence from the interviews show conflicting results where there are three different answers towards just transition. There were different perceptions on the readiness for transition, however, participants indicate that South Africa is ready to transition from fossil fuels to renewable energy sources. All participants are in agreement that coal is here and will be mined for a long time. Some even mention that coal will be mined until it is finished. In the next 25 years and beyond, South Africa will still be mining coal. All participants agree

that just energy transition will happen and that it is the right thing to do. The country needs a phased-in approach where renewable energy will be introduced while mining continues. When coal is phased out, renewables must be sufficient to supply the required energy for South Africa.

Participant F indicates that South Africa is open to any new technology for green energy generation. He further adds that there is commitment from the major coal consumer, Eskom, to decarbonise. “We are actively looking at opportunities to invest in green energy in terms of technology. Number two, we don't operate power stations Eskom operates, powers stations. We have seen initiatives on their side. They are starting to be ready” (Participant F, 2022).

According to Participant D, South Africa is ready to transition, including Eskom, which is the biggest coal consumer in the country. An MoU which was signed on the 25th of October, 2021 between Exxaro, Thungela, and Eskom indicates an intent from the government to say they are ready to transition and they are in support of just energy transition. The MoU is evidence of the commitment from the main polluters to reduce the impact of carbon emission. This means Eskom is moving towards green energy and their coal suppliers are in support of green energy.

Eskom is pursuing the unbundling. To create the transmission in the good companies, separate from generation. In other words, do effectively set-up competition between the generation division of Eskom or the generation subsidiary of Eskom and other power producers. And, that MOU is at least a very high-level commitment to say, well we have set our missions at this much 700,000 tons of CO2 equivalent per year. (Participant D)

According to Participant B, South Africa has an abundance of coal and is able to produce good renewable energies. The abundance of good weather, which supports renewable energy, puts South Africa in a better position to transition to green energy. This is an indication that no groundwork was done. We have the best sun in NC but we cannot feed power generated from this area back onto the grid. “firstly, we have a country that is naturally endowed with coal and, with the ability as well to transition on to the renewable energies”. (Participant B, 2022).

However, Participant M thinks that Just Energy Transition is still too early for South Africa. More work still needs to be done for the country to be ready to transition. "I think we're in its infancy, infancy stages. There's a lot of work to be done". (Participant M, 2022).

There is still a skills gap in South Africa in the current economy. According to Participant I, the skills gap is still a big issue to be addressed when the country transitions from coal to green energy. There has to be alignment from the human development point to ensure that employees and communities are taught the new skills to remain relevant during transition.

The skills that we have, will they match, you know, what are the requirements of the new world? Of course, we need to change the thinking you've changed into the new communities where we operate as we need bring to start now bringing just transition and ensuring that the development of our people you know, from HRD point of view, skills point of view, it is allied to the discussion on just the energy transition. (Participant I)

On the other end, Participant B does not think the coal mining industry is ready to transition. He feels there is no groundwork that has been done by other coal mining companies. There is still a long way to go to at least get other coal mines closer to Exxaro.

I do not think that the industry. I wouldn't say the industry is ready today. Simply because I don't think much effort has already been put by other organizations. In the way we as Exxaro not to brag, but I mean, just to read the landscape, is that we are a few steps ahead of our contemporaries in that our strategy talks to transition already and we've committed some investments towards that. (Participant B)

Participant L feels that South Africa is not ready. The mining industries are doing things the way they want. There is no collaboration and no direction.

Definitely not. Definitely not, and not because there is no cohesive pathway, so if you if you speak to Seriti, Seriti will tell you this is what they're doing and this does not Seriti green. If you speak to Exxaro, they'll tell you that this is what they're doing, and if you if. (Participant L)

South Africa still need baseload to sustain power supply and not only rely on renewable energy. Other baseload energy sources like hydrogen energy is also an option but not yet proven in South Africa. The country might have to revisit the use of nuclear power as a form of baseload. "It is interesting and and I think you know the challenge is is you can't be 100% green until you've got baseload. So, we're only gonna replace the third or so of our power with green energy" (Participant A, 2022).

