SOCIAL IMACT ASSESSMENT

MULILO KAROO WIND POWER 2 ENERGY FACILITY

WESTERN CAPE PROVINCE

JULY 2024

Prepared

by

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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

SES Environmental was appointed to manage the Environmental Impact Assessment (EIA) process for the Karoo Wind Energy Facility (WEF) which will be developed in three phases, namely:

- Mulilo Karoo Wind Power 1 WEF: Up to 348.5 MW.
- Mulilo Karoo Wind Power 2 WEF: Up to 382.5 MW.
- Mulilo Karoo Wind Power 3 WEF: Up to 144.5 MW.

The study area is located between 20 and 30 north of the town of Beaufort West in the Beaufort West Municipality (BWM) in the Western Cape Province. Tony Barbour Environmental Consulting was appointed to undertake a specialist Social Impact Assessment (SIA) as part of an EIA process. This report contains the findings of the SIA for the Mulilo Karoo Wind Power 2 WEF.

SUMMARY OF KEY FINDINGS

The key findings of the study are summarised under the following sections:

- Fit with policy and planning.
- Construction phase impacts.
- Operational phase impacts.
- Cumulative impacts.
- Decommissioning phase impacts.
- No-development option.

POLICY AND PLANNING ISSUES

The development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The BWM Spatial Development Framework (SDF) and Integrated Development Plan (IDP) also support the development of renewable energy and the site is located within the Beaufort West REDZ. The development of the proposed WEF is therefore supported by key policy and planning documents.

CONSTRUCTION PHASE

The key social issues associated with the construction phase include:

Potential positive impacts

- Creation of employment and business opportunities, and the opportunity for skills development and on-site training.

The construction phase will extend over a period of approximately 18 months and create in the region of 200-250 employment opportunities. Members from the local communities in Beaufort West may potentially qualify for low skilled and semi-skilled and some skilled employment opportunities. Most of these employment opportunities

will accrue to Historically Disadvantaged (HD) members of the community. However, due to the low education and skills levels in the area the local employment opportunities are likely to be limited. The total wage bill will be in the region of R 60 million (2024 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in Beaufort West. The capital expenditure associated with the construction phase will be approximately R 6.8 billion (2024 Rand value). Due the lack of diversification in the local economy the potential for local companies is likely to be limited. Most benefits are therefore likely to accrue to contractors and engineering companies based outside the BWM. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities.
- Impacts related to the potential influx of jobseekers.
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
- Increased risk of grass fires associated with construction related activities.
- Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles.
- Impact on productive farmland.

The findings of the SIA indicate that the significance of all the potential negative impacts with mitigation are likely to be **Low Negative**. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. Table 1 summarises the significance of the impacts associated with the construction phase.

Table 1: Summary of social impacts during construction phase

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Creation of employment and business opportunities	Medium (Positive)	Medium (Positive)
Presence of construction workers and potential impacts on family structures and social networks	Medium (Negative)	Low (Negative)
Influx of job seekers	Low (Negative)	Low (Negative)
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Medium (Negative)	Low (Negative)
Increased risk of grass fires	Medium (Negative)	Low (Negative)
Nuisance impacts associated with construction activities	Medium (Negative)	Low (Negative)
Loss of farmland	Medium (Negative)	Low (Negative)

OPERATIONAL PHASE

The following key social issues are of relevance to the operational phase:

Potential positive impacts
- Establishment of infrastructure to improve energy security and support renewable sector.
- Creation of employment opportunities.
- Benefits for local landowners.
- Benefits associated with socio-economic contributions to community development.

The proposed project will supplement South Africa's energy and assist to improve energy security. In addition, it will also reduce the country's reliance on coal as an energy source. This represents a positive social benefit.

Potential negative impacts
- Noise impacts associated with the operation of the facility.
- Visual impacts and associated impacts on sense of place.
- Potential impact on property values.
- Potential impact on tourism.

The findings of the SIA indicate that the significance of all the potential negative impacts except for visual impacts will be **Low Negative** with mitigation. Most of the potential negative impacts can therefore be effectively mitigated. The significance of the impacts associated with the operational phase are summarised in Table 2.

Table 2: Summary of social impacts during operational phase

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Establishment of infrastructure to improve energy security and support renewable sector	High (Positive)	High (Positive)
Creation of employment and business opportunities during maintenance	Low (Positive)	Medium (Positive)
Benefits associated with socio-economic contributions to community development	Medium (Positive)	High (Positive)
Benefits for landowners	Low (Positive)	High (Positive)
Visual impact and impact on sense of place[1]	High (Negative)	High (Negative)
Visual impact and impact on sense of place[2]	Low (Negative)	Low (Negative)
Impact on property values	Low (Negative)	Low (Negative)

[1] Based on findings of VIA (Logis 2024)
[2] Significance for observers that do not regard wind turbines as a negative visual impact

Impact on tourism	Low (Negative)	Low (Negative)

CUMULATIVE IMPACTS

Cumulative impact on sense of place
The findings of the VIA (Logis 2024) indicate the cumulative visual impact of the proposed Karoo Wind Power Phase 2 facility, together with the other authorised WEFs within a 30 km radius (is expected to be **very high**, depending on the observer's sensitivity to wind turbine structures. While the visual quality of the landscape is considered high and taking into consideration the potential visual impacts on sensitive visual receptors, the cumulative visual impact is considered to be within acceptable limits owing to its location within the Beaufort West REDZ.

Cumulative impact on local services and accommodation
The significance of this impact with mitigation was rated as **Low Negative**.

Cumulative impact on local economy
The significance of this impact with enhancement was rated as **High Positive**.

DECOMMISSIONING PHASE

Given the moderate number of people employed during the operational phase (~ 15-20), the potential negative social impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be **Low Negative**.

NO-DEVELOPMENT OPTION

The No-Development option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost. The No-Development option is not supported by the findings of the SIA.

CONCLUSIONS

The findings of the SIA indicate that the development of the proposed Karoo 2 WEF and associated infrastructure will create employment and business opportunities during both the construction and operational phase of the project. Except for the visual impact on sense of place, all the potential negative impacts can be effectively mitigated.

SED contributions associated with the project will also benefit the local community. The enhancement measures listed in the report should be implemented to maximise the potential benefits. The significance of this impact is rated as **High Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a

local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The Karoo 2 WEF is also located within the Beaufort West REDZ. The area has therefore been identified as suitable for the development of renewable energy facilities and associated infrastructure.

Statement and reasoned opinion
The establishment of the Karoo 2 WEF and associated infrastructure is supported by the findings of the SIA.

Recommendations
- The recommendations of the VIA should be considered.
- Radar activated civil aviation lights should be installed on all wind turbines.
- The proponents should engage with the owner of Quagga Fontein 82 to discuss concerns relating to specific turbine locations.
- WEF developers should liaise with local farmers and Provincial Roads Department to address the potential cumulative impacts on the R381.

TABLE OF CONTENTS

CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	Section 1 Annexure A
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 1 Annexure D
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1 Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A to SIA
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1 Annexure B
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section 4
(g) an identification of any areas to be avoided, including buffers;	Section 4
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 1
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	Section 4 and 5
(k) any mitigation measures for inclusion in the EMPr;	Section 4
(l) any conditions for inclusion in the environmental authorisation;	Section 4 and 5
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	Section 5
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Section 1, Annexure A
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q) any other information requested by the competent authority	N/A
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Comply with the Assessment Protocols that were published on 20 March 2020, in Government

	Gazette 43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. As at May 2024, there are no sensitivity layers on the Screening Tool for Socio-economic-features. Part A has therefore not been compiled for this assessment.

ACRONYMS

BESS	Battery Energy Storage System
BWM	Beaufort West Municipality
CKDM	Central Karoo District Municipality
DEA&DP	Department of Environmental Affairs and Development Planning
DM	District Municipality
HD	Historically Disadvantaged
EIA	Environmental Impact Assessment
IDP	Integrated Development Plan
IPP	Independent Power Producer
kV	Kilovolts
LED	Local Economic Development
MW	Megawatt
SDF	Spatial Development Framework
SIA	Social Impact Assessment
WCP	Western Cape Province
WEF	Wind Energy Facility

SECTION 1: INTRODUCTION

1.1 INTRODUCTION

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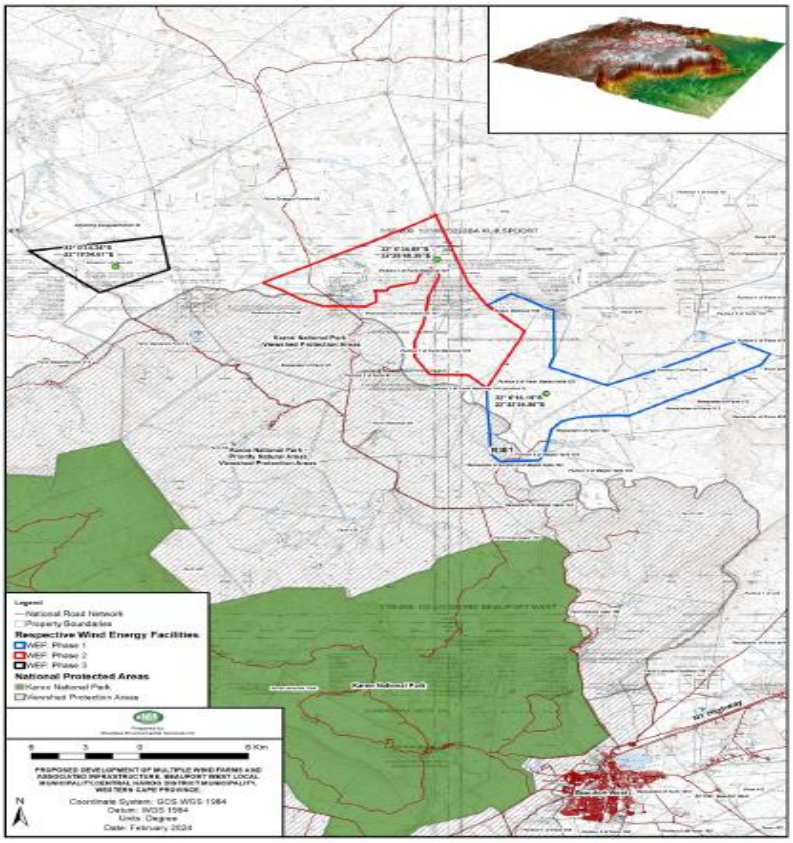


Figure 1.1: Location of Karoo Wind Energy Facility (Phase 1-Blue, Phase 2-Red and Phase 3-Black)

1.2 PROJECT DESCRIPTION

Mulilo Karoo Wind Power 2 (Pty) Ltd is proposing to develop the Karoo 2 WEF located ~ 25 km to the north of Beaufort West. The capacity will be up to 382.5 MW. The technical details are summarised in Table 1.1. The Karoo 2 site is located on 4 properties, namely Middle Kraal 98/RE, Waterval 101/RE, 101/1 and 101/3.

Table 1.1: Technical details

Component	Description
Applicant name – Phase 2	Mulilo Karoo Wind Power 2 (Pty) Ltd
Turbine detailing (Photograph 1.1)	Hub Height: Up to 160 m Generation capacity per turbine-up to 8.5 MW Rotor Diameter-Up to 200 m (currently 182 m) Blade length: 82.5m Crane platform and Hardstand area-up to 0,8 ha per turbine Reinforced Concrete Foundation- up to 0.07 ha per turbine WTG Component Laydown area- up to 4 ha (per phase)
Internal Gridline (33kV) information	A combination of underground and overhead grid Infrastructure height will be used, where underground infrastructure is feasible. The underground grid infrastructure will have a width of 3 m and where overhead internal infrastructure will be used, the grid corridor width will be 15 m. Height of internal infrastructure where overhead powerlines are to be used: 20 m
Access roads	A combination of fractured stone, sand, and fine particles with a binding characteristic to form a smooth, firm surface. According to the layout provided, the internal road widths will be up to 12 m and the access road reserve will be up to 15 m.
Number of high and medium voltage substations required per facility	Up to 2 substations of up to 2 ha each (1 ha IPP substation and 1 ha Eskom switching station) 33 kV to 132 kV collector substation to receive, convert and step-up electricity from the WEF to the 132 kV grid suitable supply. The substations maximum height will be the lightning mast up to 25m high. The facility will house control rooms and grid control yards for both Eskom and IPP.
Laydown Areas and temporary laydown areas and areas for M&O Contracting area per phases	Temporary Construction/Office yard: up to 4ha Temporary WTG Laydown areas: up to 4 ha Temporary on-site batching plant: up to 1 ha Temporary stockpiles: up to 2ha O&M areas: up to 2 ha
The transmission capacity of the Eskom switching Station on site per phase	Up to 500 MW
Batching plants	Batching plants are temporary and are 1 ha in size. Ideal to be placed near a water source.
Fuel Storage areas	Each wind farm will have a bunded fuel & lubricants storage facility on site in fixed tanks not exceeding 80m3 (situated at the site camp)
Water reticulation requirements	80 000Kl/year during construction (Construction period will be over a period of approximately 18-24 months). 1 200 Kl/year for the 30-year operational phase. Quality – Drinking water quality is required suitable for the making of concrete. Possible pipeline from existing bulk water supply.

External Gridline information	132kV overhead powerline with pylons of up to 32m connection from on-site substation to Eskom Main Transmission Substation. The external grid line does not form part of the BA.

Photograph 1.1: Typical example of wind turbine

1.3 APPROACH TO STUDY

The approach to the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (February 2007). These guidelines are based on international best practice. The key activities in the SIA process embodied in the guidelines include:

- Describing and obtaining an understanding of the proposed intervention (type, scale, and location), the settlements, and communities likely to be affected by the proposed project.
- Collecting baseline data on the current social and economic environment.
- Identifying the key potential social issues associated with the proposed project. This requires a site visit to the area and consultation with affected individuals and communities. As part of the process a basic information document was prepared and made available to key interested and affected parties. The aim of the document was to inform the affected parties of the nature and activities associated with the construction and operation of the proposed development to enable them to better understand and comment on the potential social issues and impacts.

- Assessing and documenting the significance of social impacts associated with the proposed intervention.
- Identifying alternatives and mitigation measures.

In this regard the study involved:

- Review of socio-economic data for the study area.
- Review of relevant planning and policy frameworks for the area.
- Review of information from similar studies, including the SIAs undertaken for other renewable energy projects.
- Site visit and interviews with key stakeholders.
- Identifying the key potential social issues associated with the proposed project.
- Assessing the significance of social impacts associated with the proposed project.
- Identification of enhancement and mitigation measures aimed at maximizing opportunities and avoiding and or reducing negative impacts.

Annexure A contains a list of the secondary information reviewed. Annexure B summarises the assessment methodology used to assign significance ratings to the assessment process.

1.4 ASSUMPTIONS AND LIMITATIONS

1.4.1 Assumptions

Technical suitability
It is assumed that the development site represents a technically suitable site for the establishment of the proposed WEF and associated infrastructure.

Strategic importance of the project
The strategic importance of promoting renewable and other forms of energy is supported by the national and provincial energy policies.

Fit with planning and policy requirements
Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard, a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.

The site is located within the Beaufort West REDZ. The area has therefore been identified as suitable for establishment of renewable energy infrastructure.

1.4.2 Limitations

There are no limitations that have a material bearing on the SIA.

1.5 SPECIALIST DETAILS

Tony Barbour, the lead author of this report, is an independent specialist with 30 years' experience in the field of environmental management. In terms of SIA experience Tony Barbour has undertaken in the region of 350 SIAs and is the author of the Guidelines for

Social Impact Assessments for EIA's adopted by the Department of Environmental Affairs and Development Planning (DEA&DP) in the Western Cape in 2007. Annexure C contains a copy of Tony Barbour's CV.

Schalk van der Merwe, the co-author of this report, has an MPhil in Environmental Management from the University of Cape Town and has worked closely with Tony Barbour over the last 20 years.

1.6 DECLARATION OF INDEPENDENCE

This confirms that Tony Barbour and Schalk van der Merwe, the specialist consultants responsible for undertaking the study and preparing the SIA Report, are independent and do not have any vested or financial interests in the proposed power line being either approved or rejected. Annexure D contains a signed declaration of independence.

1.7 REPORT STUCTURE

The report is divided into five sections, namely:

- Section 1: Introduction.
- Section 2: Summary of key policy and planning documents.
- Section 3: Overview of the study area.
- Section 4: Identification and assessment of key social issues.
- Section 5: Summary of key findings and recommendations.

SECTION 2: POLICY AND PLANNING ENVIRONMENT

2.1 INTRODUCTION

Legislation and policy embody and reflect key societal norms, values, and developmental goals. The legislative and policy context therefore plays an important role in identifying, assessing, and evaluating the significance of potential social impacts associated with any given proposed development. An assessment of the "policy and planning fit[3]" of the proposed development therefore constitutes a key aspect of the Social Impact Assessment (SIA). In this regard, assessment of "planning fit" conforms to international best practice for conducting SIAs.

Section 2 provides an overview of the policy and planning environment affecting the proposed project. For the purposes of meeting the objectives of the SIA the following policy and planning documents were reviewed:

- National Energy Act (2008).
- White Paper on the Energy Policy of the Republic of South Africa (December 1998).
- White Paper on Renewable Energy (November 2003).
- Integrated Energy Plan (2016).
- Integrated Resource Plan (IRP) for South Africa (2010-2030).
- National Development Plan (2011).
- New Growth Path Framework.
- National Infrastructure Plan.
- Western Cape Provincial Spatial Development Framework (2014).
- Western Cape Infrastructure Framework (2013).
- Western Cape Provincial Strategic Plan (2014).
- Western Cape Green Economy Strategy (2013).
- One Cape 2040 (2012).
- Central Karoo District Municipality Spatial Development Framework (2020).
- Beaufort West Municipality Integrated Development Plan (IDP) (2022-2027).
- Beaufort West Municipality Spatial Development Framework (Draft 2023).
- SANParks, 2017. Karoo National Park – Park Management Plan 2017-2027.

Section 2 also provides a review of the renewable energy sector in South Africa.

2.2 NATIONAL POLICY ENVIRONMENT

2.2.1 National Energy Act (Act No 34 of 2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar and wind:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty

[3] Planning fit" can simply be described as the extent to which any relevant development satisfies the core criteria of appropriateness, need, and desirability, as defined or circumscribed by the relevant applicable legislation and policy documents at a given time.

alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…"(Preamble).

2.2.2 White Paper on the Energy Policy of the Republic of South Africa

Investment in renewable energy initiatives, such as the proposed SEF, is supported by the White Paper on Energy Policy for South Africa (December 1998). In this regard, the document notes:

"Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly ***solar*** and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented.
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
- Addressing constraints on the development of the renewable industry.

The White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive, and many appropriate applications exist.

2.2.3 White Paper on Renewable Energy

The White Paper on Renewable Energy (November 2003) (further referred to as the White Paper) supplements the *White Paper on Energy Policy*, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes that while South Africa is well endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol[4], Government is

[4] The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC), aimed at fighting global warming. The UNFCCC is an international environmental treaty with the goal of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of November 2009, 187 states have signed and ratified the protocol (Wikipedia).

determined to make good the country's commitment to reducing greenhouse gas emissions. To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

South Africa is also a signatory of the Copenhagen Accord, a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change agreed to "take note of" at the final plenary on 18 December 2009. The accord endorses the continuation of the Kyoto Protocol and confirms that climate change is one of the greatest challenges facing the world. In terms of the accord South Africa committed itself to a reduction target of 34% compared to business as usual. In this regard, the IRP 2010 aims to allocate 43% of new energy generation facilities in South Africa to renewables.

Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels.

2.2.4 Integrated Resource Plan (2019)

South Africa's National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines a desired destination where inequality and unemployment are reduced, and poverty is eliminated so that all South Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living. In formulating its vision for the energy sector, the NDP took as a point of departure the Integrated Resource Plan (IRP) 2010–2030 promulgated in March 2011. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment (minimize negative emissions and water usage).

On 27 August 2018, the then Minister of Energy published a draft IRP which was issued for public comment (Draft IRP). Following a lengthy public participation and consultation process the Integrated Resource Plan 2019 (IRP 2019) was gazetted by the Minister of Mineral Resources and Energy, Gwede Mantashe, on 18 October 2019, updating the energy forecast for South Africa from the current period to the year 2030. The IRP is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost.

The IRP notes that South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. The energy sector contributes close to 80% towards the country's total Green House Gas (GHG) emissions of which 50% are from electricity generation and liquid fuel production alone. A transmission from a fossil fuel-based energy sources is therefore critical to reducing GHG emissions. In September 2021 South Africa released its latest emission targets, indicating that it intended to limit Green House Gas (GHG) emissions to 398-510 MrCo2e by 2025, and 350-420 MrCo2e by 2030. These emissions are significantly lower than 2016 emission targets and will see South Africa's emissions decline in absolute terms from 2025, a decade earlier than planned (World Resource Institute, 2021).

The IRP (2019) notes that 39 730 MW of new generation capacity must be developed. Of the 39 730 MW determined, about 18 000 MW has been committed to date. This new capacity is made up of 6 422 MW under the REIPPP with a total of 3 876 MW operational on the grid.

Under the Eskom build programme, the following capacity has been commissioned: 1 332MW of Ingula pumped storage, 4800MW of Medupi, 4800MW of Kusile and 100MW of Sere Wind Farm. In addition, IPPs have commissioned 1 005MW from two Open Cycle Gas Turbine (OCGT) peaking plants.1 005 MW from OCGT for peaking has also been commissioned (IRP 2019, page 14).

In terms of IRP (2019) provision has been made for the following new additional capacity by 2030:

- 1 500MW of coal.
- 2 500MW of hydro.
- 6 000MW of solar PV.
- 14 400MW of wind.
- 1 860MW of nuclear.
- 2 088MW for storage.
- 3 000MW of gas/diesel.
- 4 000MW from other distributed generation, co-generation, biomass and landfill technologies.

Figure 2.1 provides a summary of the allocations and commitments between the various energy sectors.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed/Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 2.1: Summary of energy allocations and commitments based on the 2019 IRP

As indicated above, the changes from the Draft IRP capacity allocations see an increase in solar PV and wind, and a significant decrease in gas and diesel; and new inclusions include nuclear and storage.

In terms of renewable energy five bidding rounds have been completed for renewable energy projects under the RE IPP Procurement Programme. The most dominant technology in the

IRP2019 is renewable energy from wind and solar PV technologies, with wind being identified as the stronger of the two technologies. There is a consistent annual allocation of 1 600MW for wind technology commencing in the year 2022 up to 2030. The solar PV allocation of 1 000MWs per year is incremental over the period 2022 to 2030, with no allocation in the years 2024 (being the year the Koeberg nuclear extension is expected to be commissioned) and the years 2026 and 2027 (presumably since 2 000MW of gas is expected in the year 2027). The IRP 2019 states that although there are annual build limits, in the long run such limits will be reviewed to take into account demand and supply requirements.

2.2.5 National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

2.2.6 The New Growth Path Framework

The aim of the New Economic Growth Path Framework is to enhance growth, employment creation and equity. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard, the framework identifies investments in five key areas namely: energy, transport, communication, water, and housing.

The New Growth Path also identifies five other priority areas as part of the programme, through a series of partnerships between the State and the private sector. The Green Economy as one of the five priority areas to create jobs, including expansions in construction and the production of technologies for solar, wind and biofuels. In this regard, clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

2.2.7 National Infrastructure Plan

Government adopted a National Infrastructure Plan (NIP) in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. The aim of the NIP is to support investments to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, ***electricity plants***, hospitals, schools, and dams will contribute to improved economic growth.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions) and included three energy SIPs, namely SIP 8, 9 and 10.

- SIP 8: Green energy in support of the South African economy.
- SIP 9: Electricity generation to support socio-economic development.
- SIP 10: Electricity transmission and distribution for all.

The NIP 2050 was gazetted for public comment on 10 August 2021[5]. The first phase of the NIP 2050 focuses on four critical network sectors that provide a platform, namely, energy, freight transport, water, and digital infrastructure. In line with the NDP, the vision for the energy sector is to promote:

- Economic growth and development through adequate investment in energy infrastructure" (generation, transmission, and distribution) and reliable and efficient energy service at competitive rates, while supporting economic growth through job creation by stimulating supply chains.
- Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
- Environmental sustainability through efforts to reduce pollution, reduce water usage and mitigate the effects of climate change.

The NIP 2050 notes that by 2030, the NDP set a target that more than 90% of the population should enjoy access to grid connected or off-grid electricity by 2030. To realise this vision, South Africa's energy system will be supported by effective policies, institutions, governance systems, regulation and, where appropriate, competitive markets. In terms of energy mix, NIP 2050 notes that coal will contribute significantly less to primary-energy needs in the future, while gas will have an important enabling role, energy supply will be ***increasingly dominated by renewable energy resources– especially wind and solar which are least cost and where South Africa has a comparative advantage.***

NIP 2050 also notes that South Africa is signatory of the Paris Agreement which aims to achieve Net Zero greenhouse gas emissions by 2050. To achieve this will require a shift to a least cost energy path that is increasingly reliant on renewables. For South Africa this is imperative for the following reasons:

- SA cannot afford to overspend while dramatically expanding capacity
- Renewables can be built quickly and in modular form thereby avoiding many of the challenges associated with mega projects.
- Trade partners are expected to increasingly impose border carbon taxes harming SA exports.

2.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

2.3.1 Western Cape Infrastructure Plan

The Western Cape Infrastructure Framework (WCIF)(2013) was developed by the WCP Provincial Department of Transport and Public Works in terms of the Provincial Government's mandate to coordinate provincial planning under Schedule 5A of the Constitution. The objective of the WCIF is to align the planning, delivery and management of infrastructure to the strategic agenda and vision for the province, as outlined in the 2009-2014 Draft Provincial Strategic Plan. The One Cape 2040 and 2013 Green is Smart strategy were other key informants.

The document notes that given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the 2-3 decades a new approach to infrastructure is needed. Namely one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome. The 2040

[5] Gazette No. 44951

vision requires a number of transitions to shift fundamentally the way in which infrastructure is provided and the type of infrastructure provided in WCP.

The WCIF addresses new infrastructure development under five major 'systems' (themes), and outlines priorities for each. Energy is one of the 'systems' identified. The document notes that a provincial demand increase of 3% per year is anticipated for the period 2012-2040. Key priorities are in matching energy generation/ sourcing with the demand needed for WCP economic growth. Additionally, the energy focus should be on lowering the provincial carbon footprint, with an emphasis on renewable and locally generated energy.

Three key transitions are identified for the WCP Energy 'system' infrastructure, namely:

- Shifting transport patterns to reduce reliance on liquid fuels.
- Promoting natural gas as a transition fuel by introducing gas processing and transport infrastructure.
- Promoting the development of renewable energy plants in the province and associated manufacturing capacity.

2.3.2 Western Cape Green Economy Strategy Framework

The Western Cape Green Economy Strategy (2013) – 'Green is Smart' - is a framework for shifting the Western Cape economy from its current carbon intensive and resource-wasteful path within a context of high levels of poverty to one which is smarter, greener, more competitive, and more equitable and inclusive. The Strategy is closely aligned with provincial development goals and the 2014 WCCCRS.