Additional infrastructure is required to capture the best yield of solar energy from the Northern Cape Province of South Africa, which has the greatest potential for the production of solar renewable energy. A discussion from the interviews shows that Exxaro is ready to transition. They started in 2009 with their 'Business of Tomorrow', which focuses on renewable energy. Exxaro's renewable energy business is run by Cinnergi. They confirmed that it is a stable investment of renewable energy with lower risk and lower returns. Seriti has just entered the renewable energy space when they purchased Windlab Africa in August 2022. The renewable energy part of Seriti is called Seriti Green. Seriti Green will run as a separate entity responsible only for renewable energy which will be implemented in Mpumalanga and fed into the current grid. Thungela Resources has no intent to venture into renewable business on a commercial basis. They confirmed that they can consider installing solar energy for self-consumption only. These findings do not have to contradict evidence because Exxaro's strategy has been to grow its renewable energy business. There is a slight change with Seriti whose main focus was to mine coal and integrate their business. They saw a window of opportunity to enter into renewables and are not aiming to excel in the renewable space.

## **5.7. Conclusion**

Just Energy Transition is a complex matter. It will not happen overnight, but it will take up to a decade. Is the mining sector ready to transition into renewable energy? Based on the evidence, it seems that South Africa is not yet ready to transition. Coal will still be mined for the next 25 years. In terms of the infrastructure, South Africa is not properly equipped And more work still needs to be done to feed renewable energy into the grid. Moreover, employees require reskilling. The South African government must fulfil its obligations in terms of the governance issues and make sure that the community is not left behind.

When South Africa embarks on, its citizens must be offered the opportunity to grow with the sector. Every participant re-emphasise that Just Energy transition cannot happen in isolation. People must be informed and they must understand the need to transition from the use of fossil fuels for energy generation to renewable energy. The benefits and impact of Just Energy Transition must be made known to them. The benefit of a sustainable, greener future and the impact of socio-economic issues linked to job losses must also be discussed. Systems must be put in place and have a process to implement Just Energy Transition.

There is a perception that government is quiet, and they must start to take the lead on the matter of just energy transition. When they take the lead, they will be forced to put together legislation and governance processes, and guidelines to manage the transition. Participant L further adds that there is a risk that the mining companies might communicate with the community and the community might retaliate. The government is expected to initiate the process and they must manage the risk should the community retaliate. Currently, there are many structures that are discussing but there is no direction from the government. The expectation is for the government to standardise the process and keep all stakeholders involved and informed. Exxaro has started to inform the community and they will not wait to the government because for them, it is the right thing to do to take everyone along. Thungela Resources is hesitant to communicate and Seriti is also keeping the communities up to date.

The mining companies are not aligned because there is no directive from the government and Department of Mineral Resources and Energy (DMRE). A concern is that the government has not started to engage with the communities, and they might not start. Exxaro believes it is the right thing for them to start. As for Thungela Resources, going green is not in their strategy and they are not obliged to communicate unless they are mandated to do so, and they will make sure they comply. On the contrary is that, the government expects mining companies to transition but they do not provide a guideline of how the companies must initiate this process. There is no collaboration among the coal mining companies identified by the research as a key finding.

## CHAPTER SIX: FINDINGS

### 6.1. Introduction

The purpose of this section is to confirm whether the objectives which were set in the beginning of this study were met, and to assess if the research questions were answered. The objectives were to investigate the social perception and attitudes of senior coal mine managers towards just transition; to investigate and describe the level of awareness among senior coal mine managers concerning just transition; and to assess the readiness level of senior manager with regard to just transition. The research questions were to understand what the perception of senior managers towards just energy transition are; what the attitudes of senior managers towards just energy transition; what the level of awareness of senior coal mine managers towards just energy transition and how ready are senior coal mine managers to transition from fossil fuels to renewable energy are. The data gathered through interview processes confirmed that all senior managers of coal mines are aware of the topic of just energy transition and the reasons why it is necessary to transition from fossil fuels to renewable energy or greener energy.

### 6.2. Mining Strategies

Exxaro is leading the pack out of the three coal mining organisations in terms of their current standing with regard to renewable energy. Backdating from 2009, the organisation embarked on a green strategy, which was called the ‘Business of Tomorrow’ which focused on agriculture, renewable energy, and water as a resource. Exxaro has been consistent year-on-year to expand its renewable energy portfolio. In their 2021 annual report, Exxaro confirmed that their intent is to diversify from coal and focus on other minerals and renewable energy (Exxaro, 2021). Exxaro is generating 232MW of energy per day powering 200 000houses as per figure 1.4.

Seriti purchased Windlab Africa in July 2022, which is called Seriti Green. An announcement was made on 15 August 2022 where Seriti indicated its intention to venture into renewable energy sources (Reuters, 2022). The Chief Financial Officer acknowledged during the interview that Seriti is not an expert in renewable energy hence Seriti Green will remain a stand-alone business to maintain the current expertise from Windlab Africa. The strategy of the three major coal producers in South Africa is different. Exxaro is active in the renewable energy production; Seriti has just entered the space of renewable energy;



and Thungela Resources has no intent to produce renewable energy for commercial reasons.