The Strategy's point of departure is that while the WCP faces significant challenges in terms of climate change and economic development. Two of the WCP's key economic sectors - both of national importance - agriculture and tourism, are vulnerable to climate change. At the same time, these challenges hold significant potential for opportunities linked to attracting investment, economic development, employment creation, and more resilient infrastructure and patterns of consumption. These opportunities are partly linked to the WCP's existing leadership in some fields of green technology, including knowledge services.

The core objective of the Strategy is to position the WCP as the lowest carbon footprint province in South Africa, and a leading green economy hub on the African continent.

The Strategy framework is made up of 5 drivers of the green economy which are market focused and principally private sector driven and supported by 5 enablers which are either public sector driven, or the product of a collaborative effort.

The five drivers are: smart mobility, smart living and working, smart ecosystems, smart agri-processing and smart enterprise. The relevant cross-cutting enablers are: finance, rules and regulations, knowledge management, capabilities, and infrastructure.

The framework also identifies priorities that would position the WCP as a pioneer and early adopter of green economic activity. These priorities have been identified in terms of the WCP being firstly, a front-runner or pioneer and secondly, an early adopter of innovations and technologies which already exist but are not widely adopted in South Africa. Some priorities are considered game-changers and are singled out as 'high level priorities for green growth'.

Three such 'high level priorities for green growth' are identified, two of which are of relevance here:

- Natural Gas and Renewables: Off-shore natural gas, potential gas baseload power plants and renewable energy IPP programme, together with a greenfield gas infrastructure, will be the game-changer for the Western Cape to be the lowest carbon province in South Africa, and achieve significant manufacturing investment.
- Green Jobs: A green growth path without job growth is unsustainable. There must be early pursuit of priorities with a high rate of job growth potential – notably rehabilitation of natural assets, responsible tourism and the waste sector.

'Under the section dealing with drivers, renewable energy is discussed under 'Smart Enterprise'. The WCP's objective in terms of this driver is to establish the WCP as a globally recognized centre of green living, working, creativity, business, and investment, and thereby attract investment, business and employment opportunities. Based on existing comparative advantages, three key opportunities are identified, one of which is of relevance here, namely, to establish the WCP as Africa's new energy servicing hub.

In this regard, the Strategy document notes that WCP is well placed to be the most important research and servicing hub for the renewable and natural gas energy sectors in South Africa and on the African continent. The Strategy also notes that there are important initial opportunities in the construction of new energy infrastructure. However, the real long-term benefits lie in the servicing of operational infrastructure. In this regard, it is estimated that the annual servicing and maintenance costs of WEFs for instance amount to approximately 10% of the initial capital investment.

Public and market sector procurement are identified as some of the key enablers. The creation of a streamlined regulatory system – the reduction of 'red tape' – is identified as a key prerequisite for creating an enabling environment.

Under the section dealing with enablers necessary to unlock development potential, renewable energy is discussed under "Smart Infrastructure". The Strategy document notes that existing infrastructure systems, particularly those relating to energy and transport, are carbon intensive, with high costs to the environment. Opportunities for the WCP are linked to tapping into infrastructural development funding by leveraging existing advantages.

With regard to the energy sector, the Strategy proposes that the WCP becomes an early adopter of natural gas processing and transport infrastructure and become the hub of Concentrated Solar manufacture and servicing. Natural gas is identified as the key potential 'game changer' of the WCP economy, and at present the best way to transition the economy to a more fully integrated renewables sector as major part of the WCP fuel mix in the long term. In this regard, the relative ease with which gas-fired stations could be activated make them an ideal supplement to less predictable wind and solar sources.

Surprisingly, WEF and Solar PV manufacture and servicing receive no specific mention, while Concentrated Solar (CSP) does. The Strategy document justly notes that while the Northern Cape Province is the best suited for CSP facilities, the WCP has strong existing research capabilities in CSP at the University of Stellenbosch (US), and the WCP's existing manufacturing sector already has the capacity to manufacture many CSP components.

Potential opportunities of commercialisation of CSP technology for local (RSA, Africa) conditions based on US research could be substantial. This subsector is identified as an important area of collaboration between the two provinces to realise the potential benefits (p 41). The key action at this stage to initiate a WCP manufacturing and servicing centre is to

lobby for support for a pilot of South African designed CSP technologies, adapted to SA conditions (p. 43).

2.3.3 Western Cape Climate Change Response Strategy

The Western Cape Climate Change Response Strategy (WCCCRS) was adopted in February 2014. The strategy is an update of the 2008 Western Cape Climate Change Response Strategy and Action Plan. The key difference with the 2008 Strategy is a greater emphasis on mitigation, including strategically suitable renewable energy development.

The 2014 WCCCRS was updated in accordance with the National Climate Change Response Policy (2013) and is strongly aligned with the overarching provincial objectives contained in the Western Cape Draft Strategic Plan 2009-2014 (2010), and the WCP 'Green is Smart' Strategy (2013). In line with the National Climate Change Response Policy, the Strategy takes a two-pronged approach to addressing climate change:

- **Mitigation:** Contribute to national and global efforts to significantly reduce Green House Gas (GHG) emissions and build a sustainable low carbon economy, which simultaneously addresses the need for economic growth, job creation and improving socio-economic conditions.
- **Adaptation:** Reduce climate vulnerability and develop the adaptive capacity of the Western Cape's economy, its people, its ecosystems and its critical infrastructure in a manner that simultaneously addresses the province's socio-economic and environmental goals (WCCCRS, 2014: 21).

The Strategy will be executed through an implementation framework which will include an institutional framework for both internal and external stakeholders, with a strong emphasis on partnerships. The framework still has to be prepared. A monitoring and evaluation system is further envisaged in order to track the transition to a low carbon and climate resilient WCP. Policy aspects dealing with mitigation are of specific relevance to renewable energy generation.

Energy and emissions baseline
Based on comprehensive 2009 data for all WCP energy use sectors, the following key findings pertain to overall WCP energy use and emissions:

- Electricity is the key fuel used in the WCP, accounting for 25% of total consumption.
- Approximately 95% of base load electricity is generated from low-grade coal and the remainder by nuclear. The vast bulk of WCP electricity is generated in the north of the country.
- In terms of emissions by sector, electricity is responsible for 55% of total WCP emissions. According to the Strategy, this supports the case for a shift towards renewables and clean energy types.
- Transport (55%) was the greatest energy user, followed by industry (33%). Although domestic consumption accounted for only 8%, it accounted for 18% of emissions, again underscoring the emission-intensive nature of electricity generation.

Mitigation potential
According to the Strategy, the main opportunities for mitigation include energy efficiency, demand-side management, and moving towards a less-emission intensive energy mix.

In the short to medium term, four areas with mitigation potential are identified, including promoting renewable energy in the form of both small-scale embedded generation as well as

large scale renewable energy facilities. Together with other mitigation interventions, renewable energy generation is anticipated to result in the following socio-economic benefits:

- Reducing fuel costs to households and business.
- Improving the competitiveness of businesses.
- Job creation opportunities with the development of new economic sectors.
- Local business development.
- Improved air quality (with positive health impacts).
- Reducing the negative impact of large carbon footprints, particularly for export products.
- Reducing stress on energy needs of the province and thereby increasing energy security.

Renewable energy as strategic focus area
Initial implementation of the Strategy will focus on select focus areas aligned with the National Climate Change Response Policy Flagship Programmes and the Western Cape Green Economy Strategy Framework. These focus areas will be reviewed every five years – i.e., the next revision is due in 2019. Renewable area is identified as one of nine focus areas. The Strategy document notes that renewable energy is a key area of focus for the Western Cape and forms a fundamental component of the drive towards the Western Cape becoming the green economy hub for Africa.

The role of provincial government is identified as 'supporting the development of the renewable energy industry through promoting the placement of renewable energy facilities in strategic areas of the Western Cape as well as through supporting renewable energy industries.

The document further notes that waste-to-energy opportunities are being investigated in order to facilitate large-scale rollout. Current investigation includes understanding the most appropriate technologies for waste-to-energy projects as well as developing decision support tools for municipalities to implement waste-to-energy programmes).

Priority areas identified for renewable energy development*:*
- Development of the Renewable Energy economy in the WCP, in terms of both the appropriate placement of renewable energy as well as manufacturing opportunities.
- Development of waste-to-energy opportunities for both municipal and private sector (commercial and industrial) waste systems.
- Development of opportunities around small-scale renewable energy embedded generation activities.

2.3.4 One Cape 2040 Strategy

The One Cape 2040 (2012) vision was developed by the Western Cape Government, the City of Cape Town (CoCT) and the Western Cape Economic Development Partnership. It was adopted as policy by CoCT Council in 2012. It is aimed at stimulating a transition towards a more inclusive and resilient WCP economy. It seeks to set a common direction to guide planning and action and to promote a common commitment and accountability to sustained long-term progress.

The 2040 Strategy does not replace any existing statutory plans. Rather, it is intended as a basic reference point and guide for all stakeholders planning for long-term economic resilience and inclusive growth.

Six key transitions are identified which to define the necessary infrastructure-related shifts in the WCP. One of these 6 key transitions is an Ecological transition ('Green Cape') from an

unsustainable, carbon-intensive, resource use economy, to a sustainable, low carbon-footprint one. The development of renewable energy projects and natural gas are expected to significantly decrease the WCP's carbon footprint.

2.3.5 Central Karoo District Municipality Spatial Development Framework

The spatial vision for the Central Karoo District Municipality (CKDM) is "Working together in sustainable spatial development and growth towards a resilient Central Karoo".

The vision is underpinned by four strategies, namely:

- Strategy 1: A region that protects the environment, enhances resilience, and capitalises on and honour's the Karoo charm in support of a vibrant people and economy.
- Strategy 2: Improve regional and rural accessibility and mobility for people and goods in support of a resilient economy.
- Strategy 3: Allocate government resources, infrastructure and facilities in a manner that uplifts and skills people and focusses on maximising impact on the most possible people, while providing a basic level of service for all.
- Strategy 4: Partnership-driven governance and administration towards improved financial and non-financial sustainability and resilience.

The most relevant strategy is Strategy 1 and to a lesser extent Strategy 3.

Strategy 1: A region that protects the environment, enhances resilience and capitalises on and honour's the karoo charm in support of a vibrant people and economy

The SDF notes that the Central Karoo is a dry, arid landscape, sparsely populated with low growth potential. However, is does certain competitive advantages which must be capitalised, including its ***scenic appeal, sense of place and related tourism potential***, limited yet important agricultural activities and related agri-processing potential, ***green energy (solar and wind)*** potential.

In terms of spatial development, this translates into:

- Protecting and enhancing the natural systems of the Central Karoo.
- Protecting and enhancing water catchment areas, and water resources by demarcating Critical Biodiversity Areas and Environmental Support Areas and preventing inappropriate development within these areas.
- Capitalising on the tourism appeal of the various assets that exist in the Central Karoo, such as the heritage appeal of existing town centres, as well as scenic ports and passes. Ensure that all development in the Karoo is compatible with the sense of place, Karoo character and charm.
- Encouraging value-add, industrial and agri-processing industries locating in the primary and local service centres to create jobs and add value to the region's agricultural goods and services.
- Developing partnerships to enhance various interventions, with a focus on the top three most impactful and critical interventions for the region. Energy and water are identified as key sectors for intervention.

Each strategy is informed by a set of policies and associated development guidelines. The relevant polices and guidelines for strategy 1 are listed below.

Policy A1: Protect critical biodiversity areas, environmental support areas and natural environment towards a resilient Karoo

The development guideline for policy A1 involves manging land use management in the rural areas of the Central Karoo through the application of Spatial Planning Categories (SPC's) as set out in the Western Cape Rural Land Use Planning Guidelines and the Western Cape Biodiversity Spatial Plan and ensure that all investment in the Karoo landscape seeks to underpin the principles of spatial sustainability and spatial resilience.

Three SPCs are relevant to the study area, namely:

- Core 1 Areas - those parts of the rural landscape required to meet targets / thresholds for biodiversity patterns or ecological processes (i.e. Protected Areas and Critical Biodiversity Areas).
- Core 2 Areas - places in a degraded condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. These areas should be rehabilitated and only low-impact, biodiversity-sensitive land uses are appropriate. Also includes Ecological Support Areas (ESA) that are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs.
- Buffer 1 Areas – These areas may be natural, or they may be degraded but still play an important role in supporting the functioning of Protected Areas or CBAs, and are essential for delivering ecosystem services. These areas should be restored and/or managed to minimize impact on ecological infrastructure functioning.

As indicated in Figure 2.2, the study area is located in a Core 1 and 2 SPC to the north of the Karoo National Park. There are also two scenic routes/passes located in the study area. The SDF notes the scenic routes and passes should be maintained and enhanced.

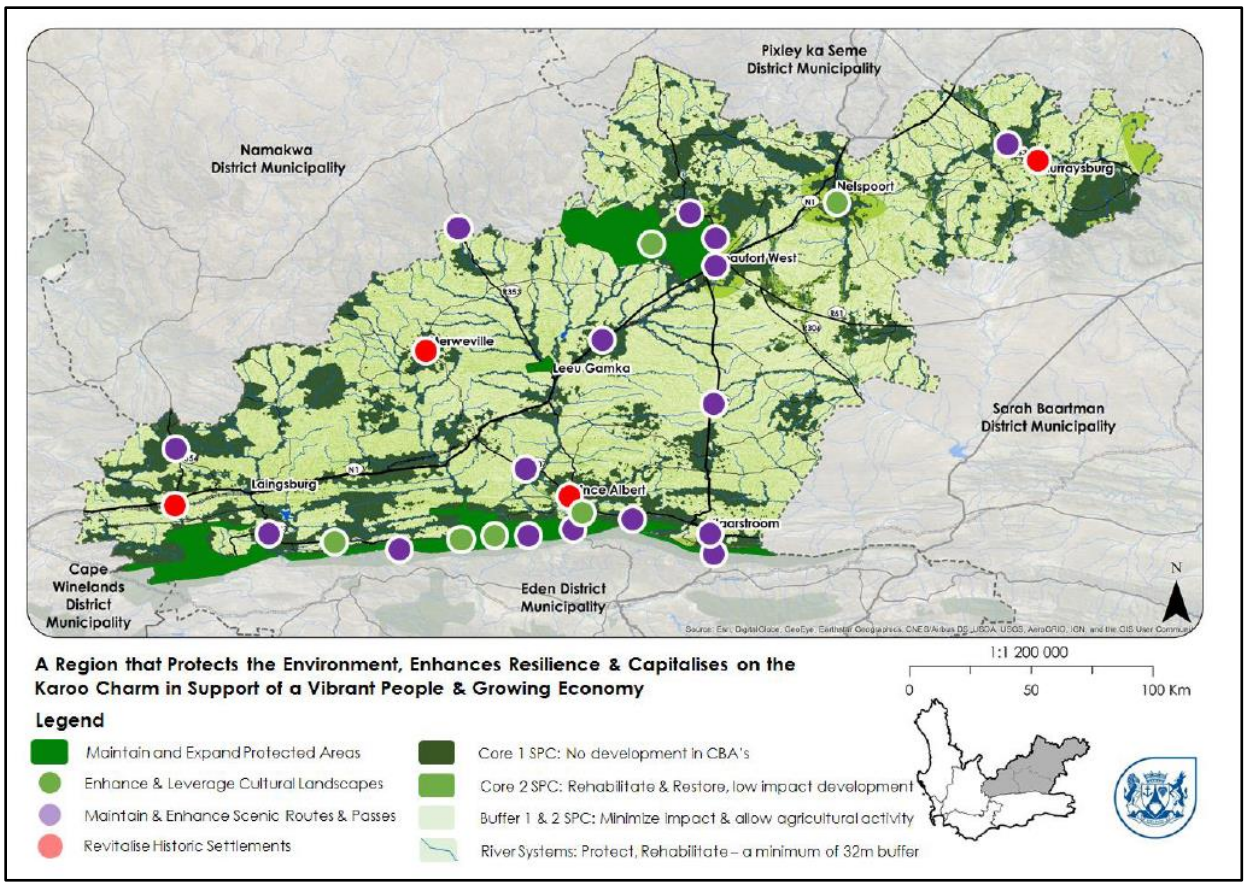


Figure 2.2: A region that protects the environment, enhances resilience and capitalises on and honour's the karoo charm in support of a vibrant people and growing the economy

Policy A2: Promote and develop a water resilient central karoo

The SDF notes that without water, the region is economically, socially, and environmentally not unsustainable. Water is therefore very much the heart of the economy of the region.

The relevant development guidelines for policy A2 involves adapting to water scarcity by:

- Developing water and sanitation infrastructure that utilises water re-cycling and reuse.
- Regulate borehole use to ensure sustainable use of groundwater systems.
- Promoting farming techniques that minimise water use.

The first two guidelines should be adhered to during the construction and operational phase. The SED initiatives associated with project can support the objectives of the third guideline.

Policy A3: Tourism enhancement and protection of scenic assets

The SDF notes that together with agriculture and agri-processing, tourism is a sector of the economy that can significantly assist in achieving future growth and development in the region and playing a significant part in uplifting the poor out of poverty. The way the region is managed can either enhance or degrade the tourism, scenic and heritage potential of the region.

The relevant development guidelines for policy A3 involve:

- Managing all development in the Karoo (whether rural or urban, high income or low income) in a way that respects and enhances the sense of place, scenic assets and unique Karoo charm.
- When delivering any agri-processing, ***renewable energy,*** or any infrastructure in rural areas, ensure that key view sheds, vistas and views are not undermined.
- Ensuring adequate setbacks and screenings (by planting) of all new development from key movement routes in scenic areas of the region[6].

As indicated in Figure 2.3, the study area borders onto the Karoo National Park, which is identified as a Cultural Landscape (7). Access to the study area from Beaufort West is via two scenic passes, namely the Molento and Roseberg Pass (13 and 14 respectively).

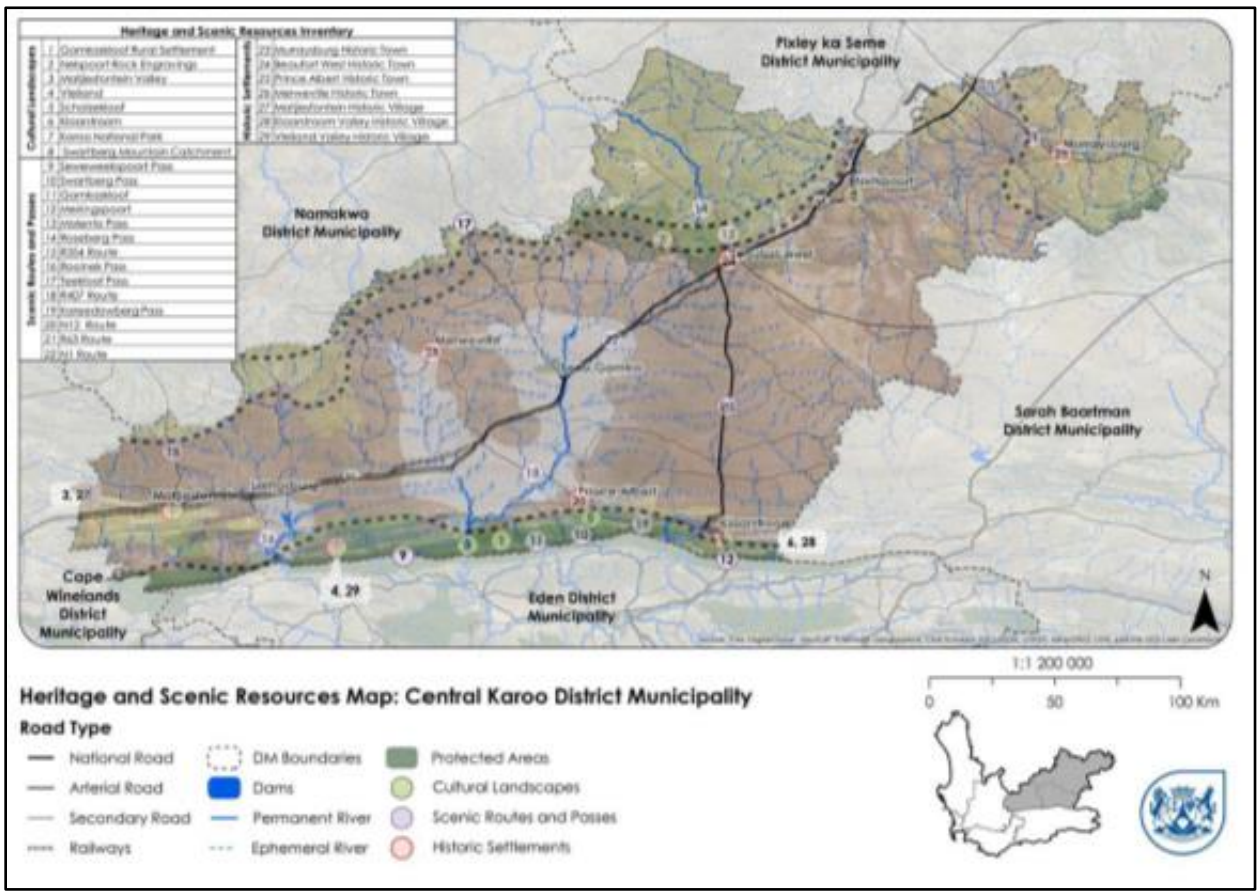


Figure 2.3: Location of heritage and scenic resources in the CKDM

Policy A5: Support and promote the renewable energy economy

The SDF notes that the Karoo region is blessed with significant solar and wind energy – the prerequisites for successful renewable energy projects. The Karoo should leverage this asset to encourage Independent Power Producers to locate in the region and create a well-managed

[6] Give the scale of wind turbines screening may not be possible.

and desirable place to locate for employees connected to this industry. The SDF refers to Renewable Energy Development Zones (REDZ's) and notes that there are also large areas of the Central Karoo located outside of these REDZ's that hold potential to generate renewable energy. These areas should not be completely ignored in supporting the future energy resilience of the province and country.

The relevant development guidelines for policy A5 involve:

- Actively seek out green energy projects to be located in the region.
- Put in place incentives to encourage green energy operators to locate in the Central Karoo.

Policy A8: Central Karoo climate change adaptation and mitigation policy

The SDF notes that drought is the most severe of the suite of potential climate change impacts for the Central Karoo. Extended periods of drought not only have water-related impacts but biodiversity, infrastructure, food, and human health impacts.

The relevant development guideline for policy A5 (mitigation) involves promoting renewable energy generation and use.

Strategy 3: Allocate government resources, infrastructure and facilities in a manner that uplifts and skills people and focusses on maximising impact on the most possible people, while providing a basic level of service for all in the settlements of the karoo

Policy C4: A skilled people

The SDF notes that there is mismatch between the skill set of the people of the Central Karoo compared to the key sectors that can create growth opportunities. Of relevance whilst the primary sector (and agriculture specifically) makes up 23% of all jobs in the Central Karoo, these jobs are generally poorly paid, subject to seasonal variation and fluctuation due to the drought conditions of the Karoo. The key sectors identified for future growth include ***energy***, ***tourism*** and agri-processing.

The SDF indicates that the Karoo District can be divided into four broad landscape regions namely:

- The higher altitude 'Nuweveld Plateau'.
- The Nuweveld Mountain escarpment.
- The lower altitude 'Die Vlakte'.
- Swartberg Mountains.

The study are falls within the Nuweveld Plateau landscape region and is accessed via the Nuweveld Mountain escarpment (Figure 2.4).

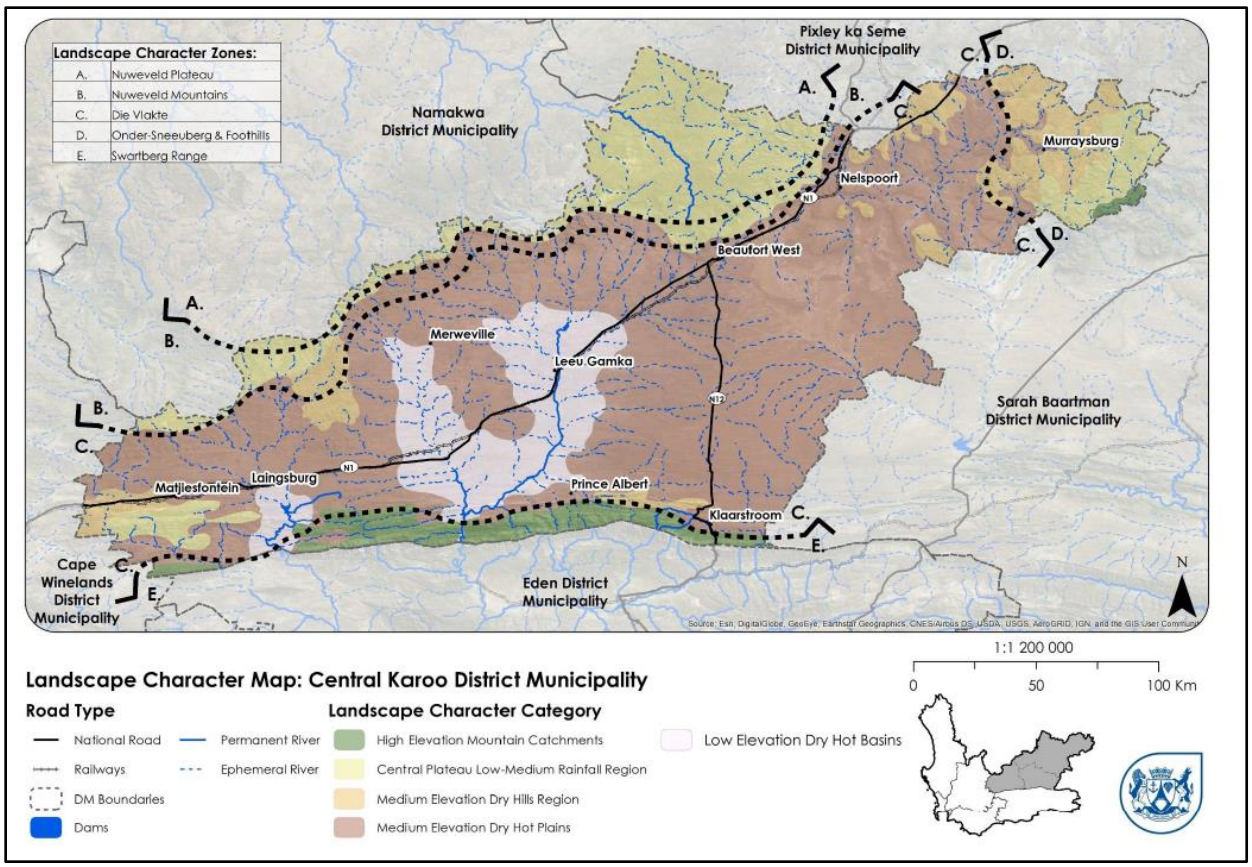


Figure 2.4: Landscape characteristics of CKDM

A SWOT analysis of the environmental and socio- economic environment was undertaken as part of the SDF. The key findings are summarised below.

Environmental

Strengths

- Central Karoo has large tracts of natural landscapes and resources.
- Very sparsely located, and relatively compact settlements.
- Excellent scenic assets in the form of nature reserves, mountain passes, and heritage centres which can be better leveraged for tourism.

Weaknesses

- Central Karoo's arid nature impacts the growth potential of towns, and the viability of agriculture in the region. The District is very dependent on groundwater.

Opportunities

- The areas scenic and heritage assets, conservation areas, and farming areas can be better leveraged to support tourism.
- There are various renewable energy projects which have already been approved but have yet to be implemented.
- Improving agricultural potential through veld rehabilitation and through the implementation of sustainable agricultural practices.

Threats

- Climate change and natural disasters.

- Cumulative impacts associated with renewable energy developments could have negative environmental impacts.

Socio-economic

Strengths
- Tourism assets relating to landscape, sense of place and wilderness

Weaknesses
- High poverty rates, poor health outcomes (high degree of malnutrition and HIV transmission rates) undermine quality of life and economic development potential of the region.
- Low per capita GDP and high-income inequality resulting in increase in number of indigent households. growing. This places pressure on municipal financial sustainability to deliver services and the ability of residents to both sustain themselves and pay for services.
- Slowing economic growth.

Threats
- Vulnerability of agricultural economy to droughts.
- Influx of people in search of jobs associated with shale gas and mining jobs if public expectations of these industries are poorly managed. The same threat could apply to renewable energy projects.

Based on the SWOT analysis the SDF lists a the cross-cutting regional spatial issues that have a bearing on spatial planning outcomes and are relevant to the development, including:

- High Poverty, unemployment, and inequality levels.
- Water security and vulnerability of ground water resources.
- The areas significant sense of place, heritage and tourism assets that can be undermined or eroded by poor development decisions and land use practices.
- Opportunity to upscale renewable energy production in the region and create downstream opportunities.

2.2.3 Beaufort West Municipality Integrated Development Plan

The vision statement for the Beaufort West Municipality (BWM) is "Beaufort West in the Central Karoo, the economic gateway to the Western Cape, where people are developed and living together in harmony". The associated mission statement highlights the importance of service delivery, economic development, and the reduction of poverty. Economic development includes the implementation of infrastructure to grow the economy and create jobs, while the reduction in poverty notes the need to promote the empowerment of women, youth and people living with disabilities.

The IDP lists six Strategic Objectives (SOs), of which the following are relevant to the development:

- SO1: Provide, maintain, and expand basic services to all people in the municipal area.
- SO2: Sustainable, safe, and healthy environment
- SO3: Promote broad-based growth and development.

The Municipality comprises 4 towns, namely Beaufort West, Murraysburg, Merweville and Nelspoort. The administrative head office of the Municipality is situated in Beaufort West, with a satellite office at each of the other towns. The development area is located in Ward 7, which includes the northern part of Beaufort West town and the town of Merweville. The community

needs for Ward 7 identified during the IDP process that are relevant to the development include:

Beaufort West
- Provision of a High School in the ward.
- Provision of Barrake play park for children.
- Creation of employment opportunities.
- Provision of a sports facility.
- Provision of a community hall for ward 7

Merweville
- Security, fencing for the play park for children.
- Creation of employment opportunities.
- Provide waiting room for patients waiting for ambulance to be transported to Beaufort West.
- Provision of solar panels to supply power for boreholes.
- Repair wall around the stadium.
- Provision of water, toilet, and more trees at the cemetery.
- Provision of employment opportunities for learners that complete learnerships.
- Provision of a recreational facility for the youth
- Provision of fire services station in Merweville.

Section 10.5 of the IDP, Renewable Energy as a Strategic Economic Sector, highlights the potential of the renewable energy sector, noting that the Renewable Energy Independent Power Producer Programme (REIPPPs) have consistently contributed new capacity to the network since the end of 2013. The IDP also refers to the GreenCape 2022 Large-Scale Renewable Energy Market Intelligence Report, which notes that there are substantial growth opportunities in the largescale renewable energy market over the next ten years (2020 – 2030). The reports notes that as the South African industry gears up to meet the 24.4 GW of new renewable energy build required by 2030, the need for local value creation is increasingly growing to ensure the sector contributes to the country's infrastructural needs; economic objectives, including through establishing a local manufacturing base; Just Transition objectives, including job creation in transition areas. The IDP indicates that the benefits associated with the renewable energy sector will create significant opportunities for BWM.

The IDP notes that Beaufort West falls within a Renewable Energy Development Zones (REDZ) which demarcate areas with good grid connection infrastructure where large-scale wind and solar PV facilities can be constructed with limited negative impacts on the environment, while delivering equitable socioeconomic benefits to regional communities. The IDP goes onto state that given the significant benefits associated with the REIPPPP have been, it is of paramount importance that the BWM prioritise and leverage the REIPPPP as a critical local economic development driver in the Municipality.

The key role played by the renewable energy sector also forms part of the BWM's SMME Strategy. According to the Beaufort West Local Economic Development and Tourism Strategy 2021 – 2026, the challenge facing Beaufort West is how to broaden and encourage the significant and inclusive economic participation of local SMMEs in various strategic economic opportunities in Beaufort West Local Municipality region.

In this regard the IDP notes that one strategic economic sector that can be leveraged for local SMME economic participation and development is the Renewable Energy sector. In this regard the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) includes a number of policies that can be leveraged such as the Implementation Agreement

(IA) signed between the Department of Mineral Resources and Energy and the individual REIPPs, as part of the Power Purchase Agreements. The IA determines contractual obligations by the IPP in relation to socio-economic and enterprise development commitments over the lifetime of the project. Under the Economic Development (ED) Obligations of the Implementation Agreement (IA), reference is made of the following Seven ED Elements:

- Ownership Obligations.
- Job Creation Obligations.
- Local Content Obligations.
- Skills Development Obligations.
- Management Control Obligations.
- Enterprise and Supplier Development Obligations.
- Socio-Economic Development Obligations.

Each of these obligations will create opportunities for local communities and businesses in the BMM. The BWM SMME strategy highlights the potential opportunities associated with Enterprise and Socio-Economic Development Obligations associated with the REIPPPP. The IDP notes that the Municipality must ensure that these ED Obligations are implemented within the BWM for the benefit of local SMMEs. This can be achieved by:

- Optimising local participation across the value chain, including participation in both the O&M Phase and the EPC/Construction Phase etc.
- Optimising social economic development impact at community level through more impactful IPP ED/SED initiatives.
- Improving IPP's support for local content within the BWM.
- Establishment of a Business Incubator for SMMEs in the BWM.

Of relevance the IDP also notes that Beaufort West's main attraction is in its untouched Karoo landscape. Reference is made to the Karoo National Park located 10 km northwest of Beaufort West and the N1.

2.2.4 Beaufort West Municipality Spatial Development Framework

The vision for the BWM is "To work together to develop Beaufort West into a thriving Regional Development Anchor that is the economic, tourism and transport gateway to the people, mountains, and plains of a resilient Central Karoo". The vision is informed by the Central Karoo District Municipal Spatial Development Framework (2020): "Working together in Sustainable Spatial Development and Growth towards a Resilient Central Karoo.", 2014 Beaufort West MSDF which states that it seeks to be the "Wilderness tourism and transport gateway to the people, mountains and plains of the Central Karoo." and BWM IDP "Beaufort West in the Central Karoo, the economic gateway to the Western Cape where people are developed and living together in harmony".

The SDF lists several spatial planning, development planning and land use management perspective that have a bearing on the vision. The following are relevant to the development:

- Beaufort West should position itself as a tourist destination due to its expansiveness and desolation, particularly the areas north of the town in the Karoo National Park and the surrounding mountain regions.
- Maximizing job opportunities for locals and identify what skills training will be required to enable this.

- Key areas such as Critical Biodiversity Areas, conservancies and stewardship areas and visually sensitive landscapes contributing to long term heritage and tourism opportunities should be off limits to mining and shale gas exploration; The visual impact of Shale Gas Extraction on the Karoo landscapes could be severe, considerably diminishing its long-term tourism appeal unless properly rehabilitated.

The SDF notes that the BWM is a dry, arid landscape, which is sparsely populated. The Growth Potential of Town's Study (2018) views its overall growth potential as low to very low, however, the municipality does possess a few inherent competitive advantages which must be capitalised upon to grow the economy, provide more people with access to work opportunities and perhaps even more importantly, the ability to see and create latent entrepreneurial opportunities in the economy. The competitive advantages listed include:

- Its scenic appeal, sense of place and related tourism potential.
- Its limited yet important agricultural activities and related agri-processing potential.
- Green energy (solar and wind) potential.

The SDF highlights the importance of the natural resource base to the municipalities competitive advantage, including the scenic landscape. The functioning of the regions is economy is also critically linked to the availability of water and the health of the ecological systems. The protection and enhancement of the environment is therefore one of the main strategies of this MSDF. The primary resources to protect, maintain and enhance include:

- Natural and agricultural resource base, including the Karoo National Park, Critical Biodiversity Areas, and Environmental Support Areas.
- Settlements with different economic roles and heritage potential: The towns of Beaufort West, Murraysburg, Merweville and Nelspoort. The SDF notes that all of these settlements hold significant built heritage assets such as churches, and other significant buildings and facades.
- Unique landscapes, lifestyle, and tourism offerings, including scenic routes – namely the Gamkaskloof Pass, as well as Molteno Pass in the Nuweveld range.

The spatial concept for the municipality focusses on sustainable development, resilience, and partnerships. The SDF lists four strategies informed by the Central Karoo District MSDF (2020) that support the spatial concept, namely:

- Strategy 1 (A): A region that protects the environment, enhances resilience, and capitalises on and honours the Karoo charm in support of a vibrant people and economy.
- Strategy 2 (B): Improve regional and rural accessibility and mobility for people and goods in support of a resilient economy.
- Strategy 3 (C): Allocate government resources, infrastructure and facilities in a manner that uplifts and skills people and focusses on maximising impact on the most possible people, while providing a basic level of service for all.
- Strategy 4 (D): Partnership-driven governance and administration towards improved financial and non-financial sustainability and resilience.

How the above translates spatially in the region is described as follows:

- Protect and enhance the natural systems of the municipality, ensuring continuity in the natural systems Karoo (such as the Karoo National Park, the Onder-Sneeuberg and Nuweberg mountain ranges) and ensure the river corridors in the region (Gamka river – and its tributaries) are provided with the necessary buffers and setbacks to preserve

continuity and integrity of biodiversity systems. Prioritise the protection of Critical Biodiversity Areas and Environmental Support Areas from development.
- Seek partnerships to enhance various interventions, with a focus on the top three most impactful and critical interventions for the municipality, which include water and ***energy***.
- Protect and enhance water catchment areas and water resources by demarcating Critical Biodiversity Areas and Environmental Support Areas and preventing inappropriate development within these areas.

Strategy 1 (A): A region that protects the environment, enhances resilience and capitalises on and honours the karoo charm in support of a vibrant people and growing the economy, is relevant to the development.

Each strategy is supported by a set of policies that inform land use planning, infrastructure development and rural and urban development decision making within Beaufort West Municipality.

- Policy A1: Protect critical biodiversity areas, environmental support areas & natural environment towards a resilient municipality.
- Policy A4: climate change adaptation and disaster mitigation.
- Policy A5: Tourism enhancement & protection of scenic assets.
- Policy a6: Resilient, sustainable agriculture & agri-processing.

Policy A1: Protect critical biodiversity areas, environmental support areas & natural environment towards a resilient municipality.

The SDF notes that designated Spatial Planning categories (SPCs) must be considered in terms of land use management. This, in part, should ensure that Critical Biodiversity Areas (CBAs) and protected areas are conserved and, where applicable, restored. Policy A1 guidelines include:

- Manage land use management in the rural areas of Beaufort West Municipality through the application of Spatial Planning Categories (SPCs) as set out in the Western Cape Rural Land Use Planning Guidelines and the Western Cape Biodiversity Spatial Plan (2017) and ensure that all investment in Beaufort West Municipality seeks to underpin the principles of spatial sustainability and spatial resilience.
- Protect and conserve important terrestrial, and aquatic habitats (rivers and wetlands) as identified in Figure 5 as well as the Biodiversity Spatial Plan maps in the Status Quo section of this MSDF.

As indicated in Figure 2.5, the development area falls within CBA 1 and 2 areas located to the north of the Karoo National Park (Protected Area-Olive Green). The following land uses are permitted in the municipality, as per the following Spatial Planning Categories (SPCs).

- Core 1 Areas: Critical Biodiversity Areas 1 (CBA) and Protected Areas. In Beaufort West, the Karoo National Park is the key Protected Area for the municipality, but CBAs also run along river corridors and other sensitive areas. This category also includes essential biological corridors, as it is vital to sustain their process and pattern functionality. These areas must be regarded as "no-go" for development and must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. There should be no further loss of natural habitat and degraded areas should be rehabilitated.

- Core 2 Areas: Consist of two areas, Critical Biodiversity Area 2 (Degraded) and Ecological Support Area 1. These areas are in a degraded or secondary condition and are required to meet biodiversity targets for species, ecosystems, or ecological processes and infrastructure. These areas should be maintained or rehabilitated into a natural or near-natural state with no further loss of natural habitat.

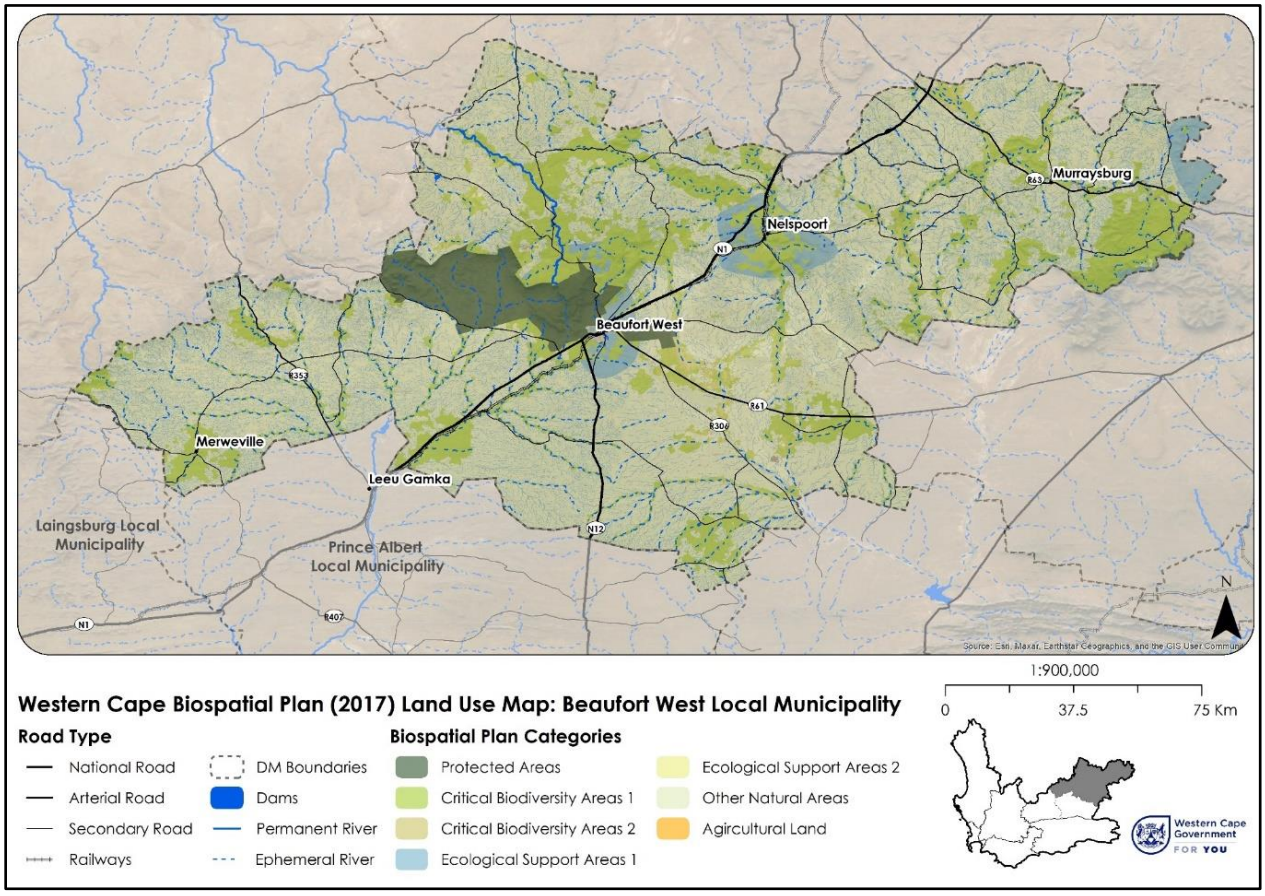


Figure 2.5: Land use map for BWM

Policy A4: Climate change adaptation and disaster mitigation

Of reference to the development the Policy A4 Guidelines for adaptation and mitigation note that ***renewable energy generation*** and use should be promoted. Reference is also made to implementation of carbon tax aimed as supporting renewables such as solar and wind.

Policy A5: Tourism enhancement and protection of scenic assets

The SDF notes that the main cultural heritage and scenic resources, as identified in the PSDF and endorsed in the MSDF, include the Karoo National Park and scenic routes. The SDF also notes that the landscape character of the passes in the BWM must be safeguarded and compromising development on ridge lines or in important view corridors must not be allowed. Of relevance to the study area the Karoo National Park is identified as a Cultural Landscape (7), and Molento and Roseberg Pass (13 and 14 respectively) as Scenic Passes (Figure 2.6).

The development guidelines for policy A5 note that when considering renewable energy, or any infrastructure in rural areas, steps must be taken to ensure that key view sheds and vistas are not undermined and that, where appropriate, setbacks and screenings (in the form of tree planting) are provided from roads[7].

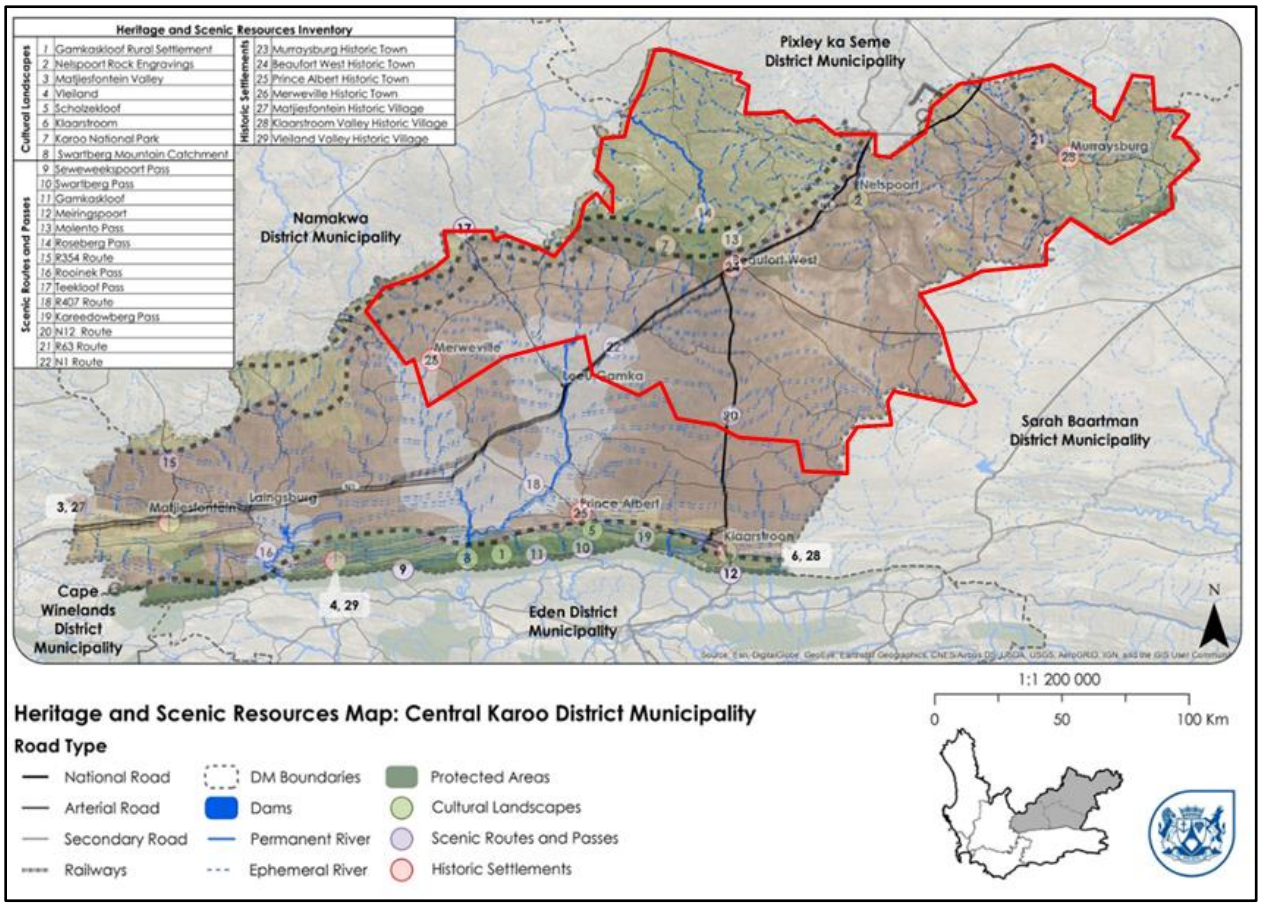


Figure 2.6: Heritage and Scenic Resource Map-Central Karoo District Municipality (red line denotes boundary of BWM)

Policy A6: resilient, sustainable agriculture & agri-processing

Policy A6 notes that use of agricultural land and the integrity of agricultural operations must be protected and enhanced, and it is in the national interest to preserve and promote sustainable use and development of agricultural land. The sustainable development of agricultural land requires the integration of social, economic, and environmental considerations in both forward planning and ongoing agricultural land management to ensure that development of agricultural land.

The development guidelines for Policy A6 that are relevant to the development, specifically SED initiatives, include providing support for drought relief, water use efficiencies and agricultural expansion in the region, with a specific focus on emerging farmers.

[7] Give the scale of wind turbines screening may not be possible.

2.3 KAROO NATIONAL PARK MANAGEMENT PLAN 2017-2027

The 2017-2027 Karoo National Park (KNP) Park Management Plan (PMP) is the second medium-term park management plan prepared for the park. The PMP is in line with SANParks's objective to identify a broad vision and strategic direction for each individual national park, such intended to complement the role of other parks in adding overall value to South Africa's national park system in terms of biodiversity conservation, recreational opportunities, and regional socio-economic contribution.

The vision of the KRNP is 'A sustainable national park system connecting society'. The mission of the KRNP is 'To ensure KRNP is a key driver of sustainability in the region, by restoring and conserving processes that maintain representative cultural, landscape and biodiversity assets, which facilitate equitable opportunities for the well-being of society and deliver *high quality nature-based tourism derived from the Nama-Karoo's sense of place*' (p30)

Thirteen vital attributes have been identified for the KRNP. These vital attributes reflect the key characteristics of the park which serve to inform the general management approach. The following are relevant to the project:

- The unique Nama-Karoo vistas (land, night, and soundscapes).
- The nature experience, tranquillity and ambiance provide a sense of place and opportunity for reflection.
- Tourist facilities ideally placed to enhance visitor experience of the setting.
- (12) Large proportion of conservation-compatible adjacent land uses.

The PMP notes that the KNP's most outstanding feature is its scenic value. Overall biodiversity and heritage values are comparatively moderate. Identified key threats to the visual/ sense of place amenity include Renewable Energy Facility (REF) development within the park buffer zone, and sound and light pollution due to industrial activities (arguably including aviation lights on wind turbines).

Six high-level management objectives are identified for the KRNP, of which of the following are relevant:

- Bioregional: To expand the park and influence development through co-operative management and effective engagement with relevant stakeholders.
- Responsible tourism: To become the nature-based tourism destination of choice in the region, enabling visitor engagement with the landscape vistas, biodiversity, and cultural heritage, whilst growing revenue *and protecting the tranquillity and sense of place* (p35).

Land use management is based on the use zoning system developed by SANParks for its parks. The key objective is to provide the optimal balance between offering a range of visitor uses and protecting the integrity of the environment, by determining i). visitor use zones covering the entire park, ii). special management overlays; iii). a park buffer zone. The PNP notes that visitor expectations and recreational objectives also include the KRNP's *intangible attributes, its 'wilderness' quality, a place of solitude, remoteness, serenity* (p41).

The current zoning for the KNP is underpinned by an analysis and mapping of the sensitivity and value of a park's biophysical, heritage and scenic resources. The visual sensitivity of the landscape was also surveyed to identify sites where infrastructure development could have a strong aesthetic impact (Figure 2.7).

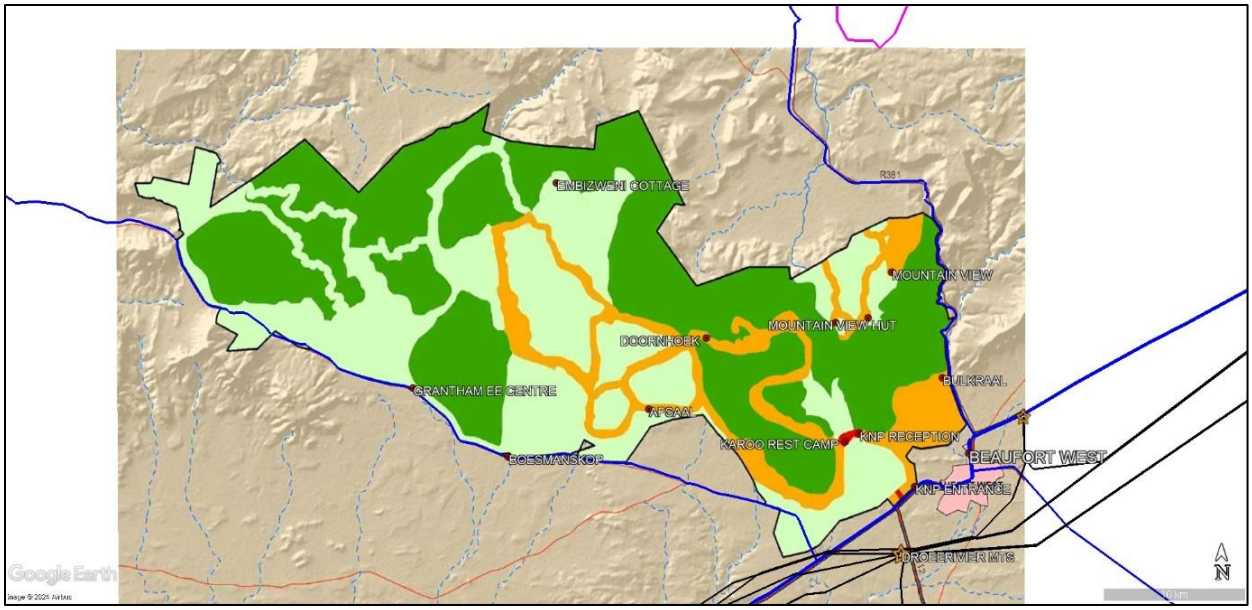


Figure 2.7: Use zoning of the KRNP: Remote (dark green), Primitive (light green), Low Intensity Leisure (orange) and High Intensity Leisure (red) in relation to key KRNP receptors, Karoo WEF 2 site (pink), key roads (blue) and existing 132-765 kV lines (black) (Source: SANParks, 2017)

Conservation-orientated zoning categories (Remote, Primitive) cover 87.3% of the park area. The Low Intensity Leisure (LIL) zone (12.5%) represents most of the balance, with High Intensity Leisure (HIL) accounting for only 0.1%. The LIL areas are largely associated with broad corridors along tarred and gravel roads and picnic areas. The HIL areas consist of 2 small areas, namely the main park entrance off the N1, and the loose node of the reception complex, staff housing and rest camp approximately 6 km from the park entrance. The nearest LIL zone to the Karoo WEF 2 site is associated with the Mountain View picnic site and surrounds (12 km) in the north-eastern corner of the park. The HIL zones are located 26-30 km south of the WEF 2 site, i.e., not in immediate proximity.