Thungela Resources' strategy is to mine coal and they have no intention to enter renewable energy space for commercial purposes. Their parent company, Anglo American Coal, which diversified from coal in 2021 was clear that their strategy is neither to mine coal nor focus on renewables. Thungela Resources has adopted a similar strategy and they believe that the introduction of renewable sources will still need coal which will provide baseload energy during the evening or when the weather does not allow for sufficient production of power through renewable sources (Thungela, 2021).

There were no surprises concerning the previous three years commitment from Exxaro. They did not deviate from the strategy to grow within the renewable energy space. Seriti's strategy never focused on renewable energy but rather focused on growing their coal mining business, hence, the purchase of the former South 32 coal mines. They changed their strategy when coal mines started to get good export prices. The availability of extra cash as results of good coal price created an opportunity to purchase of Windlab Africa (Reuters, 2022).

The overall findings were positive, and all participants agree and support the need to transition from fossil fuels to green energy to sustain the environment. They all agree that coal mining will continue for a long time. Some of the participants feel that there must be an intervention from the government to outline and guide the process for South Africa to have a good transition.

### **6.3. Perception of senior managers towards just transition**

The findings on the perception of just energy transition from fossil fuel to renewable energy was positive with all the participants. They acknowledged witnessing the devastating impacts of global warming which is mainly influenced by burning fossil fuel (Akinbami, Oke, & Bodunrin, 2021). The senior coal mine managers acknowledge that coal is dirty and there is a need to fast-track the reduction of carbon emissions because it is the responsibility of human beings to make a difference in the release of carbon to the environment. Sustaining the environment has a benefit for a good healthy environment for current and future life on earth (Chung & Kim, 2018). The positive side is that, the senior managers of coal mines who are proud of how they are extracting coal safely and

productively, acknowledge the need to transition to greener energy for the sustainability of the environment (Jakob, Lamb, Steckel, Flachslan, & Edenhofer, 2020).

#### **6.4. Attitudes and level of awareness of senior managers towards just transition**

The attitude observed from the senior coal mine managers was positive towards just energy transition. They all acknowledge that the rewards of transitioning from fossil fuels to renewable energies are great. They have however listed some challenges which have the potential to delay the start of just energy transition. The main one was a confirmation that coal is still economical to use while introducing just energy transition (Thopil, Bansal, Zhang, & Sharma, 2018). They believe that just energy transition will not happen independently but with a phased-in approach where coal will still be in use together with renewable energies. This belief has the potential to make the senior managers reluctant to fast-tracking the startup of just energy transition projects in their operation. Thopil, Bansal, Zhang, and Sharma (2018), believe that South Africa must prove that renewable energy can provide base load energy before the country can move over to renewables as they are perceived as unreliable. The literature from Hainsch, et al., (2022), conform the attitude of senior managers towards just energy transition which was positive. All senior coal mine managers are familiar with the phrase just energy transition. They understand it as a way to shift from fossil fuel energy to renewable energy. The intent of implementing just energy transition is to ensure there is a sustainable environment for future use.

#### **6.5. Just energy transition in Mining**

Overall findings from the participants state that South Africa can transition. However, the country is not ready to transition from fossil fuel to renewable energy. Some participants feel that there is a lot to be done to ensure a smooth transition process. on those bases, South Africa must first address the issues before the just energy transition is implemented. Coal mining and coal consumption will remain part of South Africa's source of energy generation while the country is establishing renewable energy projects. Renewable energy alone will not sustain the power demand in South Africa (Simpson et al., 2019). The sustainability of renewable energy to provide baseload power has not been proven. Participants in this study do not have confidence that renewable energy alone will provide South Africa with a sufficient power supply. According to Yang et al. (2018), battery storage systems can be used for renewables such as wind and solar power due to their unreliability. The challenge will be to

compare the cost of the battery, which is linked to the battery capacity and the expected power to be generated from renewable energy sources. The cost evaluation will influence the decision for battery installation. This option is still under review, and it must still be proven as a feasible option to have sustainable renewable energy (Yang et al., 2018). The overall readiness of coal mines and South Africans is dependent on the support that is needed to ensure that there is a continuous supply of energy to the power grid.