The buffer zone consists of areas outside the park within which land use changes could affect the park. The PNP notes that, in terms of EIA responses, *the buffer zone serves largely to raise red-flags and does [by itself] not remove the need for carefully considering the exact impact of a proposed development [outside the buffer zone]. In particular, it does not address activities with broad regional aesthetic or biodiversity impacts e.g. renewable energy development projects* (p49). The buffer zone is divided into three (mapped) categories: priority natural areas, catchment protection areas, and viewshed protection areas. The the Karoo WEF 2 site falls outside the viewshed protection area (Figure 2.8).

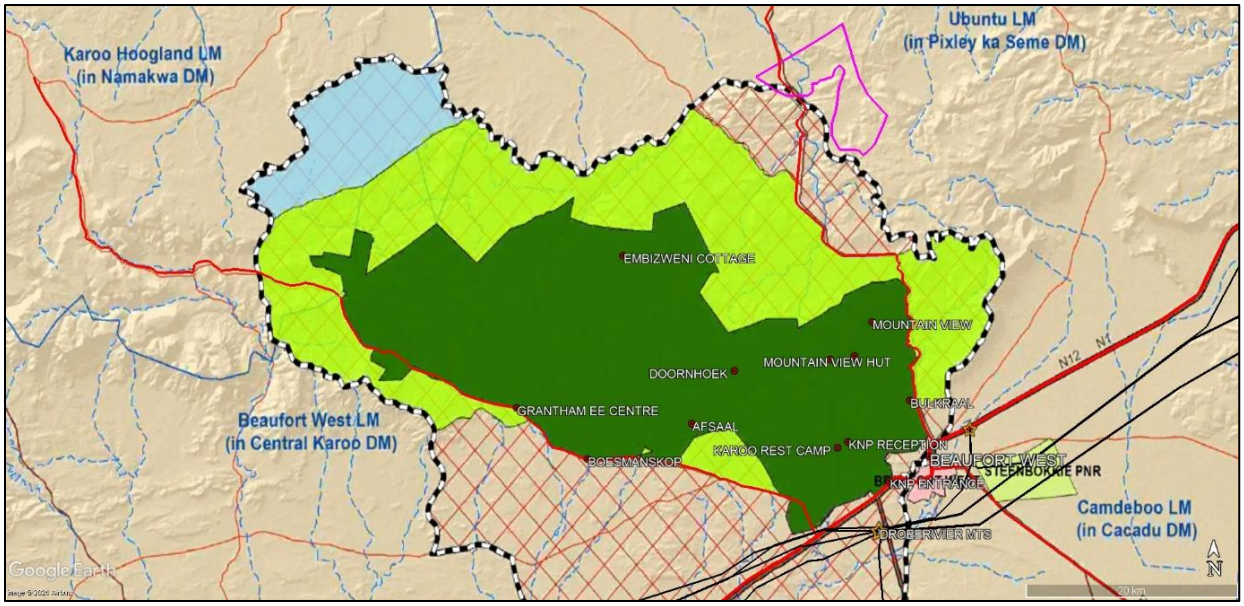


Figure 2.8: Karoo WEF 2 site (pink) in relation to KRNP (dark green), buffer zone boundary (black and white stippled outline), priority natural areas (light green), catchment protection areas (blue), and viewshed protection areas (red cross hatching). Also indicated are key roads (red lines) and existing transmission lines (Source: SANParks, 2017)

Viewshed protection areas are of specific relevance. These are areas where developments can impact on the aesthetic quality of a visitors experience in a park. This zone is particularly concerned with *visual impacts (both day and night)* but can also include sound pollution. Development guidelines include: *Within these areas any development proposals must be carefully screened to ensure that they do not impact excessively on the aesthetics of the park. The areas identified are only broadly indicative of sensitive areas, as at a fine scale many areas within this zone will be perfectly suited for development. Further, invasive developments outside this zone will also have to be considered* (p49).

The PMP notes that at the time of writing (2017), no REF applications had been received in the park's immediate vicinity, but that the area to the north of Beaufort West had been identified in the BWM 2016/7 IDP as suitable for WEF development north of the park's buffer zone. The PMP notes the need to monitor the situation regarding WEF applications. The PMP for the KNP also predates the establishment of the Beaufort West REDZ (2018).

The PMP notes that, given the KNP's recognised biodiversity, its landscape interface and its regional social-economic importance, expansion and consolidation of the KNP remains a national priority for SANParks. The expansion programme is informed by SANParks policy regarding land inclusion (SANParks 2015), and the National Protected Areas Expansion Strategy (NPAES) (DEAT 2008). The KNP Park consolidation programme for the 10-year planning period is focused on rectifying the park's inefficient shape and lack of a link to the major road network. Emphasis is on the park's northern boundary. Two expansion areas have been identified, a small one adjacent to the south of the park, and a very large consolidated ('broad brush') area to its north. The Karoo WEF 2 site is not located within an expansion area (Figure 2.9).

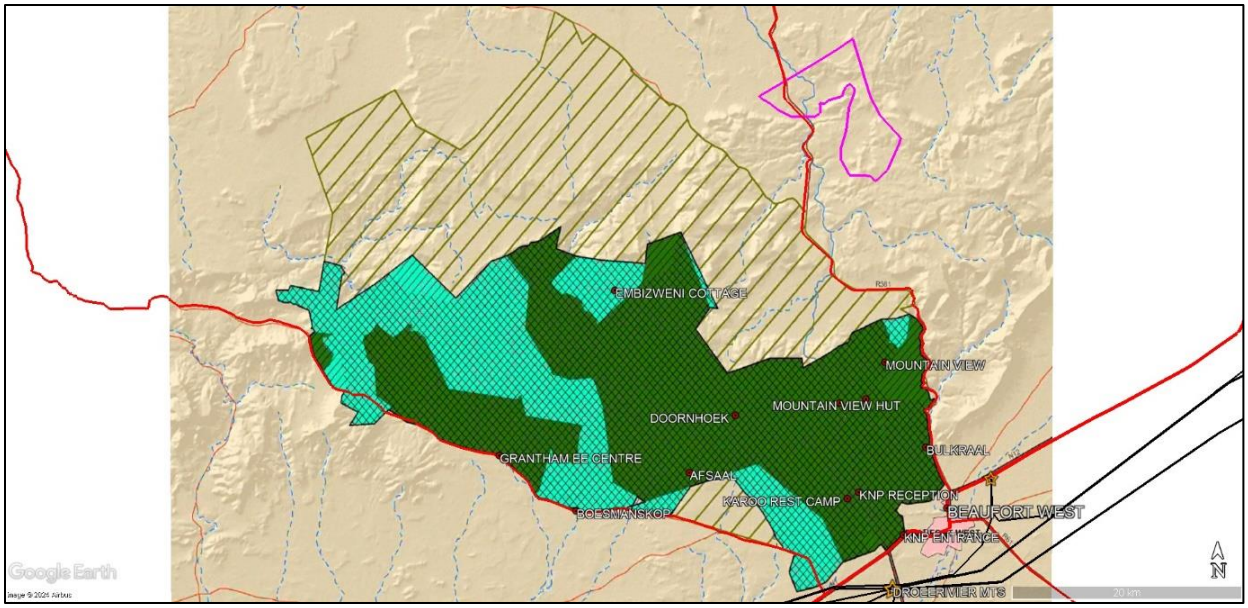


Figure 2.9: Karoo WEF 2 site (pink) in relation to identified 2017-2027 KRNP expansion areas (khaki hatching). Also indicated are key roads (red lines) and existing transmission lines (Source: SANParks, 2017).

2.4 OVERVIEW RENEWABLE ENERGY SECTOR IN SOUTH AFRICA

The section below provides an overview of the potential benefits associated with the renewable energy sector in South Africa. Given that South Africa supports the development of renewable energy at national level, the intention is not to provide a critical review of renewable energy. The focus is therefore on the contribution of renewable energy, specifically in terms of supporting economic development.

The following documents were reviewed:

- Independent Power Producers Procurement Programme (IPPPP): An Overview (June 2020), Department of Energy, National Treasury and DBSA.
- Green Jobs Study (2011), IDC, DBSA Ltd and TIPS.
- Powering the Future: Renewable Energy Roll-out in South Africa (2013), Greenpeace South Africa.
- WWF SA, Renewable Energy Vision 2030, South Africa, 2014.
- Jacqueline M. Borel-Saladin, Ivan N. Turok, (2013). The impact of the green economy on jobs in South Africa), South African Journal of Science, *Volume 109 /Number 9/10, September/October 2013.*
- The potential for local community benefits from wind farms in South Africa, Louise Tait (2012), Master's Thesis, Energy Research Centre University of Cape Town.

2.4.1 Independent Power Producers Procurement Programme (IPPPP): An Overview

The section below provides an overview of the potential benefits associated with the renewable energy sector in South Africa based on the information contained in the Independent Power Producers Procurement Programme (IPPPP): An Overview (December 2021), Department of Energy, National Treasury and DBSA. The document presents an

overview of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) undertaken by the Department of Energy, National Treasury, and the Development Bank of South Africa in December 2021. The programme's primary mandate is to secure electrical energy from the private sector for renewable and non-renewable energy sources. With regard to renewables, the programme is designed to reduce the country's reliance on fossil fuels, stimulate an indigenous renewable energy industry and contribute to socio-economic development and environmentally sustainable growth. The IPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership.

The Integrated Resource Plan for electricity (IRP) provides South Africa's long-term plan for electricity generation. It primarily aims to ensure security of electricity supply, minimise the cost of that supply, limit water usage and reduce greenhouse gas (GHG) emissions, while allowing for policy adjustment in support of broader socio-economic developmental imperatives. The IRP 2019 was promulgated in October 2019 and replaced the IRP 2010 as the country's official electricity infrastructure plan.

It calls for 37 696MW of new and committed capacity to be added between 2019 and 2030 from a diverse mix of energy sources and technologies as ageing coal plants are decommissioned and the country transitions to a larger share of renewable energy. By2030, the electricity generation mix is set to comprise of 33 364MW (42.6%) coal, 17 742MW (22.7%) wind, 8 288MW (10.6%) solar photovoltaic (PV), 6 830MW(8.7%) gas or diesel, 5 000MW (6.4%) energy storage, 4 600MW (5.9%) hydro, 1 860MW (2.4%) nuclear and 600MW (0.8%) concentrating solar power (CSP). Additionally, a short-term gap at least 2000MW is to be filled between 2019 and 2022, thereby further raising new capacity requirements, while distributed or embedded generation for own-use is positioned to add 4 000MW between 2023 and 2030. The IRP is intended to be frequently updated, which could impact future capacity allocations from various energy sources and technologies.

Energy supply

By the end of December 2021, the REIPPPP had made the following significant impacts.

- 6 323 MW of electricity had been procured from 92 RE Independent Power Producers (IPPs) in BW1-4.
- 5 661 MW of electricity generation capacity from 85 IPP projects has been connected to the national grid.
- 71 073GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational in November 2013.

Renewable energy IPPs have proved to be very reliable. Of the 85 projects that have reached COD, 77 projects have been operational for longer than a year. The energy generated over the past 12-month period for these 77 projects is 14 117GWh, which is 95% of their annual energy contribution projections (P50) of 14 924GWh over a 12-month delivery period. Thirty-one (31) of the 77 projects (40%) have individually exceeded their P50 projections.

Comparatively, the following statistics were presented at the REIPPPP Bid Window 6 Bidders Conference on 7 July 2022 by the IPP Office based on data as of March 2022 following seven bid rounds (IPP Office, 2022[8]):

[8] IPP Office (2022). RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROCUREMENT PROGRAMME (REIPPPP) BID WINDOW 6 BIDDERS' CONFERENCE, 7 JULY 2022 [online]. Accessed July

- 92 IPPs have been selected as preferred bidders.
- 6 323 MW of electricity capacity procured.
- 5 826 MW already operational from 87 IPPs.
- 74 805 GWh energy generated by Renewable Energy sources.

Energy costs

In line with international experience, the price of renewable energy is increasingly cost competitive when compared with conventional power sources. The REIPPPP has effectively captured this global downward trend with prices decreasing in every bid window. Energy procured by the REIPPPP is progressively more cost effective and has approached a point where the wholesale pricing for new coal-and renewable-generated energy intersect.

Through the competitive bidding process, the IPPPP effectively leveraged rapid, global technology developments and price trends, buying clean energy at lower and lower rates with every bid cycle, resulting in SA getting the benefit of renewable energy at some of the lowest tariffs in the world. The price for wind power has dropped by 50% to R0.94/kWh, while solar PV has dropped with 75% to R1.14/kWh between BW1 and BW4.

Prices contracted under the REIPPPP for all technologies are well below the published REFIT prices. The REIPPPP has effectively translated policy and planning into delivery of clean energy at very competitive prices. As such it is contributing to the national aspirations of secure, affordable energy, lower carbon intensity and a transformed 'green' economy. with the BW4 price directly comparable with the per kWh price of new coal generation. Solar PV has dropped most significantly with a price decrease of 75% to R1.10/kWh between BW1 and BW4. This compares with the industry estimates in April 2020 of R1.45/kWh for Medupi. Considering the on-going delays incompletion, indications are that these costs may even be significantly higher.

Investment

The document notes that the REIPPPP has attracted significant investment in the development of the REIPPs into the country. The total investment (total project costs[9]), including interest during construction, of projects under construction and projects in the process of closure is R209.6 billion (this includes total debt and equity of R209 billion, as well as early revenue and VAT facility of R0.5 billion).

The REIPPPP has attracted R42 billion in foreign investment and financing in the seven bid windows (BW1 – BW4). This is almost double the inward FDI attracted into South Africa during 2015 (R22.6 billion). The document notes that the share of foreign investment and equity showed an increase in the most recent bid window (2S2), suggesting that the REIPPPP continued to generate investor confidence despite the poor economic conditions in South Africa in recent years.

Comparatively, based on the information presented at the REIPPPP Bid Window 6 Bidders Conference on 7 July 2022 by the IPP Office (IPP Office, 2022), approximately R209.6 billion investment has been attracted for energy infrastructure in all bid windows; and as at March 2022 an actual R1.9 billion contribution was realised for socio-economic development.

2022. https://www.ipp-renewables.co.za/PressCentre/GetPressRelease?fileid=16a21004-f9fd-ec11-9578-2c59e59ac9cd&fileName=BW6%20Bidders%20Conference%20Consolidated.pdf.

[9] Total project costs means the total capital expenditure to be incurred up to the commercial operations date in the design, construction, development, installation, and or commissioning of the project)

South African citizen shareholding

The importance of retaining local shareholding in IPPs is key condition of the procurement requirements. The RFP notes that bidders are required to have South African Equity Participation of 40% in order to be evaluated. South African (local) equity shareholding across BW1-4 equates to 52% (R31.4 billion) of the total equity shareholding (R61.0 billion) was held by South African's across BW1 to BW4, 1S2 and 2S2. This equates to substantially more than the 40% requirement. Foreign equity amounts to R29.6 billion and contributes 49% of total equity.

The REIPPPP also contributes to Broad Based Black Economic Empowerment (BBBEE) and the creation of black industrialists. In this regard, Black South Africans own, on average, 34% of projects that have reached financial close (BW1-BW4), which is 4% higher than the 30% target. This includes black people in local communities that have ownership in the IPP projects that operate in or near their communities and represents the majority share of total South African Entity Participation.

On average, black local communities own 9% of projects that have reached financial close. This is well above the 5% target. In addition, an average of 21% shareholding by black people in engineering, procurement, and construction (EPC) contractors has been attained for projects that have reached financial closure. This is higher than 20% target. The shareholding by black people in operating companies of IPPs has averaged 30% (against the targeted 20%) for the 85 projects in operation (i.e. in BW1–4).

The target for shareholding by black people in top management has been set at 40%, with an average 68% achieved to date. The target has therefore been significantly exceeded.

Community shareholding and community trusts

The regulations require a minimum ownership of 2.5% by local communities in IPP projects as a procurement condition. This is to ensure that a substantial portion of the investments has been structured and secured as local community equity. An individual community's dividends earned will depend on the terms of each transaction corresponding with the relevant equity share. To date all shareholding for local communities have been structured through the establishment of community trusts. For projects in BW1 to BW4, qualifying communities will receive R25.5 billion net income over the life of the projects (20 years). The report notes that the bulk of the money will however only start flowing into the communities from 2028 due to repayment obligations in the preceding years (repayment obligations are mostly to development funding institutions). However, despite the delay this represents a significant injection of capital into mainly rural areas of South Africa. If the net projected income for the first seven bid windows (BW1-BW4) was structured as equal payments overtime, it would represent an annual net income of R1.27 billion per year.

Income to all shareholders only commences with operation of the facility. Revenue generated to date by the 85 operational IPPs amounts to R149.9 billion.

Procurement spend

In addition to the financial investments into the economy and favourable equity structures aimed at supporting BEE, the REIPPPP also targets broader economic and socio-economic investment. This is through procurement spend and local content.

The total projected procurement spend for BW1 to BW4 during the construction phase was R71.1 billion, while the projected operations procurement spend over the 20 years operational life is estimated at 75.2 billion. The combined (construction and operations) procurement value is projected as R146.3 billion of which R92.1 billion has been spent to date. For

construction, of the R71.1 billion already spent to date, R71 billion is from the 85 projects which have already been completed. These 85 projects had planned to spend R64.2 billion. The actual procurement construction costs have therefore exceeded the planned costs by 11% for completed projects.

Preferential procurement

The share of procurement that is sourced from Broad Based Black Economic Empowered (BBBEE) suppliers, Qualifying Small Enterprises (QSE), Exempted Micro Enterprises (EME) and women owned vendors are tracked against commitments and targeted percentages. The IA target requirement for BBBEE is 60% of total procurement spend. However, the actual share of procurement spend by IPPs from BBBEE suppliers for construction and operations combined is currently reported as 83%, which is significantly higher than the target of 60%, but also the 71% that had been committed by IPPs. BBBEE, as a share of procurement spend for projects in construction, is also reported as 84% with operations slightly lower at 74%.

The majority of the procurement spend to date has been for construction purposes. Of the R76 billion spent on procurement during construction, R64.3 billion has reportedly been procured from BBBEE suppliers, achieving 84.6% of total procured. Actual BBBEE spend during construction for BW1 and BW2 alone was R25.5 billion, 81% more than the 14.1 billion planned by the IPPs. The R64.3 billion spent on BBBEE during construction is 30% more than the R49.7 billion that had originally been anticipated by all IPPs procured in BW1-4.
Total procurement spend by IPPs from QSE and EMEs has amounted to R28.1 billion (construction and operations) to date, which exceeds commitments by 250% and is 30% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction was 31% of construction procurement to date and 26% of operational procurement, exceeding the 10% targets set. QSE and EME share of construction procurement spend totals R23.8 billion, which is 5.4 times the planned spend for construction of R4.4 billion during this procurement phase.

In terms of procurement from women-owned vendors to date, 5% of total construction procurement spend has been from woman-owned vendors (against a targeted 5%), and 6% of operational procurement spend has been realised from woman-owned vendors to date, thereby exceeding the targeted 5%. In terms of construction spend, R 4.1 billion was undertaken by women-owned vendors, which is almost double the R 1.8 billion expected to be spent for the construction of projects that have reached financial close.

The REIPPPP has therefore created significant employment opportunities for black South African citizens and local communities beyond planned targets. This highlights the importance of the programme in terms of employment equity and the creation of more equal societies.

Local Content[10]

The report notes that the REIPPP programme represents the country's most comprehensive strategy to date in achieving the transition to a greener economy. Local content minimum thresholds and targets were set higher for each subsequent bid window. The report notes that for a programme of this magnitude, with construction procurement spend alone estimated at R71.1 billion, the result is a substantial stimulus for establishing local manufacturing capacity. The local content strategy has created the required incentives for a number of international technology and component manufactures to establish local manufacturing facilities.

The documents notes that for the portfolio as a whole, the expectation would reasonably be for local content spend to fall between 25% and 65% of the total project value (considering

[10] Local content is expressed as a % of the total project value and not procurement or total project costs.

the range of targets and minimum requirements). Local content commitments by IPPs amount to R66.3 billion or 45% of total project value (R148.2 billion for all bid windows).

Actual local content spend reported for IPPs that have started construction amounts to R63.3 billion against a corresponding project value (as realised to date) of R127.2 billion. This means that 50% of the project value has been locally procured, exceeding the 45% commitment from IPPs and the thresholds for BW1 – BW4 (25-45%).

To date, the R63.3 billion local content spend reported by active IPPs is already 96% of the R66 billion local content expected. This is with 6 projects still in construction, and 85 of the 91 active projects having reached COD (i.e. 93% of the active portfolio complete). For the 85 projects that have reached COD, local content spend has been R 58.72 billion of a committed R58.67 billion, which is 0.1 more than the planned local spend.

Leveraging employment opportunities

To date, a total of 63 291 job years[11] have been created for South African citizens, of which 48 110 job years were in construction and 15 182 in operations. These job years should rise further past the planned target as more projects enter the construction phase. Employment opportunities across BW1-4 are 143% of the planned number during the construction phase (i.e. 33 707 job years), with 6 projects still in construction and employing people. The number of employment opportunities is therefore likely to continue to grow beyond the original expectations.

By the end of December 2021, 85 projects had successfully completed construction and moved into operation. These projects created 44 172 job years of employment, compared to the anticipated 30 488. This was 45% more than planned.

The report notes that employment thresholds and targets were consistently exceeded across the entire portfolio. The average share of South African citizens of total South Africa based employees for BW1 – BW4 was 91% during construction (against a target of 80%), while it was 96% during operations for BW1 – BW4 (against a target of 80%). The report notes that the construction phase offers a high number of opportunities over shorter durations, while the operations phase requires fewer people, but over an extended operating period.

To date, 48 110 job years for SA citizens were achieved during construction, which is 43% above the planned 33 707 job years for active projects. These job years are expected to rise further since 6 projects are still in construction.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. For active projects, the expectation for local community participation was 13 284 job years. To date 25 272 job years have been realised (i.e. 90% more than initially planned), with 6 projects still in, or entering, construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 74%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 81%, 44% and 48% of total job opportunities created by IPPs to date. However, woman and disabled people could still be significantly empowered as they represent a mere 10% and 0.4% of total jobs

[11] The equivalent of a full-time employment opportunity for one person for one year

created to date, respectively. Nonetheless, the fact that the REIPPPP has raised employment opportunities for black South African citizens and local communities beyond planned targets, indicates the importance of the programme to employment equity and the drive towards more equal societies.

The share of black citizens employed during construction (81%) and the early stages of operations (85%) has significantly exceeded the 50% target and the 30% minimum threshold. Likewise, the share of skilled black citizens (as a percentage of skilled employees) for both construction (71%) and operations (82%) has also exceeded the 30% target and minimum threshold of 18%. The share of local community members as a share of SA-based employees was 48% and 70% for construction and operations respectively – significantly exceeding the minimum threshold of 12% and the target of 20%.

Socio-economic development (SED) contributions

An important focus of the REIPPPP is to ensure that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. In this regard, IPPs are required to contribute a percentage of projected revenues accrued over the 20-year project operational life toward SED initiatives. These contributions accrue over the 20-year project operation life and are used to invest in housing and infrastructure as well as healthcare, education, and skills development.

The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20-year project operational life. For the current portfolio of projects, the average commitment level is 2%, which is 101% higher than the minimum threshold level. To date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

As a percentage of revenue, SED obligations become effective only when operations commence, and revenue is generated. Of the 91 IPPs that have reached financial close (BW1–BW4), 85 are operational. The SED contributions associated with these 85 projects has amounted to R 1.8 billion to date.

In terms of ED and SED spend, education, social welfare, and health care initiatives have a SED focus. SED spend on education has been almost double the expenditure on enterprise development. This is despite enterprise development being a stand-alone commitment category in terms of the IA. This is, in part, due to the fact that some early childhood development programmes have also been incorporated in educational programmes. IPPs have supported 1 388 education institutions with a total of R437 million in contributions, from 2015 to the end of June 2021. A total of 1 276 bursaries, amounting to R210.8 million, have been awarded by 67 IPPs from 2015 until the end of June 2021. The largest portion of the bursaries were awarded to African and Coloured students (97.4%), with women and girls receiving 56.3% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 57.2%, followed by the Eastern Cape (20.2%) and Western Cape (14.1%). Enterprise development and social welfare are the focus areas that have received the second highest share of the contributions to date.

Enterprise development contributions

The target for IPPs to spend on enterprise development is 0.6% of revenues over the 20-year project operational life. However, for the current portfolio, IPPs have committed an average of 0.63% or 0.03% more than the target. Enterprise development contributions

committed for BW1-4, amount to R7.2 billion. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R358 million per annum. Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development.

Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. A total contribution of R504.1 million has already been made to the local communities (i.e. 94%of the total R537.9 million enterprise development contributions made to date).

Contribution to cleaner energy and water savings

As part of the global commitment, South Africa is targeting an emissions trajectory that peaks at 34% below a "business as usual" case in 2020, 42% below in 2025 and from 2035 declines in absolute terms. The REIPPPP contributes constructively to economic stability, energy security and environmental sustainability.

The emission reductions for the programme during the preceding 12 months (June 2019-June 2020) is calculated as 15.1 million tonnes CO_2 ($MtonCO_2$) based on the 14 835 GWh energy that has been generated and supplied to the grid over this period. This represents 75% of the total projected annual emission reductions ($20.5MtonCO_2$) achieved with only partial operations. A total of 72.1 Mton CO_2 equivalent reduction has been realised from programme inception to date.

The March 2019 Report also notes that since operation, the IPPs have saved 42.8 million kilolitres of water related to fossil fuel power generation. This saving will have increased with the increase in energy generated by renewable energy since 2019. The REIPPPP therefore contributes significantly towards meeting South Africa's GHG emission targets and, at the same time, supporting energy security, economic stability, and environmental sustainability.

2.4.2 Green Jobs Study

The study notes that South Africa has one of the most carbon-intensive economies in the world, therefore making the greening of the electricity mix a national imperative. Within this context the study notes that the green economy could be an extremely important trigger and lever for enhancing a country's growth potential and redirecting its development trajectory in the 21st century. The attractiveness of wind and solar technologies is not only supported by local conditions, but also by the relatively mature stage of their technological development.

The aim of the Green Jobs study was to provide information on the net direct job creation anticipated to emerge in the formal economy across a wide range of technologies/activities that may be classified as green or contributing to the greening of the economy. The study looked at the employment potential for a number of green sectors, including power generation, over three consecutive timeframes, namely, the short term (2011 – 12), medium term (2013 – 17) and long term (2018 – 25). The analysis attempts to estimate the employment potential associated with: building, construction and installation activities; operations and maintenance services; as well as the possible localisation spin-offs for the manufacturing sector as the domestic production of equipment, parts and components benefits from preferential local procurement.

It is also worth noting that the study only considered direct jobs in the formal economy. Multiplier effects were not taken into account. As a result, the analysis only captures a portion

of the potential employment impact of a greening economy. International studies have indicated that there are considerable backward and forward linkages through various value chains of production, as well as of indirect and induced employment effects. The employment figures can therefore be regarded as conservative.

The analysis reveals the potential of an unfolding green economy to lead to the creation of approximately 98 000 new direct jobs, on average, in the short term, almost 255 000 in the medium term and around 462 000 employment opportunities in the formal economy in the long term. The number of jobs linked to the power generation was estimated to be ~ 12 500 in the short term, 57 500 in the medium term and 130 000 in the long term. Power generation jobs therefore account for 28% of the employment opportunities created in the long term. However, the report notes that the contribution made by a progressively expanding green energy generation segment increases from 14% of the total in the short term, or just over 13 500 jobs, to more than 28% in the long term (166 400) (Table 2.3). The study also found that energy generation is expected to become an increasingly important contributor to green job creation over time, as projects are constructed or commissioned.

Table 2.3: Net direct employment potential estimated for the four broad types of activity and their respective segments in the long term, and an indication of the roll-out over the three timeframes

Broad green economy category		Segment	Technology/product	Total net direct employment potential in the long-term	Net direct manufacturing employment potential in the long-term	Total net direct employment potential (ST, MT, LT)	Net direct manufacturing employment potential (ST, MT, LT)
ENERGY GENERATION	Renewable (non-fuel) electricity	Wind power	Onshore wind power	5 156	2 105	VL, L, M	L, M, H
			Offshore wind power				
		Solar power	Concentrated solar power	3 014	608	N, VL, M	N, VL, M
			Photovoltaic power	13 541	8 463	M, H, H	H, VH, VH
		Marine power	Marine power	197	0	N, N, VL	N, N, N
		Hydro power	Large hydro power	272	111	VL, VL, VL	VL, M, VL
			Micro-/small-hydro power	100	0	VL, VL, VL	N, N, N
	Fuel-based renewable electricity	Waste-to-energy	Landfills	1 178	180	VL, VL, L	VL, VL, L
			Biomass combustion	37 270	154	VL, H, VH	VL, VL, L
			Anaerobic digestion	1 429	591	VL, VL, L	VL, L, M
			Pyrolysis/Gasification	4 348	2 663	VL, L, M	VL, H, H
			Co-generation	10 789	1 050	L, M, H	M, H, H
	Liquid fuel	Bio-fuels	Bio-ethanol	52 729	6 641	M, H, VH	L, H, VH
			Bio-diesel				
ENERGY GENERATION SUB-TOTAL				**130 023**	**22 566**		
ENERGY & RESOURCE EFFICIENCY		Green buildings	Insulation, lighting, windows	7 340	838	L, M, M	L, M, M
			Solar water heaters	17 621	1 225	L, H, H	L, M, H
			Rain water harvesting	1 275	181	VL, VL, L	VL, VL, L
		Transportation	Bus Rapid Transport	41 641	350	VH, VH, VH	H, M, L
		Industrial	Energy efficient motors	-566	4	VL, VL, VL	VL, VL, VL
			Mechanical insulation	666	89	VL, VL, VL	VL, VL, VL
ENERGY & RESOURCE EFFICIENCY SUB-TOTAL				**67 977**	**2 686**		
EMMISIONS AND POLLUTION MITIGATION		Pollution control	Air pollution control	900	166	N, VL, VL	N, L, L
			Electrical vehicles	11 428	10 642	VL, L, H	N, H, VH
			Clean stoves	2 783	973	VL, VL, L	VL, L, M
			Acid mine water treatment	361	0	VL, VL, VL	N, N, N
		Carbon Capture and Storage		251	0	N, VL, VL	N, N, N
		Recycling		15 918	9 016	M, H, H	H, VH, VH
EMMISIONS AND POLLUTION MITIGATION SUB-TOTAL				**31 641**	**20 797**		
NATURAL RESOURCE MANAGEMENT		Biodiversity conservation & eco-system restoration		121 553	0	H, VH, VH	N, N, N
		Soil & land management		111 373	0	VH, VH, VH	N, N, N
NATURAL RESOURCE MANAGEMENT SUB-TOTAL				**232 926**	**0**		
TOTAL				**462 567**	**46 049**		

(Source: Green Jobs Study, 2011)

Notes:

- VH = very high (total employment potential > 20 000 direct jobs; manufacturing employment potential > 3 000 direct jobs);
- H = high (total employment potential > 8 000 but < 20 000; manufacturing employment potential > 1 000 but < 3 000);
- M = medium (total employment potential > 3 000 but < 8 000; manufacturing employment potential > 500 but < 1 000);
- L = low (total employment potential > 1 000 but < 3 000; manufacturing employment potential > 150 but < 500);

- VL = very low (total employment potential > 0 but < 1 000; manufacturing employment potential > 0 but < 150);
- N = negligible/none (total employment potential = 0; manufacturing employment potential = 0).

Of relevance the study also notes that the largest gains are likely to be associated with operations and maintenance (O&M) activities, particularly those involved in the various natural resource management initiatives. In this regard, operations and maintenance employment linked to renewable energy generation plants will also be substantial in the longer term. The employment growth momentum related to building, construction and installation activities peaks in the medium term, largely propelled by mass transportation infrastructure, stabilising thereafter as green building methods become progressively entrenched.

In addition, as projects related to a greening economy are progressively commissioned, the potential for local manufacturing also become increasingly viable. Employment gains in manufacturing are also expected to be relatively more stable than construction activities, since the sector should continue exhibiting growth potential as new and replacement components are produced, as additional markets are penetrated, and as new green technologies are introduced. Manufacturing segments with high employment potential in the long term would include suppliers of components for wind and solar farms. The study does note that a shortage of skills in certain professional fields pertinent to renewable energy generation presents a challenge that must be overcome.

The study also identifies a number of advantages associated with renewable energy with a large 'technical' generation potential. In this regard, renewable energy, such as solar and wind, does not emit carbon dioxide (CO_2) in generating electricity and is associated with exceptionally low lifecycle emissions. The construction period for renewable energy projects are much shorter than those of conventional power stations, while an income stream may, in certain instances, be provided to local communities through employment and land rental. The study also notes that the greenhouse gases (GHG) associated with the construction phase are offset within a short period of time compared with the project's lifespan. Renewable power therefore provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa, renewable energy source is not dependent on water (as compared to the massive water requirements of conventional power stations), has a limited footprint and therefore does not impact on large tracts of land, poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

Of relevance, the study also notes that renewable energy projects in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.

2.4.3 Powering the Future: Renewable Energy Roll-out in South Africa

The study notes that South Africa has higher CO_2 emissions per GDPppp (2002 figures) from energy and cement production than China or the USA (Letete, T et al). Energy accounts for 83% of the total GHG emissions (excluding land use, land use change and forestry) with fuel combustion in the energy industry accounting for 65% of the energy emissions of South Africa (DEA, 2011).

Within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. Acid mine drainage from abandoned mines in South Africa impacts on water quality and poses the biggest threat to the country's limited

water resources. Huge volumes of water are also required to wash coal and cool operating power stations. Eskom uses an estimated 10 000 litres of water per second due to its dependency on coal (Greenpeace, 2012).

The report notes that the concerns relating to whether South Africa can afford renewable energy arise out of the perception that renewable energy (RE) is expensive while fossil and nuclear technologies are cheap. The premise also ignores life cycle costing of the technologies which is favourable to renewable technologies where the sources of fuel are free or cheap.

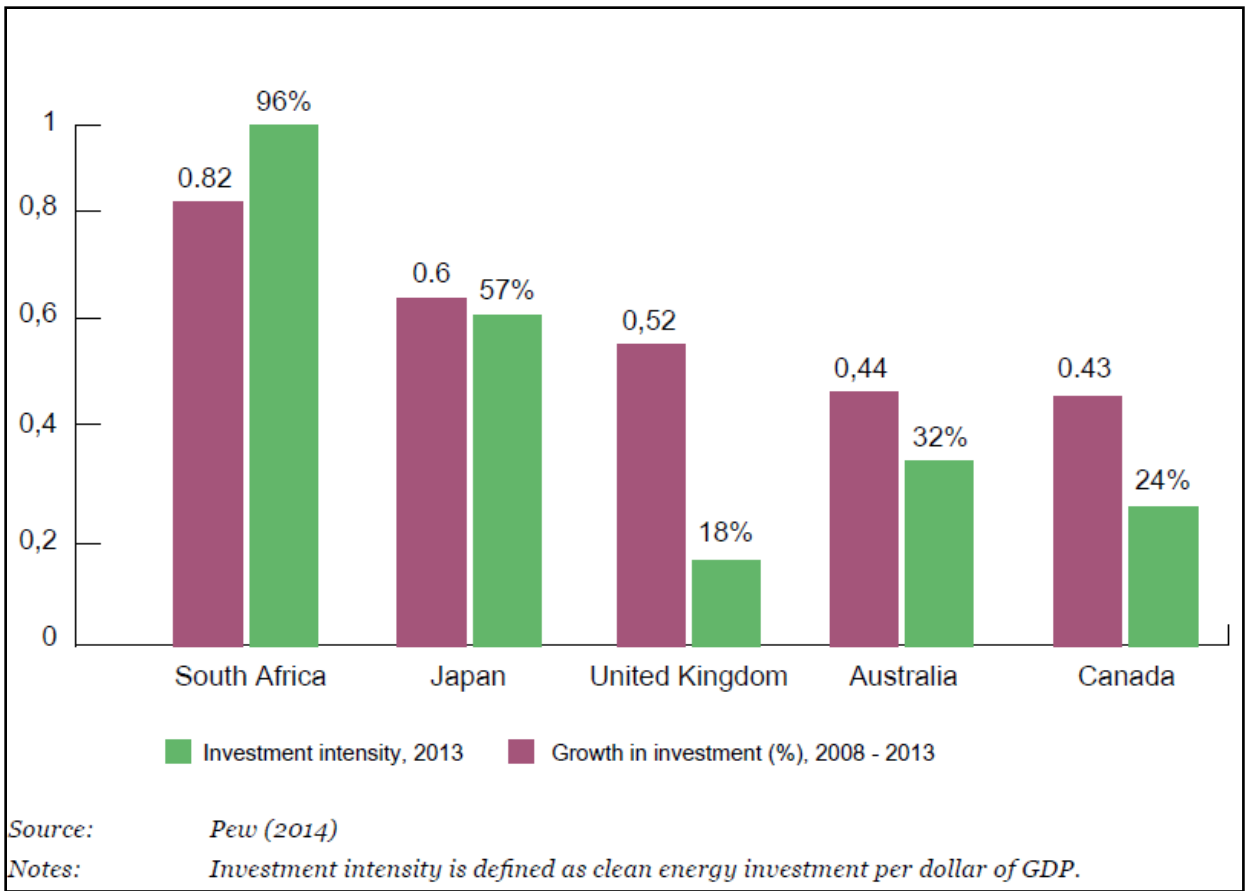
2.4.4 WWF SA Renewable Energy Vision 2030

In its vision the WWF motivated for a more ambitious plan, suggesting that the IRP should provide for an 11-19% share of electricity capacity by 2030, depending on the country's growth rate over the next fifteen years. The vision is to increase renewable energy at the expense of new coal-fired and nuclear capacity. The report notes that in addition to the obvious environmental benefits of this scenario, it will enable South Africa to add flexibility to energy supply capacity on an on-demand basis.

The report notes that Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) introduced in 2011, has by all accounts been highly successful in quickly and efficiently delivering clean energy to the grid. Increasingly competitive bidding rounds have led to substantial price reductions. In this regard, the study indicates that in three years, wind and solar PV have reached pricing parity with supply from new coal-fired power stations from a levelised cost of electricity (LCOE) perspective.

In bidding window 3 of August 2013, the average tariffs bid for wind and solar PV were R0,66/kWh and R0.88/kWh respectively, well below the recent estimates of R1.05/kWh for supply from the coal-fired Medupi and Kusile power stations (Papapetrou 2014).

The report also notes that the REIPPPP has several contracting rounds for new renewables supply. A robust procurement process, extension of a 20-year sovereign guarantee on the power purchase agreement (PPA) and, especially, ideal solar power conditions, have driven the investment case for RE in South Africa. In this regard, South Africa has been identified as one of the worlds' leading clean energy investment destinations (Figure 2.11).



Source: *Pew (2014)*

Notes: *Investment intensity is defined as clean energy investment per dollar of GDP.*

Figure 2.11: South Africa leads as a clean energy investment destination

With regard to local economic development, the REIPPPP sets out various local economic development requirements with stipulated minimum threshold and aspirational targeted levels, which each bidder must comply with. Based on the Broad-Based Black Economic Empowerment Codes, this requirement comprises the following components which make up a scorecard:

- Ownership by black people and local communities.
- Job creation.
- Local content.
- Management control.
- Preferential procurement.
- Enterprise development.
- Socio-economic development.

The final award is based on a combined evaluation in which price determines 70% of the ranking and performance on the local economic development scorecard the remaining 30%. This gives non-price criteria a much heavier weighting than they would normally enjoy under Government's preferential procurement policy.

Job creation, local content and preferential procurement accounted for the bulk of possible points on the scorecard in REIPPPP Round 3. Consequently, a requirement to source goods and services locally is considered to be the central driver of project costs associated with local

economic development. In terms of local content, the definition of local content is quite broad, being the value of sales less the costs associated with imports. However, through successive bidding rounds, the definition has become subject to more detailed definition, with an expanding list of exclusions and increased targeting in terms of key components identified by the Department of Trade and Industry for local manufacturing. This has benefitted local manufacturers and suppliers.

The WWF study considers a low and high growth renewable energy scenario. The capital requirements for the low growth scenario are estimated at R474 billion over the period 2014-2030 (2014 Rand value), rising to R1.084 trillion in the high-growth scenario, in which 35 GW of capacity is built. Each annual round of purchasing 2 200 MW of RE capacity would cost approximately R77 billion in 2014 Rand value terms. In relative economic terms, this equates to 2% of the GDP per annum or approximately one quarter of Government's planned annual investment in infrastructure over the medium term. In the low economic growth scenario, which is arguably the more realistic one, the average annual new liability over the period is approximately R40 billion.

The study also points out that infrastructure spend is more beneficial than other government expenditure due to the infrastructure multiplier effect. This refers to the beneficial impact of infrastructure on economic growth in both the short term, resulting from expansion in aggregate demand, as well as in the longer term (six to eight years) due to enhanced productive capacity in the economy. A recent USA study on highway expenditure revealed the infrastructure multiplier to be a factor of two on average, and greater during economic downturns (Leduc & Wilson 2013). This means that one dollar spent on infrastructure raises GDP by two dollars. If the same were to hold true, as similar analysis suggests it would (Kumo 2012, Ngandu et al 2010), this indicates that the construction of renewable energy plants could be a valuable economic growth driver at a time when fears of recession abound.

The report concludes that the WWF is optimistic that South Africa can achieve a much more promising clean energy future than current plans allow for. With an excellent solar resource and several good wind-producing pockets, the country is an ideal candidate for a renewable energy revolution.

The report indicates that the levelised cost of producing renewable energy already competes favourably with the three main alternatives, namely coal, gas and nuclear. In addition, renewable energy would contribute to a more climate-resilient future and insulate South Africa from dependence on expensive and unreliable fuel sources priced in dollars. Critical from a planning perspective, the report notes that renewable energy can also provide added flexibly on an 'as needed' basis, as electricity demand grows. This is vital in a highly uncertain environment.

2.4.5 The impact of the green economy on jobs in South Africa

The paper notes that greening the economy is particularly important in South Africa for two basic reasons: (1) the exceptional level of unemployment that the country is experiencing and (2) the high carbon impact of the economy.

In terms of employment, the paper refers to the IDC *Green Jobs R*eport (2011). In summary, the short-term (next 2 years) estimate of total net employment potential is 98 000 jobs, and the long-term (next 8 years) employment potential is 462 567 jobs. Natural resource management is predicted to lead to the greatest number of these at 232 926 long-term jobs. Green energy generation is estimated to produce 130 023 long-term jobs, with energy and resource efficiency measures adding another 67 977 long-term jobs.

The paper notes that the Green Jobs Report was prepared by seventeen primary researchers from three prominent organisations, namely the IDC, the Development Bank of South Africa, and Trade and Industrial Policy Strategies. Many role players from other organisations were also consulted, including the World Wide Fund for Nature, the Green Building Council, the Economic Development Department and private companies involved in green industries.

Despite questions surrounding the employment estimates contained in the Green Jobs Report, green economic activity does appear to generate more local jobs than fossil-fuel-based industries. Some of the estimates also indicate the potential for significant employment. The paper concludes that the figures represent a promising starting point that warrants further research and policy involvement in greening the economy in South Africa.

2.4.6 Potential for local community benefits

In her thesis, Tait[12] notes that the distributed nature of renewable energy generation can induce a more geographically dispersed pattern of development. As a result, RE sites can be highly suited to rural locations with otherwise poor potential to attract local inward investment therefore enabling to target particularly vulnerable areas.

In her conclusion, Tait notes that the thesis has found positive evidence for the establishment of community benefit schemes in the wind sector in South Africa. These benefits would also apply to solar projects. The BBBEE requirements for developers as set out in the DoE's IPPPP for renewables is the primary driver for such schemes. The procurement programme, in keeping with the objective of maximising the economic development potential from this new sector, includes a specific focus on local communities in which wind farms are located.

The procurement programme, typical of all Government tendering processes, includes a BBBEE scorecard on which renewable energy projects are evaluated. However, the renewables scorecard appears to play an important part in a renewed focus on the broad-based Aspects of the legislation, as enforced by a recent national review of the BBBEE Act. In this regard, the renewables scorecard includes specifications for local communities in respect of broad-based ownership schemes, socio--economic development and enterprise development contributions. This approach to legislating social responsibilities of business in all sectors definitely has a South African flavour, borne out of the political history of the country and the imperatives for social transformation laid out in the constitution.

While Tait notes that it is still early days for the development of this sector and one cannot determine the impact that such benefit schemes may have, it is clear though that targeted development expenditure will be directed to multiple rural communities and there seems to be a strong potential to deliver socio-economic benefits.

[12] The potential for local community benefits from wind farms in South Africa, Louise Tait (2012), Master's Thesis, Energy Research Centre University of Cape Town

SECTION 3: OVERVIEW OF STUDY AREA

3.1 INTRODUCTION

Section 3 provides a baseline description of the study area with regard to:

- The administrative context.
- Overview of local municipality.
- Site and surrounding land uses.

3.2 ADMINISTRATIVE CONTEXT

The study area is located within the Beaufort West Municipality (BWM) within the Western Cape Province (Figure 3.1). The BWM is one of three Local Municipalities that make up the Central Karoo District Municipality (CKDM). The town of Beaufort West is the administrative seat of the BWM and CKDM.

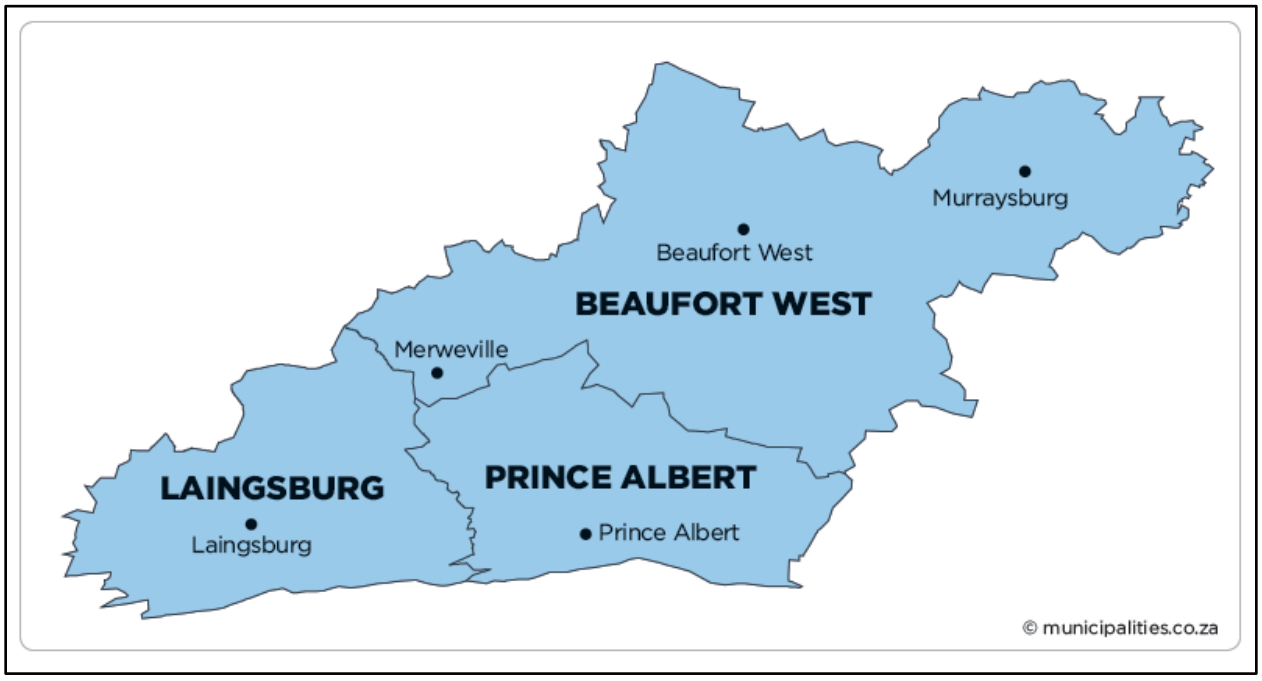


Figure 3.1: Location of Beaufort West Municipality with Central Karoo District Municipality

3.3 DEMOGRAPHIC OVERVIEW

Population

The 2021 Socio-Economic Profile (SEP) for the BWM prepared by the Western Cape Department of Social Development, indicates that the population of the BWM in 2021 was 51 177. Based on 2022 Census data the population of the BWM was 72 972 in 2022. There is therefore a significant discrepancy between the 2021 estimate and the 2022 Census figure which raises concerns regarding the accuracy of the 2022 Census data. In this regard the SEP also predicts a decrease in the population of the BWM to 50 613 by 2025, a decrease of -

0.3%. The 2022 Census data does therefore not align with the predictions of the SEP for the BWM. The total number of households in 2021 was 13 122 (SEP), with an average household size of 3.9. Census 2022 data indicates a total of 19 216 households.

Based on Census 2022, 27.72% of the population were under the age of 15, 65.80% fell within the economically active age group of 15 and 64 years old, while only 6.47% were 65 and older. Based on this this the dependency ratio was 51%. Based on the SEP, young children under the age of 15 made up 30% of the population, the working age cohort (15-64) made up 61% and people 65 years and older made up 9%. Based on these figures the dependency ratio was 64%, significantly higher than the 2022 Census figure. The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates reduced revenue for local authorities to meet the growing demand for services. The difference between the 2021 SEP and 2022 Census data is therefore a concern.

Based on 2022 Census data Coloureds made up 78% of the population of the BWM, followed by Black Africans (16%) and Whites (5%). The main first language spoken was Afrikaans (83%), followed IsiXhosa (13.4%) by English (1.5%).

Household types

As indicated above, based on 2022 Census data there were a total of 19 216 households in the BWM. The majority reside in formal dwellings (99.42%), while 0.26% of households reside in informal dwellings within backyards and 0.11% reside in informal dwellings not in a backyard. Based on the 2022 Census data informal housing does not represent a key challenge for the BWM. The lack of informal housing is also likely to be linked to the lack of employment opportunities in the BWM and limited influx of job seekers to the area. As indicated above, the 2021 SEP for the BWM predicts a decrease in population by 2025.

In terms of household heads, 45.04% of the households within the BWM were headed by females in 2022. The high percentage of female headed households reflects the limited employment opportunities in the BWM and the migration of men away from the area in the search of employment opportunities. Female headed households are traditionally more vulnerable.

Household income

At the time of preparing the report no data on household income was available from the 2022 Census. The data is therefore still based on 2011 Census. Based on this data, 8% of the population of the BWM had no formal income, 4% earned less than R 4 800, 9% earned between R 5 000 and R 10 000 per annum, 24% between R 10 000 and R 20 000 per annum and 30% between R 20 000 and R 40 000 per annum (2011).

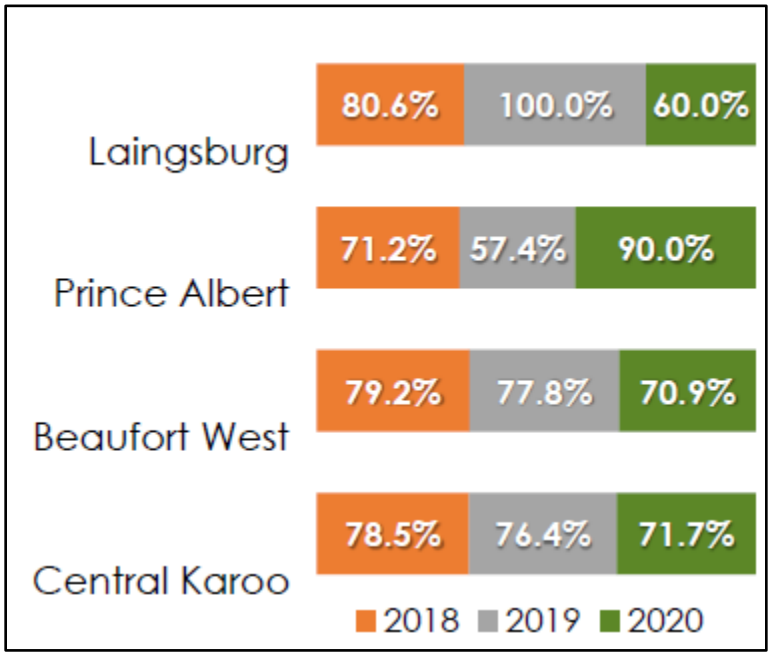
The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 75% of the households in the BWM live close to or below the poverty line. The figure for Western Cape was 50.1%. The low-income levels reflect the limited employment opportunities and dependence on the agricultural sector. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and

rates revenue for the BWM. This in turn impacts on the ability of the BWM to maintain and provide services.

Employment
The 2021 SEP for the BWM notes that the at 22.4 % in 2020 the unemployment rate in the BWM was the highest in the CKDM. The figure for CKDM and Western Cape was 20.3% and 8.9% respectively. The SEP notes that the high unemployment rate is a major concern given that it is based on the narrow definition of unemployment, namely the percentage of people that can work, but unable to find employment. The broad definition generally refers to people that can work, but not actively seeking employment.

Education
Based on Census 2022 the percentage of the population over 20 years of age in BWM with no schooling was 5.16%. The proportion of the population over 20 years old with matric as their highest level of education was 32.62% while 6.84% had a higher education qualification.

Based on the information contained in the SEP, the matric pass rate in the BWM was 70.9% in 2021, down from 79.2% in 2018. This figure was lower than the average for the CKDM (71.7%) (Figure 3.2).