A participant commented that solar farms do not require the same number of employees as required by coal mines and power stations. This statement is contrary to research by Pai et al. (2020), who note that the equal replacement of mining jobs with renewable energy jobs has not been proven even though countries like the United States and China are implementing skills transfer. Pai et al. (2020), cannot confirm the number of mining equivalent jobs that will be created in the renewable energy projects. The growing fear of job losses as a result was identified as a concern. The researcher recommends that the South African government must not stop coal mining abruptly. There must be a phased-in approach where reskilling is done to transition the coal mining employees to renewable sectors. The abrupt stoppage might force South Africa to import skills and further exacerbate the unemployment rate. The unemployment rate has been growing showing an upward trend from 2012 until 2018 in South Africa (Mzungulu & Ndzendze, 2021). Mzungulu and Ndzendze (2021), further state that, during the year 2018, South Africa recorded an unemployment rate of 38.8% among youth aged between 15 to 34 years and 17.9% among adults aged between 35 to 64 years.

The mining of coal in South Africa contributes to the country's economic growth (Joshua & Bekun, 2020). It also provides reliable power sources, which promote sustainable and uninterrupted productivity. The displayed good performance in the coal mining industry might encourage the ramping-up of coal mining to close the deficit of power shortage, which is currently contributing to load shedding in South Africa. There is a need to balance economic growth and to sustain the environment when introducing just energy transition projects (Ring et al., 2022). The researcher think that South Africa must not compromise their economic growth to sustain the environment. Countries will rather put measures to reduce the release of fossil fuels to sustain a good environment.

There is a need to sustain the economic activities in the mining towns to avoid leaving a ghost town. According to Githiria and Onifade (2020), a ghost town is an abandoned town as a result of mine closures of previously bubbling mining communities. In Australia and the United States,

there are previous coal mine employees who are currently unemployed after the closure of the coal mines (Carley & Konisky, 2022). Carletonville is a good example of a town that flourished during its mining era. The presence of gold mines placed the town in a good position where there was high economic activity and an influx of people into the city. When the mines started to scale down, automatically the economic activities also shrunk (Marais & de Lange, 2021).

Infrastructure shortage in the Northern Cape will hinder South Africa from getting the maximum solar energy (Akinbami et al., 2021). Unfortunately, the “God-given” weather that supports solar energy will be left redundant while the country experiences load shedding. This statement was confirmed by literature from Aliyu et al. (2018), who confirms that South Africa has the best solar radiation which can produce good electricity when installed capacity is feeding into the grid.

At the time of writing, South Africa is still experiencing load shedding which is bad and it suppresses economic growth. South Africa still experiences power supply shortages amidst the abundance of coal and the presence of power stations. The demand for reliable power sources presents opportunities for new businesses to substitute fossil fuel energy with greener energy, which can produce baseload energy (Thopil et al., 2018). The current gap in power supply encourages innovation and speedy implementation of alternative power sources through renewable energy sources. Alternative economies for the community to participate in when renewables are introduced as an added benefit of just energy transition.

South Africa is a developing country and to benefit the environment while growing the economy, renewable energies are key (Mutezo & Mulopo, 2021). The sustainability of future generations will be achieved when global warming is curtailed. Electricity is a key enabler for every processing and manufacturing industry (Heffron et al., 2020). Heffron et al., (2020), further state that reliable electricity contributes to economic growth. This includes ensuring that there is an adequate power supply as it serves both security and social benefits.

The presence of governance and legislation is key to ensuring that there is structure and direction when embarking on a new project or introducing new laws for the country (Lowitzsch et al., 2020). The main aim of the legislation must be to encourage and support the implementation of projects and not to discourage the organisation to start due to stringent processes. The government must be part of the solution to any challenges to ensure that South Africa achieves the desired renewable energy. Having the right legislation has the benefit of producing equal decision making which as result benefits the larger population (Ring et al., 2022).

The skills gap was identified as a hindrance to a successful. According to Ring et al. (2022), there is a need to support social science studies to have a sustainable society and to achieve desired outcomes of a sustainable environment. Closing the skills gap will ensure that there are no people who are left behind and that it is an all-inclusive process.

Boudet, (2019), listed four pillars to address public perception and response to new energy technology. The pillars were split between technology, people, place, and process (Boudet, 2019). The four pillars apply to this study. Just transition introduces new skills and technologies for the new way of energy generation. The pillars support literature on the socio-technical transition framework by Harrahill and Douglas (2019) which focuses on the people, technology, process, and place used in public consultation processes with communities. The four focus points will be used to answer the research question which is: What is the perception, attitude, and awareness of senior coal mine managers towards just transition as well as their readiness to transition from fossil fuels to renewable energy?