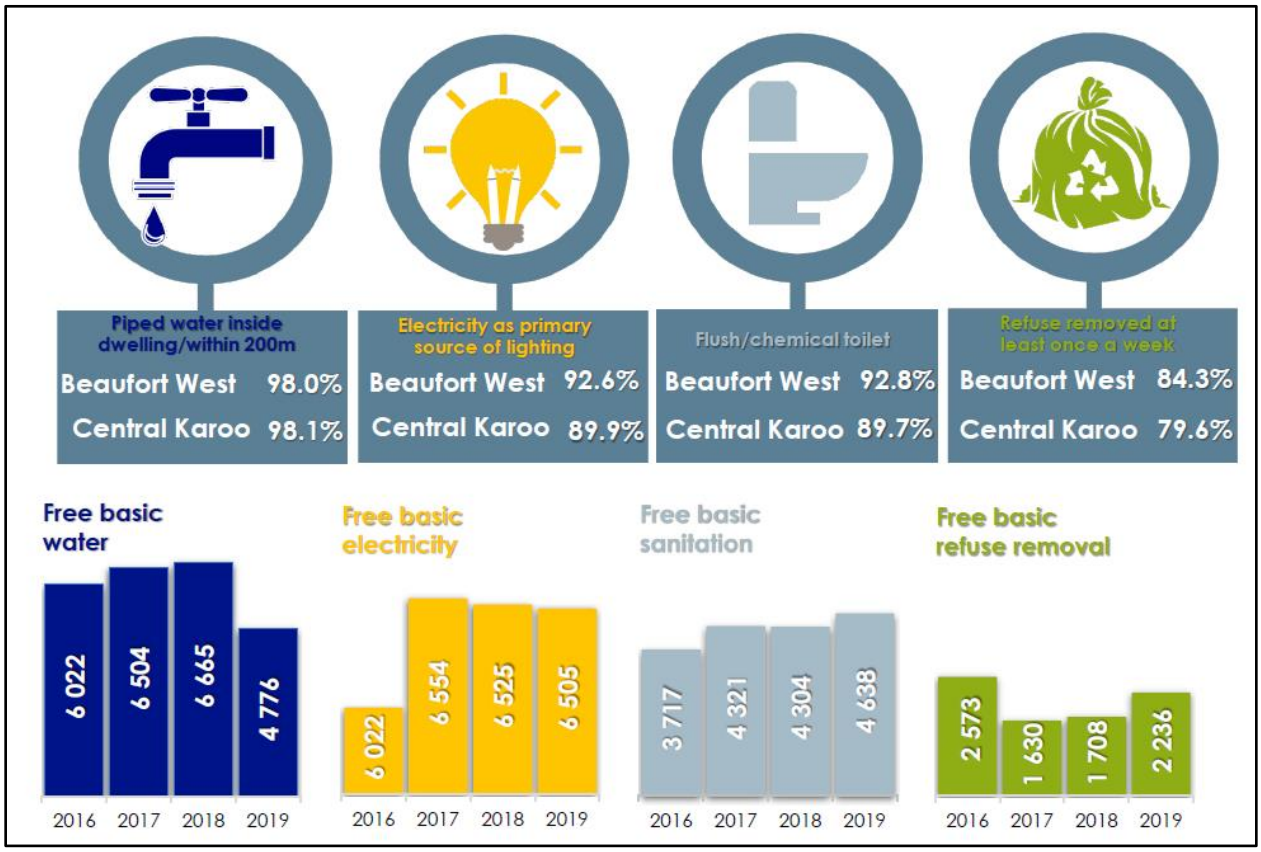
Source: SEP BWM 2021
Figure 3.2: Matric pass rates for CWM and CKDM

3.4 MUNICIPAL SERVICES

Based on the information from the 2021 SEP 92.6% of households in the BWM had access to electricity, 98% had access to water, 92.8% had access to sanitation services, and 84.3% had their refuse removed on a regular basis (Figure 3.4). In summary, service levels in the BWM can be described as good. Except for access to water, access to services for residents of the BWM is higher than the averages for the CKDM (Figure 3.3).

The figures from the 2022 Census indicate that 97.08% have access to electricity, 87.25% access to piped water inside their dwellings, 12.19% had access to piped water inside their

yards and 0.33% had access to water on a community stand, 97.97% had flush toilets (sewer and septic tank), and 92.76% had their waste collected. Some of the figures are similar to the SEP figures, while others are higher and or lower.



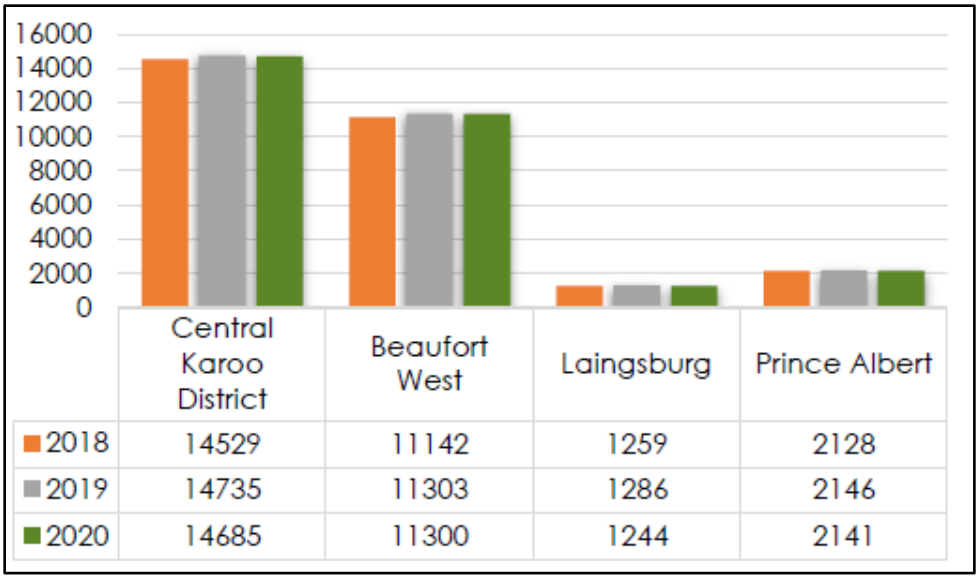
Source: SEP BWM 2021

Figure 3.3: Summary of municipal services

3.5 HEALTH AND EDUCATION FACILITIES

Education facilities

Based on the 2021 SEP there are 18 schools in the BWM, of which 14 (50%) are no-fee schools. This reflects the low income levels in the area. Of interest, 17 of the 18 schools (94,4%) are equipped with libararies. In terms of learner enrollment, the figure for the BWM dropped marginally from 11 303 in 2019 to 11 300 in 2020 (Figure 3.4). This drop would support the SEPs statement that the population of the BWM is expected to decrease by 50 613 by 2025.



	Central Karoo District	Beaufort West	Laingsburg	Prince Albert
2018	14529	11142	1259	2128
2019	14735	11303	1286	2146
2020	14685	11300	1244	2141

Source: SEP BWM 2021

Figure 3.4: Summary of GDPR and Employment for BWM

Health care facilities

Access to healthcare services is a basic human right and one that is directly affected by the number and spread of facilities within their geographical area. Based on the 2021 SEF there are 4 district hospitals in the CKDM, of which 2 are in the BWM. In addition, there 5 PHC Clinics (Satellite and Mobile) and 5 fixed PHC Clinics in the BWM. In terms of emergency services, there are 8 operational EMS ambulances in the BWM per 10 000 people.

Child health is a key indicator of well-being and potential needs. The United Nations Sustainable Development Goals (SDGs) aim to end preventable deaths of new-borns and children under 5 years of age by 2030, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1 000 live births and under-5 mortalities to at least as low as 25 per 1 000 live births (Source: UN SDG's). Key criteria used to measure child health include immunisation rates[13], percentage of malnourished children[14], neonatal mortality rate[15] and birth weight[16].

The immunisation coverage rate for children under the age of one in the BWM was 68.8% compared to 76.1% for the CKDM. The number of malnourished children under five years (per 100 000) in 2020 was 2.2, while the neonatal mortality rate (NMR) (deaths per 1 000 live

[13] **Immunisation:** *The immunisation rate is calculated as the number of children immunised as a percentage of the total number of children less than one year of age.* Immunisation protects both adults and children against preventable infectious diseases. Low immunisation rates speak to the need for parents to understand the critical importance of immunisation, as well as the need to encourage parents to have their young children immunised.

[14] **Malnutrition:** *Expressed as the number of malnourished children under five years per 100 000 people.* Malnutrition (either under- or over-nutrition) refers to the condition whereby an individual does not receive adequate amounts or receives excessive amounts of nutrients.

[15] **Neonatal mortality rate:** *Measured as the number of neonates dying before reaching 28 days of age, per 1 000 live births in a given year.* The first 28 days of life (neonatal period) represent the most vulnerable time for a child's survival. The Province's target for 2019 is 6.0 per 1 000 live births.

[16] **Low birth weight:** *Percentage of all babies born in facility that weighed less than 2 500 g.* Low birth weight is associated with a range of both short- and long-term consequences.

births before 28 days of life) was 17.8 and the low birth weight was 21.6, compared to 2, 15.6 and 22.9 for the CKDM. The child health care conditions in the BWM are worse than the conditions in the district, which is a concern.

3.6 ECONOMIC OVERVIEW

The Economic activity in the BWM plays a key role in terms of creating employment opportunities and addressing poverty and human development. The ability of households to pay for services such as water, electricity, sanitation, and refuse removal is dependent upon the ability to generate income from economic activities. A slowdown or deterioration in economic activities typically results in job losses and the inability of households to pay for services, which in turn impacts on municipal revenues and the ability to provide and maintain services and municipal infrastructure.

Economic sectors
In terms of key sectors, the local economy in the BWM was dominated by the tertiary sector which contributed 77.4% towards the Gross Domestic Product for the Region (GDPR)[17] in 2019, followed by the Secondary Sector (12.5%) and the Primary Sector (10.1%) (Figure 3.5). Within Tertiary Sector, the most important subsectors were General Government (22.4%), Transport, storage, and communication (17%) and Finance, insurance, real estate and business services (13%), both contributing more than the entire Primary Sector. The Agriculture, forestry and fishing subsector within the Primar Sector contributed 10% towards GGDP.

Employment
In terms of employment, the Tertiary Sector was made up 74.4% of all jobs in 2019, followed by the Primary Sector (19%) and the Secondary Sector (6.6%) (Figure 3.6). However, in terms of subsectors the Agriculture, forestry and fishing sector was the second most important sector in 2019, making up 19% of all jobs. The Wholesale and retail trade, catering and accommodation sector was the most important (25%). The COVID-19 pandemic is likely to have resulted in job losses during 2020, extending into 2022/23.

[17] Gross domestic product of a region (GDPR) is the standard measure of the value added created through the production of goods and services in a region (the LM) during a certain period.

	GDPR			Employment		
	R Million value 2019	Trend 2015 – 2019	Real GDPR growth 2020e	Number of jobs 2019	Average annual change 2015 - 2019	Net change 2020e
Primary Sector	**225.3**	**-2.8**	**10.7**	**2 423**	**77**	**-73**
Agriculture, forestry & fishing	223.7	-2.9	10.8	2 421	77	-73
Mining & quarrying	1.6	0.5	-17.6	2	0	0
Secondary sector	**278.6**	**-0.3**	**-12.8**	**787**	**-11**	**-94**
Manufacturing	67.4	0.4	-10.3	249	-2	-16
Electricity, gas & water	120.3	0.2	-6.2	65	0	-3
Construction	90.9	-1.3	-22.0	473	-9	-75
Tertiary sector	**1 727.3**	**0.5**	**-6.3**	**9 342**	**70**	**-558**
Wholesale & retail trade, catering & accommodation	346.4	-0.2	-11.3	3 165	41	-280
Transport, storage & communication	382.2	-1.2	-16.9	649	-1	-38
Finance, insurance, real estate & business services	287.9	2.2	-3.6	1 277	2	-86
General government	500.3	1.0	1.0	2 319	7	26
Community, social & personal services	210.5	0.7	-2.9	1 932	21	-180
Beaufort West	**2 231.2**	**-0.1**	**-4.8**	**12 552**	**136**	**-725**

Source: SEP BWM 2021

Figure 3.5: Summary of GDPR and Employment for BWM

In terms of skills levels, the labour forces in the BWM in 2020 consisted mainly of semi-skilled (42.7%), followed by low-skilled (36%) and skilled (21.3%) workers (Figure 3.6). The high percentage of low and semi-skilled workers is linked to the agricultural sector.

Skill Levels Formal employment	Skill Level Contribution 2020 (%)	Average growth (%) 2016 - 2020	Number of jobs	
			2019	2020
Skilled	21.3	0.4	1 967	1 918
Semi-skilled	42.7	-0.7	4 051	3 851
Low-skilled	36.0	-1.4	3 468	3 252
TOTAL	**100.0**	**-0.7**	**9 486**	**9 021**

Source: SEP BWM 2021

Figure 3.6: Summary of skills levels for formal employment in the BWM

3.7 OVERVIEW OF STUDY AREA

3.7.1 Introduction

As The Karoo WEF 1 site is located in the BWM in the north-eastern part of the Western Cape Province (WCP) (Figure 3.7). The town of Beaufort West, located approximately 18 km south of the site, is the administrative seat of both the BWM and the CKDM. The BWM and CKDM are the largest (by area) and by least populated local and district municipalities in the Western Cape, respectively. More than half the BWM's population reside in Beaufort West. Beaufort West functions as regional services centre. Smaller settlements in the BWM include Murraysburg, Nelspoort and Merweville. Other settlements in the broader study area include the small towns of Loxton and Fraserburg both located in the Northern Cape Province, located 100 km west and 65 km north of the site, respectively. The nearest higher-order service centre is George, located approximately 195 km south of the site.

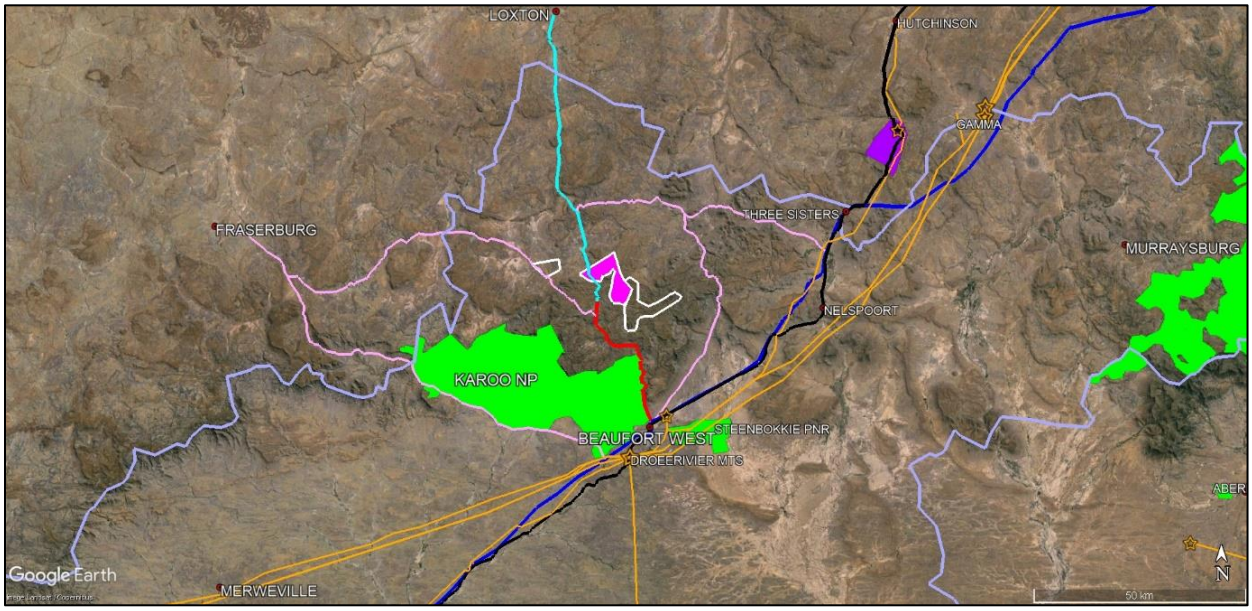


Figure 3.7: Karoo 2 WEF site (pink fill) and Karoo WEF 1-3 cluster sites (white outline) in relation to WCP boundary (grey outline), local settlements, protected areas (green fill), existing Eskom 132-765 kV lines (orange), railway line (black), operational Nobelsfontein WEF (purple fill), and key study area roads: N1 (dark blue), R381 tarred portion (red), R381 untarred portion (light blue), and other roads (light pink).

Beaufort West is located along the N1, roughly midway between Bloemfontein and Cape Town. The location provides opportunities to the local retail, overnight accommodation, logistics and engineering works sectors, amongst others. The Cape Town–De Aar railway line and existing Eskom transmission line corridors largely follow the N1 corridor in the vicinity of Beaufort West. Apart from a Sentech mast located on elevated terrain inside the Karoo National Park, no major vertical infrastructure is currently located in the study area. The nearest operational wind farm (Nobelsfontein) is located north of Three Sisters, approximately 80 km north-west of Beaufort West (See Figure 3.7).

Access to the Karoo 2 study area is off the R381 ('Loxton Road') (Photograph 3.1). The R381 intersects with the N1 just to the north of Beaufort West. Only the southernmost portion of

the R381 is tarred. A portion of the tarred portion is currently being resurfaced. The southernmost ~18 km of the R381 demarcates the eastern boundary of the Karoo National Park (KNP). This road portion witnesses the transition from the Central Karoo Plain onto the Great Escarpment and includes the scenic Molteno Pass. Portions of the KNP-adjacent road portion on the Escarpment closely follows the course of the Sak River in its upper reaches. Two park gates, Bulkraal and Mountain View are accessed off the R381 (Photograph 3.2). Bulkraal gate is only used by park management, and Mountain View is only accessible to the public on ranger-guided day trips. The Fraserburg gravel road intersects with the R381 approximately 2.3 km southwest of the Karoo 2 site. The road provides one of two links from Beaufort West to the small town of Fraserburg. The De Jagers Pass gravel road is located to the east of the site. It terminates in the north at a T-junction with a west-east aligned tar road which links the R381 to the N1 near Three Sisters.

Photograph 3.1: Intersection of the R381 and N1 just north of Beaufort West.

Photograph 3.2: Turnoff from the R381 to the KRNP's Mountain View gate via a private farm.

The study area is located on the southern fringe of the Great Escarpment north of the prominent Nuweveldberge (mountain range) north of Beaufort West (Photograph 3.3). The Nuweveld range demarcates the transition from the Central Karoo Plain in the south to the elevated Upper Karoo region in the north. The broader study area is arid to semi-arid. The Nuweveld range forms a major watershed. The north-flowing Sak River and the south-flowing Leeu and Gamka Rivers have their headwaters in the Nuweveld range. The study area terrain consists of successions of broad plains dotted with large koppies. The veld consists of mixed

karroid scrub (Karoo bossiesveld), grassveld on higher terrain, and riparian vegetation associated with stream courses and wetlands (Photograph 3.4).

Photograph 3.3: Looking west from the R381 near Molteno Pass, boundary of KNP in foreground.

Photograph 3.4: Bossiesveld and dam on Middle Kraal 98/RE (part of Karoo 2 site).

The broader BWM economy is strongly anchored in extensive livestock farming, primarily sheep, but also includes goat and cattle (Photograph 3.5). Carrying capacities are moderate, approximately 2.6-2.8 ha per sheep or goat.[18] Stock theft is not currently a significant issue in the immediate study area. This is linked to relative isolation and broken terrain. Security cameras have been installed at a number of points along the R381. The study area was once well known as a horse study area. However, commercial horse breeding is no longer considered viable due to the isolated location. Cropping activities are confined to the valleys of stream courses. Focus is on irrigated fodder crops, both commercially and for own use (Photograph 3.6). Game is located on a number of properties in the study area and several farms offer seasonal hunting opportunities but focus mainly on the local hunting market. In as far as could be established, no active trophy-hunting oriented operation is currently located within significant proximity to the Karoo 2 site.

[18] https://gis.elsenburg.com/apps/cfm/

Photograph 3.5: Cattle grazing in the valley of the Sak River along the R381.

Photograph 3.6: Irrigated fodder on Waterval 101/RE (part of Karoo 2 site).

Economic farming units are large and typically consisting of several properties. Some farmers also lease additional land. The study area settlement pattern is consequently sparse, and mainly concentrated on a few base farms, typically along stream courses. Base farms are inhabited by owners or farm managers. Limited employment opportunities are associated with extensive livestock farming. Labourers typically live on base properties, near the yard. Farmsteads and labourers' houses on some properties have become redundant and are no longer inhabited. Tourism in the broader study area is largely associated with travellers along the N1 and N12 corridors. In this regard Beaufort West is a recognised stop-over with several established accommodation facilities. There are also several rural accommodation facilities in the vicinity of the town that are located on working farms close to the N1. Additional tourism is associated with the 'Karoo farm breakaway-' and wilderness tourism markets. The Karoo sense of place – open spaces, remoteness, solitude, and starry skies – is typically marketed as the key anchoring attraction. The transition onto the escarpment provides scenic views of the surrounding area (Photograph 3.7). Receptors are consequently sensitive to visual

disturbances, including light pollution. At the same time, the edge of the escarpment provides significant screening to receptors located to the south of the site.

Photograph 3.7: Riverine Rabbit tourist accommodation on Farm 42 located approximately 10.6 km north-west of Karoo 2 site

Two proclaimed protected areas are located in the broader study area, namely the Karoo National Park (KRNP) located approximately 11.5 km to the south of the Karoo 2 site, and the Steenbokkie Private Nature Reserve approximately 30 km to its south-east (Figure 3.8). The KRNP is one of 19 parks administrated by SANParks (17 national and 2 trans-frontier). Information presented below is based on the 2017-2027 KRNP Park Management Plan and an interview with the KRNP park manager.

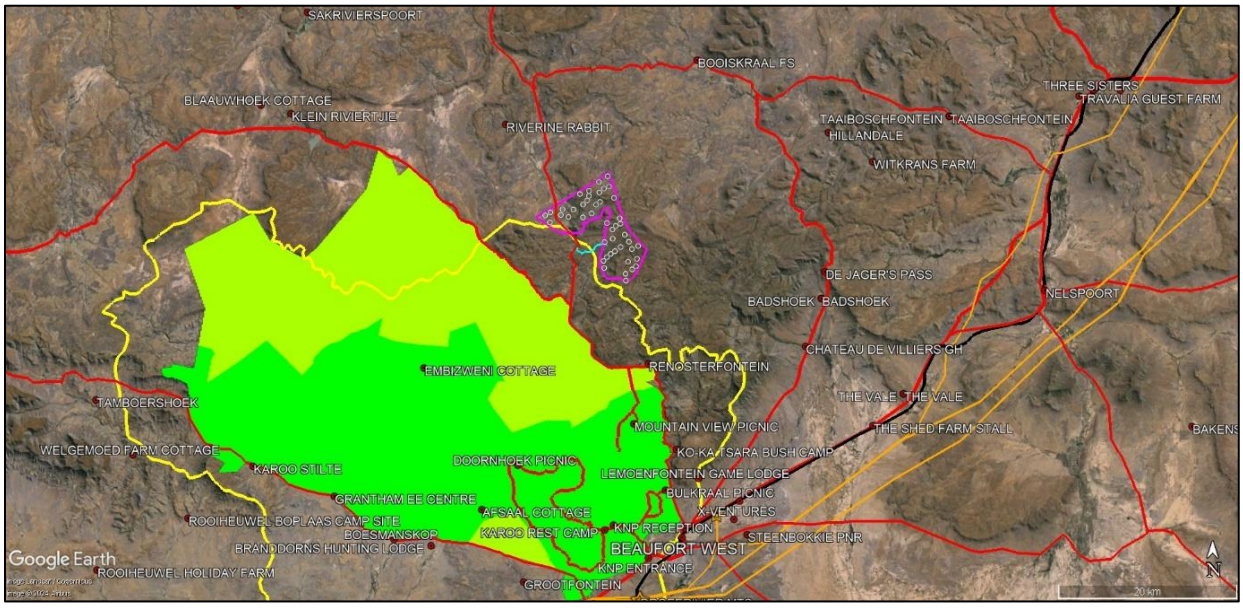


Figure 3.8: Karoo 2 WEF site (pink outline), proposed turbines (white circles) and preferred site access road (blue line) in relation to tourism receptors (labelled), protected natural areas (green fill), Karoo NP expansion area (light green fill), and

Karoo NP viewshed protection area (yellow outline). Also indicated are existing Eskom 132-765 kV lines (orange), key study area roads (red) and Beaufort West-De Aar railway line (black line) (Source: SANParks, 2017; Cape Farm Mapper)

The KNP was proclaimed in 1979 on a 7209-ha parcel of communal land donated by the BWM for the purpose of establishing a national park near the town. The park has since been considerably extended through land acquisitions by SANParks and contractual arrangements with private landowners (mainly conservation trusts). The KNP is currently around 93 000 ha in extent. The park is largely surrounded by farmland used primarily for commercial livestock farming. Apart from a Sentech mast, no major service industrial infrastructure is located in the park.

The KNP is located in the transition zone from the Central Karoo plain in the south into the Great Escarpment to the north. Most of the park is located on the plain. The extreme western, northern, and eastern portions of the park consist of the southern slopes of the Nuweveld Mountain range. Elevation in the park ranges from around 820 masl to 1 909 masl (Nuweveldberg). The steep gradients and different altitudes (and associated rainfall gradient) produce a structurally complex environment which provides many niches for animal and plant species. Most of the park falls in the Nama-Karoo biome. A small portion falls within the Grassland biome. Between these two biomes, 14 vegetation types are represented in the park. The park has a wide variety of endemic wildlife, including 58 mammal species, more than 200 bird species, and an especially rich reptilian suite which includes 18 snake- and 5 tortoise species.

Endemic large plains game species, lion and brown hyena have been reintroduced. Charismatic species include Cape Mountain zebra, black rhinoceros, and lion. The KNP is also rich in Karoo fossils. A wheelchair-accessible fossil trial is located near the park reception area. Heritage is largely associated with farming-era fabric, such including corbelled huts, stone kraals, and wolf (hyena) traps. The presence of pre-colonial burial sites and rock art in the park is strongly suspected but has not been confirmed. The KNP is classified by SANParks as a transit park. This is linked to the park's proximity to the N1 near Beaufort West. The park has only one tourist access gate, namely off the N1 (near the N1/N12 intersection). Main gate opening hours are 05h00 to 22h00. The park's road network is not very extensive. In 2017 it consisted of 30 km tarred roads, 143 km gravel roads, and 6 km 4x4 trails. Tarred roads are concentrated in the south-eastern portion of the park, near the park entrance (Photograph 3.8). Large parts of the park are currently inaccessible to normal sedan vehicles.

Photograph 3.8: Looking north from the park access road near the main gate

The KNP is not considered a key driver of tourism income generation by SANParks. By 2017 the park was not yet breaking even, but it was showing steady growth. Nevertheless, the park's potential to act as a regional socio-economic catalyst is recognized. Currently, most of the tourism income is generated by accommodation offered within the park and conservation fees charged for park access, while income from activities contribute far less. A day visit permit currently costs R70 per person. The park currently has around 32 000 visitors per year.Development inside the park is concentrated in a large loose cluster at Stolzhoek, located at the foot of the southern slopes of the Nuweveld range approximately 5.5 km north-west of the main gate. The cluster includes the only rest camp in the KNP, an interpretation centre, a day visitor centre with a pool and braai facilities, park reception and offices, and staff accommodation (Photograph 3.9). The Karoo rest camp offers 38 self-catering chalets and 24 camping and caravan sites. Occupancy throughout the year is above 60%. Other KNP accommodation facilities are limited to Afsaal Cottage in the south of the park, and Embizweni Cottage on more elevated terrain closer to the park's northern boundary. Embizweni is only accessible by 4x4. The Grantham Environmental Education Centre in the extreme south of the park (along the N1-Fraserburg/ Oukloof road) provides accommodation to visiting school groups of up to 50.

Photograph 3.9: KRNP reception area, administrative complex, and staff housing

The Mountain View rondawels and Mountain View hut in the extreme north-eastern portion of the park (accessed off the R381) are no longer used for accommodation. The Rondawels site is now only used as a picnic site on ranger-accompanied day trips. Other tourism facilities in the KNP consist of the Bulkraal and Doornhoek picnic sites, the former located near the R381 (Loxton Road), and the latter just to the south of the escarpment, approximately 16 km to the west of the R381. Both sites are only accessible via internal park roads from the park's main access gate. Bulkraal (which includes a pool) is popular with the local Beaufort West community for outings in summer.

Activities available within the park include scenic guided day and night game viewing drives, nature trails (Bossie-, rest camp- and Pointer trails and upgraded fossil trail) and a bird hide. The Pointer trail is a guided paid activity, available since November 2015. While the park's Karoo location, large size and relative seclusion from sources of light pollution makes it an ideal stargazing destination, guided stargazing is not currently offered as an activity.

None of the larger game suite in the KNP is unique to the park, and much of the vegetation is well-represented outside the park. The park's main unique attribute is its setting against

the backdrop of the Nuweveld Mountain range. The attractions include remoteness, quietness, and night skies associated with the Great Karoo. This wilderness quality is sensitive to visual disturbances. As indicated, most receptors inside the park are currently located south of the escarpment, concentrated in the south-eastern portion of the park, near the park entrance. All point receptors such as accommodation facilities and picnic sites, are located 16.1 km (and substantially further) from the nearest proposed turbines.

Table 3.1: Proposed infrastructure in relation to key KRNP receptors (distances in km).

RECEPTOR	ACCESS	TUR	SS	CON	COMMENT
KRNP declared boundary	n.a.	12.3	16.5	13.8	Mountain View accommodation not active. Mountain view park gate not publicly accessible. 13.5 km turbine setback from KRNP boundary applied by SANParks as planning guideline in past
KRNP Viewshed protection area	n.a.	<0.5	1.8	n.a.	
KRNP Expansion area	n.a.	5.4	6.9	n.a.	
KRNP Entrance	N1	31	35	34.2	
KRNP Reception	Internal	27.3	31	30	
KRNP Rest camp	Internal	27.9	31.5	30	
KRNP Afsaal cottage	Internal	29.8	32	30	
KRNP Embizweni cottage	Internal	21.1	24	21.4	
KRNP Bulkraal picnic	Internal	23.8	28	27.4	
KRNP Doornhoek picnic	Internal	23.7	26	25	
KRNP Mountain view rondawels	R381	16.1	20	19.3	

Public access to the park is exclusively off the N1 and would thus not be affected by project traffic. The Karoo 2 site does not include any land identified for park expansion. No infrastructure appears to be proposed within the KNP Viewshed Protection Area (VPA), although one turbine appears to be located <500 from the conceptual VPA boundary. A detailed boundary has not yet been defined by SANParks (Manuel, pers. comm).

In dealing with wind farm development proposals in proximity to the KNP in the past, SANParks applied a 'rule of thumb' 13.5 km turbine setback from the declared park boundary. Approximately 4 Karoo 2 turbines are proposed within 13.5 km of the KNP boundary, the nearest 12.3 km to the north of the KNP boundary. It should however be noted that the 13.5 km distance is intended as a rough guideline to inform initial planning and does not take into consideration differing turbine hub heights, topography, and relative location to key receptors. Visual modelling would be required to determine actual potential significant impacts on the basis of specific layout proposals (Manuel, pers. comm).

3.7.2 Site properties

The Karoo 2 site consists of 4 properties, namely Middle Kraal 98/RE, Waterval 101/RE, 101/1 and 101/3. Turbines are proposed on all four properties, affecting mainly the northern and western portions of the site. Site access is proposed directly off the R381, across 101/RE and 101/1. The same properties are also affected by the Preferred and Alternative construction phase sites. The operational phase site cluster is proposed on 101/1.

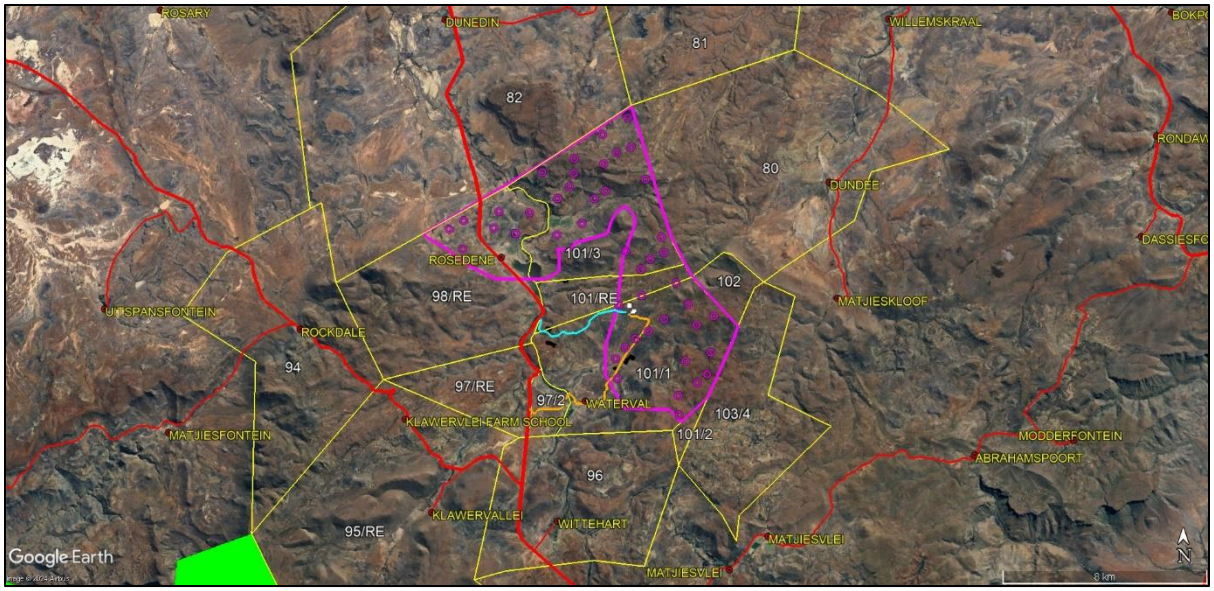


Figure 3.9: Karoo 2 WE F site (pink outline), study properties (yellow outlines), and residential- and tourism receptors in relation to proposed infrastructure: turbines (pink circles), site access road: preferred (light blue line) and alternative (orange), operational phase sites (white fill) and construction phase site clusters (black fill). Also indicated are the Karoo National Park (green fill) and study area roads (red).

The site properties and 6 of the 11 site-adjacent ones are owned by Mr Graeme Koster (Table 3.2). The properties form part of a larger livestock farming operation based on Middle Kraal 98/RE (Rosedene) (Photograph 3.10). Farm managers live on Witte Hart 96 and Klaverfontein 95/RE (Klawervallei) (Photograph 3.11). Farm labourers reside on 98/RE, 96 and 95/RE. A farm school is located on 95/RE, along the Fraserburg gravel road. The school caters for children from farms in the area and currently has around 60 learners. Learners are transported daily to and from school.

Table 3.2: Overview of directly affected and adjacent properties

PROPERTY[19]	OWNER	LAND USE	RES[20]	ACCESS	COMMENT
Dundee 80	DALRRD	Livestock	Dundee	De Jagers Pass	Part of 5 farms leased out to a group of emerging farmers (PLAS)
Spits Kop 81	Jack, Mr Andrew	Livestock	Spitskop	N1-R381 road	Part of adjacent Booiskraal farm
Bastaards Kraal 94	Koster, Mr Graeme	Livestock	Rockdale (ruin)	Fraserburg rd	Operation based on 98/RE; Farm school on 95/RE; Bastaards Kraal 94 part of proposed of Karoo 3
Klaverfontein 95/RE			Klawervallei	Fraserburg rd	
Witte Hart 96			Witte Hart	R381	
Waterfall 97/RE			n.a.	R381	
Waterfall 97/2			n.a.	R381	
Middle Kraal 98/RE			Rosedene	R381	
Waterval 101/RE			n.a.	R381	
Waterval 101/1			Waterval	R381	

[19] Shading indicates Karoo 2 site properties.
[20] Shading indicates permanently inhabited dwellings.

			(uninhabited)		
Waterval 101/2			n.a.	R381	
Waterval 101/3			n.a.	R381	
Annex Waterval 102	Minnaar, Mr Gerald	Game capture and relocation; Livestock; Commercial fodder	n.a.	R381	No tourism or hunting associated with game operation; Both properties part of proposed Karoo 1
Matjes Valie 103/2/RE			n.a.	R381	
Quagga Fontein 82	Moolman, Mr Johan	Livestock; Eco-tourism	Dunedin	R381	Base farm of operation which includes adjacent Farm 42; Riverine Rabbit accommodation and hunting based on Farm 42

Photograph 3.10: Rosedene yard (Middle Kraal 98/RE), seen from the R381.

Photograph 3.11: Klawervallei farmyard on Klaverfontein 95/RE.

The proposed infrastructure footprints would affect land used for extensive grazing. The total loss in grazing to the larger operation is relatively small, and unlikely to result in significant impacts on the operation. No concerns were raised by the relevant owner about loss of productive land or impacts on farming activities.

The remaining 5 site-adjacent properties (not part of Mr Koster's operation) are owned by 4 landowners, namely the Department of Agriculture, Land Reform and Rural Development DALRRD (Dundee 80), Mr Andrew Jack (Spitskop 81), Gerald Minnaar (Annex Waterval 102, Matjies Valie 103/RE), and Johan Moolman (Quagga Fontein 82). Dundee 80 forms part of a

group of 5 contiguous properties leased out to a small group of emerging farmers in terms of the Proactive Land Acquisition Strategy (PLAS). The remaining 3 landowners are based in the immediate study area, either on site-adjacent (Quagga Fontein 82) or near-adjacent properties. All study properties are primarily used for raising livestock. Game capture and translocation operations are associated with Mr Minnaar's operation but includes no hunting or tourism components. Seasonal hunting associated with Mr Moolman's operation appears to be confined to non-site adjacent Farm 42.

Tourist accommodation facilities are associated with the non-site portions of both Mr Moolman's (Riverine Rabbit, Farm 42) and Mr Jack's (Booiskraal) properties. Riverine Rabbit focuses on dedicated visitors and is popular with naturalists. Guests are taken on guided fossil, bird, and mammal excursions on the larger estate (which includes site-adjacent Quagga Fontein 82). Star-gazing excursions are offered on request. Accommodation is provided in a converted farmhouse on Farm 42. A camping site is envisaged on the same property. The farmhouse sleeps 10-12 people. Current occupancy is 2-3 bookings per month for typically 3–4-day stays. In winter the facility also accommodates groups of hunters hunting on Farm 42. The operation provides 3 employment opportunities (Moolman, Johan and Marietha, pers. comm). A key lookout point is located on Tandjiesberg in the south-eastern part of Quagga Fontein 82 (Photograph 3.12).

Photograph 3.12: Tandjiesberg (in distance), largely located on Quagga Fontein 82, seen from the north-west (access road to Riverine Rabbit)

The study area is sparsely populated. Many properties are large. Of the 15 study properties only 5-6 are permanently inhabited, namely Dundee 80, Spits Kop 81 (unclear), Klaverfontein 95/RE (Klawervallei), Witte Hart 96, Middle Kraal 98/RE (Rosedene) and Quagga Fontein 82 (Dunedin). Turbines are proposed within immediate proximity (~5 km) of only one residential receptor, Rosedene yard on the Karoo 2 site property Middle Kraal 98/RE (1.1 km), and moderate proximity (6-8 km) to other residential receptors. The proposed turbine locations near Rosedene yard are deemed acceptable by the owner (Koster, pers. comm). The proposed access road, substation and construction phase terrains are confined to uninhabited site properties and are not in significant proximity (>2.6 km of all) to any residential or tourism receptors (Table 3.3).

Table 3.3: Proposed infrastructure in relation to key KRNP receptors (distances in km).

PROPERTY[21]	RECEPTOR	ACCESS	RECEPTOR km[22]		COMMENT
			Turbines	Other	
Badshoek	Guest Farm	De Jagers Pass	21	24	
Booiskraal	Guest Farm	N1-R381 link	16.4	22.6	
Château de Villiers	Guest Farm	De Jagers Pass road	20.6	23.6	
De Jagers Pass	Guest Farm	De Jagers Pass	21	24.1	
Dundee 80	Dundee	De Jagers Pass road	6.9	9.2	
Farm 437	Highlands [yard]	R381	13.8	16.6	Potentially used for trophy hunting
Hillandale Guest Farm	Guest Farm	N1-R381	26	27.2	
Klaverfontein 95/RE	Klawervallei	Fraserburg rd	8	8.9	
	Farm school		6.9	6.3	
Ko-Ka Tsara Bush Camp	Guest Farm	R381	19.2	21.7	
Lemoenfontein Game Lodge	Guest Farm	N1	23.2	25.8	
Middle Kraal 98/RE	Rosedene	R381	1.1	2.6	
Matjes Valie 103/1	Renosterfontein Guest Farm	R381	9.5	12	In process of being revived and expanded
Quagga Fontein 82	Dunedin	R381	7	11.3	Moolman estate adjacent to proposed Karoo 2 to S and Redcap WEF projects to W and N
	Boundary		0.3	4.3	
	Tandjiesberg lookout		3.2	7.3	
Farm 42	Riverine Rabbit		10.9	15	
	Visserskop lookout		10.7	15	
Spits Kop 81	Spits Kop	R381	6	12.7	Permanent inhabitation unclear
Witte Hart 96	Witte Hart	R381	6	6.3	

The nearest tourist accommodation facilities to proposed turbines are associated with Renosterfontein 9.5 km to the south, and Riverine Rabbit 10.9 km to the northwest. All other accommodation receptors are located >16 km from proposed turbines. The facility on Renosterfontein is largely screened from the development area by a large hill, and unlikely to be affected. Riverine Rabbit is located in the Sak River Valley, and similarly shielded by topography and distance. However, the wilderness quality of the larger estate would potentially be affected. Key concerns were raised about the turbines proposed near the southern boundary of Quagga Fontein 82 (<300 m) and a scenic lookout point on Tandjiesberg (3.2 km). Mr Moolman has proposed a significant setback of turbines from his boundary. A further concern relates to the cumulative erosion of sense of place. The Moolman estate currently borders onto proposed WEF developments to the south (Karoo 2), west (Karoo 3, Redcap Hoogland 4), and north (Redcap Nuweveld) (Moolman, pers. comm).

Apart from public roads, no major infrastructure is currently located on any of the 15 study properties. The Karoo 1 and 3 WEFs are currently proposed (separate applications) adjacent to the east and west of the Karoo 2 site, respectively. Apart from Dundee 80, all study properties are primarily (or exclusively) accessed off the R381, or additionally, the Fraserburg

[21] Shading indicates site- or site-adjacent property.
[22] Shading highlights turbines proposed within 5 km or other infrastructure within 2 km of a receptor.

gravel road off the R381. Four tourism receptors – Riverine Rabbit, Renosterfontein, Highlands (potential), and Ko-Ka Tsara Bush Camp are accessed off the R381, and sensitive to disrupted access. Several interviewees have indicated concerns about potential impacts on use of the R381 during (and potentially preceding) the construction phase.

3.7.3 Other renewable energy facilities

The Karoo WEF 2 site is located in the extreme north-western portion of the Beaufort West Renewable Energy Development Zone (REDZ). The DFF&E's Renewable Energy Applications website indicates a near-continuous band of REF (and related) applications stretching from the provincial boundary to south of Beaufort West over a linear distance of approximately 110 km (Figure 3.10). The nearest operational REF, the Nobelsfontein 1 WEF, is located approximately 54 km north-east of the site.

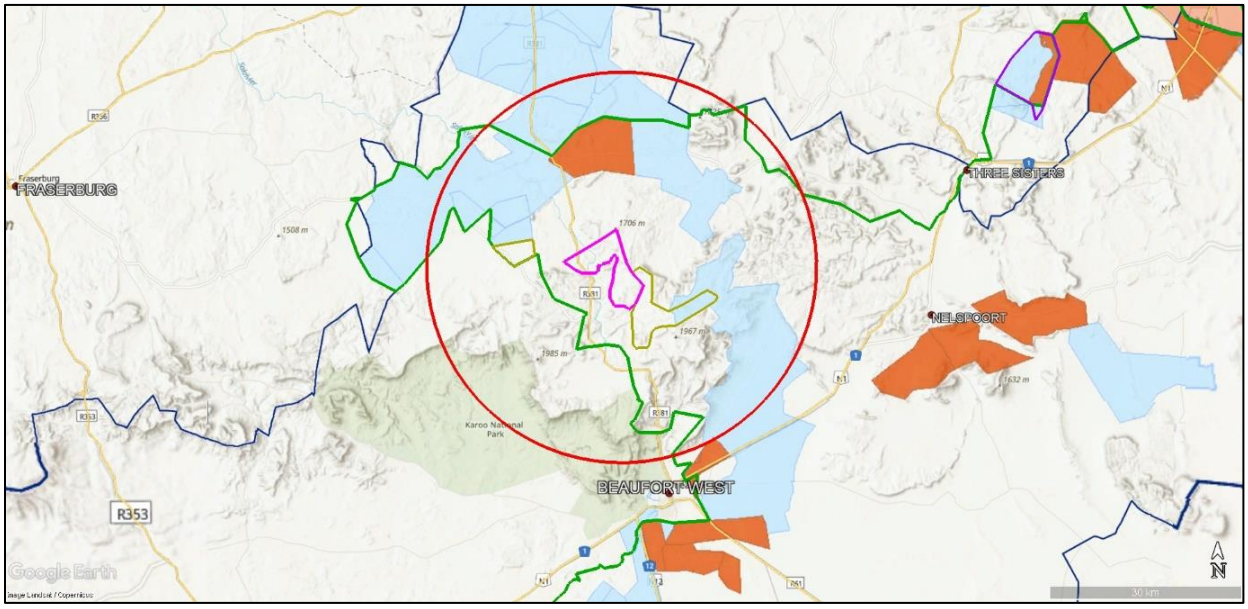


Figure 3.10: Karoo 2 WEF site (pink outline) in relation to Beaufort West REDZ (green outline), and historic REF applications within a 30 km radius of the approximate centre of the site (red circle. Light blue fill indicates WEF-related applications, orange fill SEF ones. Also indicated are the concurrently proposed Karoo 2-3 WEF sites (khaki outlines), and the operational Nobelsfontein WEF (purple outline) (Source: DFF&E[23]).

Historic applications within 30 km of the site are locate to the north-west, north, east and south-east. These include Redcap's Hoogland WEF 3&4 to the north-west of the site, and Redcap's overlapping Hoogland WEF and Mura PV clusters to the north of the site – in total Redcap is proposing (2022-3) 7 WEFs and 4 PV SEFs. The blue band indicated to the east of the Karoo 2 site is associated with a 400 kV line. The Karoo 1-3 cluster is not yet reflected. All three Karoo WEF projects will make use of the R381. Access to the Redcap projects also likely to impact on the road, making it a total of potentially 14 projects impacting on the road.

[23] https://egis.environment.gov.za/renewable_energy

SECTION 4: ASSESSMENT OF KEY SOCIAL ISSUES

4.1 INTRODUCTION

Section 4 provides an assessment of the key social issues identified during the study. The identification of key issues was based on:

- Review of project related information, including other specialist studies.
- Site visit and interviews with key interested and affected parties.
- Experience/ familiarity of the author with the area and local conditions.
- Experience with similar projects.

The assessment section is divided into the following sections:

- Assessment of compatibility with relevant policy and planning context ("planning fit".
- Assessment of social issues associated with the construction phase.
- Assessment of social issues associated with the operational phase.
- Assessment of social issues associated with the decommissioning phase.
- Assessment of the "no development" alternative.
- Assessment of cumulative impacts.

4.2 ASSESSMENT OF POLICY AND PLANNING FIT

The development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The BWM SDF and IDP also support the development of renewable energy and the site is located within the Beaufort West REDZ. The development of the proposed WEF is therefore supported by key policy and planning documents.

4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

Potential positive impacts

- Creation of employment and business opportunities.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities.
- Impacts related to the potential influx of jobseekers.
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
- Increased risk of grass fires associated with construction related activities.
- Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles.
- Impact on productive farmland.

4.3.1 Creation of local employment and business opportunities

The construction phase will extend over a period of approximately 18 months and create in the region of 250 employment opportunities. Approximately 55% of the jobs will benefit low-skilled workers, 30% semi-skilled and 15% high skilled. Members from the local communities in the area, specifically Beaufort West, may be in a position to qualify for some of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. However, due to the low education and skills levels in the area the availability of suitably qualified workers in Beaufort West may be limited. The implementation of a training and skills development programme prior to the commencement of construction would increase the potential to employ local community members.

The total wage bill will be in the region of R 60 million (2024 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in Beaufort West. The capital expenditure associated with the construction phase will be approximately R 6.8 billion (2024 Rand value). Due the lack of diversification in the local economy, the potential for local companies is likely to be limited. The majority of benefits are therefore likely to accrue to contractors and engineering companies based outside the BWM. Implementing the enhancement measures listed below can create potential opportunities for potentially qualified local companies.

The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site. The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (December 2021). The study found that to date, a total of 63 291 job years[24] have been created for South African citizens, of which 48 110 job years were in construction and 15 182 in operations. By the end of December 2021, 85 projects had successfully completed construction and moved into operation. These projects created 44 172 job years of employment, compared to the anticipated 30 488. This was 45% more than planned.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. For active projects, the expectation for local community participation was 13 284 job years. To date 25 272 job years have been realised (i.e. 90% more than initially planned), with 23 projects still in, or entering, construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 74%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 81%, 44% and 48% of total job opportunities created by IPPs to date. However, woman and disabled people

[24] The equivalent of a full-time employment opportunity for one person for one year.

could still be significantly empowered as they represent a mere 10% and 0.4% of total jobs created to date, respectively. Nonetheless, the fact that the REIPPPP has raised employment opportunities for black South African citizens and local communities beyond planned targets, indicates the importance of the programme to employment equity and the drive towards more equal societies.

The share of black citizens employed during construction (81%) and the early stages of operations (85%) has significantly exceeded the 50% target and the 30% minimum threshold. Likewise, the share of skilled black citizens (as a percentage of skilled employees) for both construction (71%) and operations (82%) has also exceeded the 30% target and minimum threshold of 18%. The share of local community members as a share of SA-based employees was 48% and 70% for construction and operations respectively – exceeding the minimum threshold of 12% and the target of 20%.

Table 4.1: Impact assessment of employment and business creation opportunities during the construction phase

Nature: Creation of employment and business opportunities during the construction phase		
	Without Enhancement	**With Enhancement**
Extent	Local – Regional (2)	Local – Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Highly probable (4)
Significance	Medium (30)	Medium (44)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	

Enhancement Measures:
Employment

- Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase.
- Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
- Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
- Before the construction phase commences the proponent should meet with representatives from the BWM to establish the existence of a skills database for the area. If such a database exists, it should be made available to the contractors appointed for the construction phase.
- The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
- Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business • The proponent should liaise with the BWM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work. Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.
Residual impacts: Improved pool of skills and experience in the local area.

Assessment of No-Go option
There is no impact, as the current status quo will be maintained.

4.3.2 Impact of construction workers on local communities

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of girlfriends and/or wives to construction workers.
- An increase in teenage and unwanted pregnancies.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.

Workers are likely to be accommodated in Beaufort West. As indicated above, the objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. However, as indicated above, the availability of suitably qualified workers in Beaufort West is likely to be limited. There is therefore likely to be a need to use construction workers from outside the area. Accommodating these workers in Beaufort West will pose a potential risk to the local community.

While the risks associated with construction workers at a community level are likely to be low with mitigation, at an individual and family level they may be significant, especially in the case of contracting a sexually transmitted disease or an unplanned pregnancy. However, given the nature of construction projects, it is not possible to totally avoid these potential impacts at an individual or family level.

Table 4.2: Assessment of impact of the presence of construction workers in the area on local communities

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Low (21)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	

Recommended enhancement measures:

- The proponent, in consultation with the BWM should investigate the option of establishing a Monitoring Committee (MC) to monitor and identify potential problems that may arise during the construction phase.
- Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase.
- Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase.
- The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report and resolve incidents.
- Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories.
- The proponent and contractor should develop a Code of Conduct (CoC) for construction workers. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation. The CoC should be signed by the proponent and the contractors before the contractors move onto site. The CoC should form part of the CHSSP.
- The proponent and the contractor should implement an HIV/AIDS and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP.
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.
- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end.
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Residual impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Also, in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.

Assessment of No-Go option
There is no impact as the current status quo would be maintained.

4.3.3 Influx of job seekers

Large construction projects have the potential to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become "economically stranded" in the area or decide to stay on irrespective of finding a job or not. While the proposed project on its own does not constitute a large construction project, the establishment of a number of renewable energy projects in the area may attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include:

- Impacts on existing social networks and community structures.
- Competition for housing, specifically low-cost housing.
- Competition for scarce jobs.
- Increase in incidences of crime.

These issues are similar to the concerns associated with the presence of construction workers and are discussed in Section 4.3.2. The findings of the SIA indicate that the potential for economically motivated in-migration and subsequent labour stranding is likely to be negligible. This is due to the isolated location of the area and the limited economic and employment opportunities in the Beaufort West. The risks associated with the influx of job seekers associated with the project are therefore likely to be low.

Table 4.3: Assessment of impact of job seekers on local communities

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (15)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS

Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Recommended mitigation measures: It is impossible to stop people from coming to the area in search of employment. However, as indicated above, the proponent should ensure that the employment criteria favour residents from the area. In addition: • Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. • Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. • The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities. • The proponent should implement a policy that no employment will be available at the gate. • The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end.		
Residual impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Also, in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.		

Assessment of No-Go option
There is no impact as the current status quo would be maintained.

4.3.4 Risk to safety, livestock and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of farm workers on the site. Based on interviews with local landowner's stock theft and safety are currently not a regarded as a key issue. This is linked to relative isolation and broken terrain. Security cameras have also been installed along the R381. However, the presence of construction workers and increase movement of construction related traffic would increase exposure to the area and increase the risk of stock theft.

The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on and off the site workers during the construction phase. Mitigation measures to address these risks are outlined below.

Table 4.4: Assessment of risk to safety, livestock, and damage to farm infrastructure

Nature: Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site		
	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.	Yes, compensation paid for stock losses and damage to farm infrastructure etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes
Recommended mitigation measures: • The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. • The developer(s) and local farming community should co-ordinate (and if necessary, upgrade) security arrangements, such as establishment of security cameras at strategic locations. • All farm gates must be closed after passing through. • Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. • The proponent should consider the option of establishing a MC (see above) that includes local farmers and develop a Code of Conduct for construction workers. The MC should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before construction activities commence. • The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). • The Environmental Management Programme (EMPr) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. • Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. • Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation. • It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.		
Residual impacts: No**,** provided losses are compensated.		

Assessment of No-Go option
There is no impact as the current status quo would be maintained.