## **6.6. Conclusion**

The existing ghost town of Carletonville was not known to the researcher as a ghost town. The devastating impact resulting from mine closure confirmed the need for the government and mining companies to intervene and use the town as a learning hub for the prevention of future ghost towns in South Africa

## Chapter seven: Conclusion

### 7.1. Introduction

This study explored the perception and attitude of senior managers of coal mines towards just energy transition, investigated and described the level of awareness amongst the senior managers on the topic of just energy transition, and also assessed readiness level to transition from fossil fuel to green energy sources.

The data gathered through interview processes confirmed that all senior managers of coal mines are aware of the topic of just energy transition and the reasons why it is necessary to transition from fossil fuel to renewable energy or greener energy. Three questions were formulated which are; what are the perceptions and attitudes of senior managers towards just transition? what is the level of awareness of senior coal mine managers towards just transition? and how ready are senior coal mine managers towards just transition?

Purposive sampling was used to select relevant participants based on their level of seniority, their experience in the mining industry, and their level of exposure. Level of exposure is linked to conversations that take place with the decision makers of coal mines on the organisation's strategy.

### 7.2. Overall findings

The main findings of this study explain that when introducing just energy transition, people must not be left behind. All people must be informed of the need to transition from fossil fuels to renewable energy. The benefits and consequences must be outlined.

All participants in this study support this because they have seen the impact of global warming through the change in weather patterns and the devastating impact of floods and heat waves, for example. Participants agree that the burning of coal has a significant impact on the environment when fossil fuel gas is released into the atmosphere. The implementation of just energy transition projects supports the sustainability of the environment and future.

There is a growing fear from coal mining employees that they will lose their jobs when just energy transition projects are implemented. Participants believe that just energy transition will not lead to the closure of coal mines. Coal will be mined until the reserves are depleted. The current coal reserves in South Africa are aligned with the life of power stations.

The inability of renewable energy to provide a continuous supply of electricity was identified as a major hindrance to a successful transition. There are options to use battery storage systems which might come at a higher cost. Due to the inability of renewable energy sources to provide baseload energy, coal mining will continue until a solution is sourced to enable a continuous supply of power from renewable energy sources.

The socio-economic transition has to ensure that it does not disadvantage the community. The issues of job losses, skills transfer, and other economic activities must be considered before South Africa can transition from coal to renewable energy sources. South Africa must put stringent measures on mine closure plans to avoid the creation of ghost towns. Carletonville has been identified as a good example of a failure in long-term closure plans by the DMRE and town planner.

South Africa must put stringent measures on the mine closure plan to avoid the creation of ghost towns. Carletonville town has been identified as a good example of a failure in a long-term closure plan by the DMRE and town planner.

Acknowledging all the challenges also has the potential to close the current deficit of energy supply in South Africa when it is introduced with the current coal-fired power generation. It allows for innovation and the introduction of new technologies. The projects from new technologies will create new jobs during the project phase and long-term jobs to maintain the renewable projects.

### **7.3. Limitations**

A total of 13 senior managers were interviewed in this study. The intent was to interview a total of 15 senior managers to get more in-depth knowledge from participants. There were limitations identified during the research process, but they did not obstruct the completion

of this study. Scheduling the interviews was a challenge. Out of nine interviews that were scheduled before the approval of ethical clearance, only four were realised as per the scheduled date. Two meetings were cancelled and never materialised. The cancellation was due to work commitments and travelling out of South Africa. The intent was to interview all three CEOs of the three mining companies that formed part of the study, however, the researcher could only interview one CEO. The other two CEOs sent an unavailability response.

The research findings are based on three selected mining companies which are Exxaro, Seriti, and Thungela Resources. The researcher only had limited time to complete this study and could not cover all coal mines in Mpumalanga. The intent was to have an equal representation from all three mining companies in terms of participants. The outcome was that nine out of thirteen participants came from Seriti. The remaining four senior managers were split in half between Thungela Resources and Exxaro. The split from different organisations did not affect the findings as these interviews were based on people's perceptions and less about their organisation. The findings cannot be generalised to the overall mining population but only to the three mining companies that participated in the study.

#### **7.4. Recommendations**

A surprise came during the interview process where it was stated that the Eskom distribution infrastructure in the Northern Cape (NC) Province is full. The NC has the best solar radiation in Sub-Saharan Africa. The opportunity of the good sun will not benefit the South African citizen due to the infrastructure gap. The study recommends Eskom must initiate a feasibility study to install additional distribution lines in the NC Province. This initiative will encourage renewable energy companies to install more solar power projects.

The coal mining companies in South Africa must collaborate to reach a potential target of reducing carbon emission. They must also work together on the execution of renewable projects to ensure delivery of big renewable projects. This study recommends the three mining companies collaborate and learn from one another. In figure 2.1, the three mining companies are neighbours with no physical boundaries in most of the mines. Furthermore,



this collaboration will enable the three mining companies to learn from one another. The added benefit is that they can jointly implement renewable energy projects on their rehabilitated land.

It is recommended that must be made known to all South African citizens. When people are informed and the process is transparent, they are likely to support the initiative. This will ensure that people are not left behind. The issue of skills transfer must be addressed to reduce the risk of job losses from the mining employees

The government must take the lead and make sure that there is legislation in place that governs the introduction of just energy transition. There are other actions which require the government to take the initiative like to ensure that all citizens are made aware of just energy transition and its intent.

The researcher recommends that the South African government must not stop coal mining abruptly because the economy is still dependent on coal, and it does not want to compromise the country's economic growth. Furthermore, European countries have reopened their coal mines which is against their drive to decarbonisation (Liu & Raftery, 2021).

## **7.5. Research recommendation**

A contradiction arises when there is a drive for decarbonisation to sustain the environment through the implementation of renewable energy sources. On contrary, South Africa has an abundance of coal reserves and experienced people to extract the reserves optimally and contribute to economic growth. Both scenarios are important for South Africa but their outcome is different. based on the findings of this research, the following research questions are proposed for future research; is South Africa going to close its coal mines and install only renewable energy sources? When will this happen? On the contrary, is South Africa going to continue to mine coal for electricity generation? For how long? Is South Africa going to continue mining until all coal reserves are depleted and use the profit made from the mining of coal to increase the infrastructures on renewable and have a

mixed power source? Does this model give South Africa enough time to transfer skills from mining employees to renewable energy?

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## APPENDIXES

### APPENDIX A: INTERVIEW GUIDE PROCESS

Study all my questions and understand the simplified language  
 Do practice/ dummy questions to two people  
 Check the similarities and differences in the two interviewees  
 Email the information sheet and consent letter to the person I will be interviewing.

Introduce myself (1 minute)

Ask a person if they consent to conduct this interview after reading the consent form

Interviewee details:

Gender	
Race	
Occupation	
Department	
Experience	

Prompt – keep all records

Include the gaps from previous interviews

Have a note pad for myself, after interviews I must write my reflection

Read the body language which must include:

Folding hands	
Hostage	
Facial expression	
Raise a voice	
Is angry	
Become passionate	
Resistance	

Add all expression as part of the findings

If they speak in vernacular, do not translate as it loses the meaning. Have a footnote explaining what it means within the vernacular expression or question.

If a person is hostile, post a question in a different manner, after three other questions.

Example: don't ask how old are you but when were you born?

Climate change, have you witnessed changes? Define climate change. Changes in weather patterns.

Find out a definition I will adopt in my study about readiness. Have you adopted or incorporated .....Ask about their policies addressing this transition.

### **Just energy transition interview guide**

1. What do you understand the term "Just Energy Transition"?
2. What do you perceive as ethical and philosophical aspects related to the question of climate justice between current and future generations?
3. What do you think is required to ensure just energy transition is successful in South Africa and in the mining sector?
4. What is your perception on South Africa coal mining industry readiness to transition from coal to renewable energy sources?
5. What are the explicit and implicit reasons why just energy transition is happening?
6. What policy and governance approaches could embed spatial justice during just energy transition, especially in the mining sector?
7. Where do you think Coal mining in South Africa will be 25 years from now with regards to renewable energy?
8. What do you think the world need to do to reduce the impact of carbon emission and global warming in the mining sector?
9. What do you see as a sustainable workable solution for a community of Mpumalanga when implementing Just Energy Transition from fossil fuel to renewable energy sources? (Socio-economic focus)
10. What does the signed Memorandum of Understanding (MOU) between Exxaro, Seriti and Eskom mean in your opinion? (Signed on 25 October 2021)
11. What do you see as the next energy source to replace coal post Just Energy Transition
12. What are mining companies doing to transfer skills linked to Just Energy Transition?
13. What is Exxaro or Thungela or Seriti doing to inform the community about Just energy Transition to ensure no one is left behind?
14. What is your closing comments on this topic of Just Energy Transition?