4.3.5 Nuisance impacts associated with construction activities

The Construction related activities, including the movement of heavy construction vehicles of and on the site, has the potential to create dust, noise and safety impacts and damage roads. The impacts will be largely local and can be effectively mitigated. The number of potentially sensitive social receptors, such as farmsteads, will also be low due to the sparse settlement patterns and small number of farmsteads in the area.

Table 4.5: **Assessment of the impacts associated with construction related activities**

Nature: Potential noise, dust and safety impacts associated with construction related activities		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (2)	Short Term (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Low (15)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Recommended mitigation measures • The movement of construction vehicles on the site should be confined to agreed access road/s. • Establishment of a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. • The movement of heavy vehicles associated with the construction phase should be timed to avoid times and days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher. • Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.		
Residual impacts If damage to local farm roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.3.6 Increased risk of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. Livestock farming is the primary economic activity, and any loss of grazing would impact on farming activities. The potential risk of grass fires will be higher during the dry, windy winter months from May to October.

Table 4.6: Assessment of impact of increased risk of grass fires

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
	Without Mitigation	**With Mitigation**
Extent	Local (4)	Local (2)
Duration	Short term (2)	short term (2)
Magnitude	Moderate due to reliance on agriculture for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Recommended mitigation measures • The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. • Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. • Smoking on site should be confined to designated areas. • Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high-risk dry, windy winter months. • Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle. • Contractor should provide fire-fighting training to selected construction staff. • No construction staff, with the exception of security staff, to be accommodated on site overnight. • As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors should compensate farmers for damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.		
Residual impacts: No, provided losses are compensated for.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.3.7 Impacts associated with loss of farmland

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for crops and grazing. However, experience from other WEFs is that impact on farming operations can be effectively minimised and mitigated by careful planning in the final layout of the proposed WEF and associated components. The impact on farmland associated with the construction phase can also be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

The timing / phasing on construction activities should where possible also be planned to avoid and or minimise disruption to farming operations. Affected landowners should be involved in planning of timing of construction activities.

Table 4.7: Assessment of impact on farmland due to construction related activities

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the project etc. will damage farmlands and result in a loss of farmlands for grazing.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Highly Probable (4)
Significance	Medium (36)	Low (20)
Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated	Yes, disturbed areas can be rehabilitated
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Recommended mitigation measures The potential impacts associated with damage to, and loss of farmland can be effectively mitigated. The aspects that should be covered include: • An Environmental Control Officer (ECO) should be appointed to monitor the construction phase. • Existing internal roads should be used where possible. In the event that new roads are required, these roads should be rehabilitated on completion of the construction phase. • The footprint associated with the construction related activities (access roads, construction camps, workshop etc.) should be minimised. • All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase.		

• The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMPr. • The implementation of the Rehabilitation Programme should be monitored by the ECO.
Residual impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.4 OPERATIONAL PHASE SOCIAL IMPACTS

The following key social issues are of relevance to the operational phase:

Potential positive impacts
- The establishment of infrastructure to improve energy security and support renewable sector.
- Creation of employment opportunities.
- Benefits to the affected landowners.
- Benefits associated with the socio-economic contributions to community development.

Potential negative impacts
- Visual impacts and associated impacts on sense of place.
- Impact on property values.
- Impact on tourism.

4.4.1 Improve energy security and support the renewable energy sector

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed WEF also reduces the carbon footprint associated with energy generation. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP.

Improved energy security
South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. Load shedding in the first six months of 2015 was estimated to have cost South African businesses R13.72 billion in lost revenue with an additional R716 million was spent by businesses on backup generators[25].

Energy expert, Chris Yelland, has estimated the cost of Stage 1 load shedding resulting in 10 hours of blackouts per day for 20 days a month results in losses of R20 billion per month. Based on this Stage 2 load shedding costs the economy R40 billion per month and Stage 3 is estimated to cost the South African economy R80 billion per month[26].

[25] Goldberg, Ariel (9 November 2015). "The economic impact of load shedding: The case of South African retailers" (PDF). Gordon Institute of Business Science. p. 109
[26] The economic consequences of load shedding in South Africa and - Generator King (genking.co.za)

A survey of 3 984 small business owners found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period[27].

Impact of a coal powered economy
The Green Jobs study (2011) notes that South Africa has one of the most carbon-intensive economies in the world, thus making the greening of the electricity mix a national imperative. The study notes that renewable energy provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa renewable energy is not as dependent on water compared to the massive water requirements of conventional power stations, has a limited footprint and therefore does not impact on large tracts of land, poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.

The Greenpeace Report (powering the future: Renewable Energy Roll-out in South Africa, 2013), also notes that within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. These include acid mine drainage from abandoned mines in South Africa and the risk this poses on the country's limited water resources.

Benefits associated with REIPPPP
Through the competitive bidding process, the IPPPP has effectively leveraged rapid, global technology developments and price trends, buying clean energy at lower and lower rates with every bid cycle, resulting in SA getting the benefit of renewable energy at some of the lowest tariffs in the world. The price for wind power has dropped by 50% to R0.94/kWh, while solar PV has dropped with 75% to R1.14/kWh between BW1 and BW4.

Prices contracted under the REIPPPP for all technologies are well below the published REFIT prices. The REIPPPP has effectively translated policy and planning into delivery of clean energy at very competitive prices. As such it is contributing to the national aspirations of secure, affordable energy, lower carbon intensity and a transformed 'green' economy.

Table 4.8: Improve energy security and support renewable sector

Nature: Development of infrastructure to improve energy security and support the renewable sector		
	Without Enhancement	**With Enhancement**
Extent	Local, Regional and National (4)	Local, Regional and National (5)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Definite (5)
Significance	High (64)	High (85)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	Reduced CO_2 emissions and impact on climate change

[27] "How does load shedding affect small business in SA?". *The Yoco Small Business Pulse (3: Q1 2019): 3*

Can impact be mitigated?	Yes
Recommended mitigation measures The proponent should: • Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members. • Maximise opportunities for local content, procurement, and community shareholding.	
Residual impacts: Overall reduction in CO_2 emission, reduction in water consumption for energy generation, contribution to establishing an economically viable commercial renewables generation sector in the Northern Cape and South Africa.	

Assessment of No-Go option
The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy.

4.4.2 Creation of employment and business opportunities

The proposed development will create ~ 15-20 full-time employment opportunities during the operational phase. Based on similar projects the annual operating budget will be in the region of R 24 million (2024 Rand values), including wages.

Table 4.9: Assessment of employment and business creation opportunities

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Enhancement	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Low (28)	Medium (40)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement Measures: ***Employment*** • Where reasonable and practical, the proponent should implement a 'locals first' policy, especially for semi and low-skilled job categories. • Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. • Where feasible, training and skills development programmes for locals should be initiated as part of the operational phase. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. ***Business***		

• The proponent should liaise with the BWM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers for the operational phase. Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the operational phase.
Residual impacts: Creation of permanent employment and skills development opportunities for members from the local community and creation of additional business and economic opportunities in the area

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.4.3 Generate income for affected landowners

The proponent will be required to either purchase the land or enter into a rental agreement with the affected landowners for the use of the land for the establishment of the proposed WEF. Farming operations are impacted by droughts and market fluctuations. Any additional source of income therefore represents a benefit for the affected landowner(s). The additional income would assist to reduce the risks to their livelihoods posed by droughts and fluctuating market prices for outputs and farming inputs, such as fuel, feed etc. The additional income would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy. Given the low carrying capacity of the veld, the additional income represents a significant benefit for the affected landowners.

Table 4.10: Assessment of benefits associated with income generated for the affected landowners

Nature: The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc.		
	Without Enhancement	**With Enhancement**
Extent	Local (1)	Local (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Low (27)	High (65)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	
Recommended enhancement measures Implement agreements with affected landowners.		
Residual impacts: Support for local agricultural sector and farming		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.4.4 Benefits associated with the socio-economic development contributions

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs.
- Education.
- Support for and provision of basic services.
- School feeding schemes.
- Training and skills development.
- Support for SMME's.

The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20-year project operational life. For the current portfolio of projects, the average commitment level is 2.2%, which is 125% higher than the minimum threshold level. To date (across seven bid windows) a total contribution of R23.1 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.2 billion. Of the total commitment, R18.8 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

SED contributions do therefore create opportunities for local rural communities. However, SED contributions can also be mismanaged. This is an issue that will need to be addressed when managing SED investments.

Table 4.11: Assessment of benefits associated with socio-economic development contributions

Nature: Benefits associated with support for local community's form SED contributions		
	Without Enhancement	**With Enhancement[28]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Medium (30)	High (65)
Status	Positive	Positive
Reversibility	Yes	Yes

[28] Enhancement assumes effective management of SED contributions.

Can impact be enhanced?	Yes
Recommended enhancement measures To maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented: • The proponents should liaise with the BWM to identify projects that can be supported by SED contributions. • Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. • Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.	
Residual impacts: Promotion of social and economic development and improvement in the overall well-being of the community	

Assessment of No-Go option
There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the supporting the social and economic development in the area would be lost. This would also represent a negative impact.

4.4.5 Visual impact and impact on sense of place

The proposed WEF will impact on the areas existing rural sense of place. Based on the available information there are several nature reserves and tourist facilities in the area. The attraction of these areas is likely to be linked to the rural character of the area, including the views and vistas. The BWM SDF and IDP highlight the value and importance of the scenic character of the Karoo. Access to the study area also includes two passes that are identified in the BWM SDF as scenic passes, namely the Molento and Roseberg Pass. The Karoo National Park is also identified as a Cultural Landscape.

The 2017-2027 Karoo National Park (KNP) Park Management Plan (PMP) identifies the unique Nama-Karoo vistas (land, night, and soundscapes) as one of the KNPs key attributes and notes that the KNP's most outstanding feature is its scenic value. The potential threats to the parks visual/ sense of place amenity include Renewable Energy Facility (REF) development within the park buffer zone. The buffer zone is divided into three (mapped) categories: priority natural areas, catchment protection areas, and viewshed protection areas. The Karoo WEF 2 site falls outside the viewshed protection area (Figure 3.8).

In terms of future growth, the PMP notes expansion and consolidation of the KNP remains a national priority for SANParks. Two expansion areas have been identified, a small one adjacent to the south of the park, and a large consolidated ('broad brush') area to its north. The Karoo WEF 2 site is not located within an expansion area (Figure 3.1).

At a site-specific level, the owner of the affected property indicated that the proposed layout was acceptable, including turbines proposed near (1.1 km north of) Rosedene yard on Middle Kraal 98/RE (Koster, pers. comm). The key viewsheds on the yard are to the west and south.

The owner of Quagga Fontein 82 (Mr Moolman) raised concerns about the potential visual and sense of place impacts on the owners' enjoyment of their property and the Riverine Rabbit eco-tourism operation on Quagga Fontein 82 and adjacent Farm 42. The night skies are considered a key attribute of the sense of place. The larger property is used for game drives and hikes. The Riverine Rabbit accommodation facility is located in the valley of the Sak River

and is screened by the natural topography. The facility is also located ~ 11km from the nearest proposed turbine. Mr Moolman has however raised concerns with regard to the proximity of turbines to his southern boundary (~300 m), and especially those in proximity (3.2 km) to a lookout point on Tandjiesberg. Mr Moolman has proposed that the turbines in this area be set back to the south (Moolman, pers. comm). Mr Moolman also raised concerns regarding the cumulative impact on the areas sense of place associated with other WEF developments. Mr Moolman's property borders onto proposed WEF developments to the south (Karoo 2), west (Karoo 3, Redcap Hoogland 4), and north (Redcap Nuweveld) (Moolman, pers. comm).

The owner of Farm 437 indicated that he is opposed to any WEF development in the area (Ihlenfeldt, pers. comm). None of the other adjacent owners raised concerns about turbine locations.

The findings of the Visual Impact Assessment (VIA) (Logis 2024) are summarized below.

Potential visual impact on sensitive visual receptors (residents and visitors) located within a 5km radius of the wind turbine structures
The operation of the Karoo Wind Power Phase 2 Facility is expected to have a **very high** visual impact on observers/visitors residing at homesteads within a 5km radius of the wind turbine structures. Refer to Section 6.7 for a full list. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 5km radius of the wind turbine structures
The operation of the Karoo Wind Power Phase 2 Facility is expected to have a **high** visual impact on observers traveling along the R381 within a 5km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on sensitive visual receptors (residents of homesteads/ tourist accommodation) within a 5 – 10km radius of the proposed WEF
The Karoo Wind Power Phase 2 Facility could have a **very high** visual impact on residents of (or visitors to) homesteads within a 5 - 10km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 5-10 km radius of the wind turbine structures
The Karoo Wind Power Phase 2 Facility could have a **high** visual impact on observers travelling along the R381 within a 5 - 10km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on sensitive visual receptors (residents of and visitors to homesteads) within 10 – 20km radius of the proposed wind turbine structures
The Karoo Wind Power Phase 2 Facility could have a **moderate** visual impact on residents of (or visitors to) homesteads within a 10 - 20km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on sensitive visual receptors (observers travelling along roads) located within a 10-20 km radius of the wind turbine structures
The Karoo Wind Power Phase 2 Facility could have a **moderate** visual impact on observers travelling along roads within a 10 - 20km radius of the wind turbine structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Potential visual impact on formally protected areas within 10-20 km from the proposed wind turbines
The Karoo Wind Power Phase 2 Facility could have a **low** visual impact on visitors/ tourists to the Karoo National Park (formally protected area) located within a 10 - 20km radius of the wind turbine structures. However, it must be noted that only a small portion above the escarpment will be visually impacted upon. This area has no game drive routes/ general access to tourists. This reduces the probability of this impact occurring. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Shadow flicker
The significance of shadow flicker is anticipated to be **moderate.**

Nighttime lighting impacts
This anticipated lighting impact on residents of homesteads and visitors is likely to be of **very high** significance and may be mitigated to **high** (rating = 64) especially within 0-5km and potentially up to 10km radius of the wind turbine structures. Similarly, lighting impacts on observers travelling along roads is anticipated to be of **high** significance which may be mitigated to **moderate**.

The potential impact on the sense of place of the region
The significance of the visual impacts on the sense of place within the region (i.e. beyond a 20km radius of the development and within the greater region) is expected to be of **very high** significance. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

Conclusion
The VIA notes that the approach adopts a risk averse approach that assumes that the perception of most (if not all) of the sensitive visual receptors (bar the landowners of the properties earmarked for the development), would be predominantly negative towards the development of a WEF in the region. However, the VIA also notes that others may not be opposed to the WEF or have negative perceptions about the potential visual impacts.

The overall significance of the visual impacts associated with the proposed Karoo Wind Power Phase 2 Facility is rated to be **very high to low**. The cumulative visual impact of the proposed Karoo Wind Power Phase 3 facility, together with the other authorised WEFs within a 30 km radius (refer to Section 6.2) is also expected to be **very high**. However, this considered to be within acceptable limits owing to its location within the Beaufort West REDZ.

However, despite certain residual ratings being very high to high and the likelihood that the proposed development may be met with concern and objections from some of the affected sensitive receptors and landowners in the region, the VIA notes that the visual impacts are not considered to be fatal flaws for a development of this nature. The VIA therefore recommends that the proposed Karoo Wind Power Phase 3 Facility be supported from a visual

perspective should all the best practice mitigation measures, as provided in this report are implemented and adhered to.

The VIA lists the following recommendations for the proposed Karoo Wind Power Phase 2 Facility:

- All turbines listed above that are located on mountains and tall hills (areas of high sensitivity) should be investigated and relocated if possible.
- Turbine WTG 35 is located on steep slope and the laydown area for turbine WTG 20 is located on a steep slope cannot be supported. This turbine and laydown area is to be either removed or relocated to other areas.
- All turbines within the 500 m buffer of the R318 to be moved (WTG 42 and 43).
- Turbine WTG 45 to be moved back from the Karoo National Park viewshed protection zone.
- The heritage specialist has recommended that turbines WTG 43, 44 and 45 be relocated to the east of the R318. This is in order to consolidate the turbines to only one side of the R381. The final placement of these turbines is to be informed by the heritage impact assessment.
- While the positions of turbines WTG 41 and 42 are located outside of the 500 m buffer of the R381, they are located on slightly elevated terrain. Owing to this, the heritage specialist has recommended that these turbines be moved further away from the R381. The additional buffer (over and above the 500 m recommended by the visual specialist) is to be informed by the heritage specialist.

Table 4.12: Visual impact and impact on sense of place (VIA)

Nature: Visual impact associated with the proposed facility and associated infrastructure and the potential impact on the area's rural sense of place.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Medium (36)
Status	Negative	Negative
Reversibility	Yes, WEF components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation • The proponents should engage with the owner of Quagga Fontein 82 to discuss concerns relating to specific turbine locations. • The recommendations contained in the VIA should also be implemented. • Install radar activated civil aviation light system.		
Residual impacts: Potential impact on current rural sense of place.		

Assessment of No-Go option

There is no impact as it maintains the current status quo.

It is also worth noting that while the VIA assumes in its approach that most observers would be predominantly negative towards the development of a WEF in the region, based on the findings of this and other SIAs for wind farms, this not necessarily the case. While some landowners and travellers may view the turbines in a negative light, for others, wind turbines are not regarded as visually intrusive. The perception of what constitutes a negative visual impact is therefore personal and subjective. The table below assess the significance for stakeholders who do view the visual impact of wind turbines in a negative light.

Table 4.13: Assessment of potential visual impact based on comments from other landowners

Nature: Potential visual impact on sense of place based on comments from other landowners interviewed		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (27)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: • The recommendations contained in the VIA should be implemented.		
Residual impacts: Linked to visual impact on sense of place.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.4.6 Potential impact on property values

A literature review was undertaken as part of the SIA. It should be noted that the review does not constitute a property evaluation study and merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas. The assessment rating is based on the findings of the review. In total five articles were identified and reviewed namely:

- Stephen Gibbons (April 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159.
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia.

- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012.
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University.
- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low, specifically for farms that are farmed as productive farms. In addition, none of the landowners interviewed raised concerns about potential impact on property values.

Table 4.14: Assessment of potential impact on property values and operations

Nature: Potential impact of the WEF on property values		
	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Mitigation • The recommendations contained in the VIA should also be implemented. • Install radar activated civil aviation light system.		
Residual impacts: Linked to visual impact on sense of place.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.4.7 Potential impact on tourism

A review of international literature in the impact of wind farms was undertaken as part of the SIA. Three articles were reviewed, namely:

- Atchison, (April 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh.

- Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government.
- Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector.

Based on the findings of the literature review, there is limited evidence to suggest that the proposed Wind Energy Facility would impact on the tourism in the BWM and the study area.

As indicated above, the owner of Quagga Fontein 82 (Mr Moolman) raised concerns about the potential visual and sense of place impacts on the owners' enjoyment of their property and the Riverine Rabbit eco-tourism operation on Quagga Fontein 82 and adjacent Farm 42. The operation is relatively modest in scale, 2-3 bookings per month for 3-4 days on average. The night skies are considered a key attribute of the sense of place. The larger property is used for game drives and hikes. The Riverine Rabbit accommodation facility is located in the valley of the Sak River and is screened by the natural topography. The facility is also located ~ 10.9 km from the nearest proposed turbine. Mr Moolman has however raised concerns with regard to the proximity of turbines to his southern boundary (~300 m), and especially those in proximity (3.2 km) to a lookout point on Tandjiesberg. Mr Moolman has proposed that the turbines in this area be set back to the south (Moolman, pers. comm).

Although the proposed WEF has the potential to impact on the areas sense of place it is unlikely to result in a significant decrease in the number of visitors to the Riverine Rabbit eco-tourism operation. The impact on local tourism activities is therefore likely to be limited.

Table 4.15: Impact on tourism in the region

Nature: Potential impact of the WEF on local tourism		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Mitigation • The proponents should engage with the owner of Quagga Fontein 82 to discuss concerns relating to specific turbine locations. • The recommendations contained in the VIA should also be implemented. • Install radar activated civil aviation light system.		
Residual impacts: Linked to visual impact on sense of place.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.5 CUMULATIVE IMPACT ON SENSE OF PLACE

The potential cumulative impacts on the area's sense of place will be largely linked to potential visual impacts. In this regard, the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues are also likely to be relevant to solar facilities and associated infrastructure, including the proposed WEF. The relevant issues identified by Scottish Natural Heritage study include:

- Combined visibility (whether two or more wind farms will be visible from one location).
- Sequential visibility (e.g., the effect of seeing two or more wind farms along a single journey, e.g., road or walking trail).
- The visual compatibility of different wind farms in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g., viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time, but if each successive stretch of the road is dominated by views of renewable energy facilities, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

The Karoo WEF 2 site is located in the extreme north-western portion of the Beaufort West Renewable Energy Development Zone (REDZ). Based on the DFF&E's Renewable Energy Applications website there is a near-continuous band of REFs stretching from the provincial boundary to south of Beaufort West over a linear distance of approximately 110 km (See Figure 3.10). The nearest operational REF, the Nobelsfontein 1 WEF, is located approximately 54 km north-east of the site.

Historic applications within 30 km of the site are located to the north-west, north, east, and south-east. These include Redcap's Hoogland WEF 3 and 4 to the north-west of the site, and Redcap's overlapping Hoogland WEF and Mura PV clusters to the north of the site – in total Redcap is proposing (2022-3) 7 WEFs and 4 PV SEFs. The Karoo 1-3 cluster is not yet reflected.

The potential for combined and sequential visibility therefore exists. By clustering the WEFs in the same area may create the impression of a single large facility, which may have the potential to reduce the cumulative impact. The cumulative impact on the areas sense of place should also be viewed within the context of the site's location within the Beaufort West REDZ. The area has therefore been identified as suitable for the development of renewable energy and the associated infrastructure.

The owner of Quagga Fontein 82, Mr Moolman, also raised concerns regarding the cumulative impact on the areas sense of place associated with other WEF developments. Mr Moolman's property borders onto proposed WEF developments to the south (Karoo 2), west (Karoo 3, Redcap Hoogland 4), and north (Redcap Nuweveld) (Moolman, pers. comm).

The findings of the VIA (Logis 2024) indicate the cumulative visual impact of the proposed Karoo Wind Power Phase 2 facility, together with the other authorised WEFs within a 30 km radius (is expected to be **very high**, depending on the observer's sensitivity to wind turbine structures. While the visual quality of the landscape is considered high and taking into consideration the potential visual impacts on sensitive visual receptors, the cumulative visual impact is considered to be within acceptable limits owing to its location within the Beaufort West REDZ. However, as indicated above, while some landowners and travellers may view the turbines in a negative light, for others, wind turbines are not regarded as visually intrusive. The perception of what constitutes a negative visual impact is therefore personal and subjective. This will also have a bearing the perception and significance of the cumulative impact on sense of place.

Table 4.16: Cumulative impacts on sense of place and the landscape (based on VIA)

Nature: Visual impacts associated with the establishment of more than one WEF and the potential impact on the area's rural sense of place and character of the landscape.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (3)	Local and regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	High (60)	High (64)
Status (positive/negative)	Negative	Negative
Reversibility	Yes. WEF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: • The recommendations contained in the VIA should also be implemented. • Install radar activated civil aviation light system.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.

4.6 CUMULATIVE IMPACT ON LOCAL SERVICES AND ACCOMMODATION

The objective will be to source as many low and semi-skilled workers for the construction phase from the BWM. This will reduce the pressure on local services and accommodation in the area. For a single WEF project ~ 200-250 workers may require accommodation. In the event of the construction phase for all three projects overlapping, the total number of workers requiring accommodation would be between 600 and 750. The potential pressure on local services will depend on the number of locally based contractors and workers that are employed during the construction phase, however, as indicated above, the availability of suitably qualified workers from the local community is likely to be limited. The establishment of a more than one WEF is therefore likely to place pressure on local services and accommodation.

The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and associated renewable energy projects in the area. These benefits will create opportunities for investment in the area, including the opportunity to up-grade and expand existing services and the construction of new houses. Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed WEF is also required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the BWM to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning (IDP) process undertaken by the BWM. It should also be noted that the WEF is located within the Beaufort West REDZ. The potential social and socio-economic risks and opportunities associated with the establishment of large-scale renewable energy projects should therefore form key aspect of the IDP process.

The cumulative impact of construction traffic on the R381 (Loxton Road) was raised as key concern. The issues relate to damage to the road surface and delays / disruptions linked to construction traffic, including the transport of wind turbine blades to site. The R381 provides access to 14 REF projects proposed in the area. The site properties in the area and most adjacent ones are primarily (and essentially exclusively) accessed off the R381. Tourism operations include Riverine Rabbit, Renosterfontein, Ko-Ka Tsara Bush Camp and (potentially) Highlands.

Table 4.17: Cumulative impacts on local services

Nature: The establishment of a number of renewable energy facilities and associated projects, such as the proposed WEF, in the BWM has the potential to place pressure on local services, specifically medical, education and accommodation.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Medium (30)[29]
Status (positive/negative)	Negative	Negative
Reversibility	Yes. WEF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation:		

[29] With effective mitigation and planning, the significance will be Low Negative.

- The proponent should liaise with the BWM to address potential impacts on accommodation and local services.
- WEF developers should liaise with local farmers and Provincial Roads Department to address the potential cumulative impacts on the R381.

Assessment on No-Go option
There is no impact as it maintains the current status quo.

4.7 CUMULATIVE IMPACT ON LOCAL ECONOMY

In In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed WEF, will also create several socio-economic opportunities for the BWM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities. As indicated above, the WEF is located within the Beaufort West REDZ. The likelihood of these opportunities being realised is therefore high. Identifying opportunities to enhance the potential social and socio-economic opportunities associated with the establishment of large-scale renewable energy projects should therefore form key aspect of the IDP process.

The review of the REIPPPP (December 2021) indicates that to date (across BW1-4) a total contribution of R22.8 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.1 billion. Of the total commitment, R18.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

Table 4.18: Cumulative impacts on local economy

Nature: The establishment of renewable energy facilities and associated projects, such as the WEF, in the BWM will create employment, skills development and training opportunities, creation of downstream business opportunities.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local and regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	High (8)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (36)	High (60)
Status (positive/negative)	Positive	Positive
Reversibility	Yes. WEF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts	Yes	

be mitigated?		
Confidence in findings: High.		
Mitigation: The proposed establishment of suitably sited renewable energy facilities and associated projects, such as the proposed WEF, within the BWM should be supported.		

Assessment of No-Go option
There is no impact as it maintains the current status quo. This would represent a lost socio-economic opportunity for the BWM.

4.8 ASSESSMENT OF DECOMMISSIONING PHASE

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. The number of people employed during the operational phase will be in the region of 15-20. Given the low number of people employed during the operational phase the decommissioning of the facility will not have a significant negative social impact on the local community. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme.

However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 25 years post commissioning[30]. The decommissioning phase is therefore also likely to create additional construction type jobs, as opposed to the jobs losses typically associated with decommissioning. The decommissioning phase will also create employment opportunities. This will represent a positive impact. These jobs will, however, be temporary.

Table 4.19: Social impacts associated with decommissioning

Nature Social impacts associated with retrenchment including loss of jobs, and source of income. Decommissioning will also create temporary employment opportunities, which would represent a positive temporary impact		
	Without Mitigation	**With Mitigation**
Extent	Local (4)	Local (2)
Duration	Short term (2)	short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (24)
Status	Negative	Negative
Reversibility	N/A	

[30] There is also a possibility that the existing wind turbines may be replaced with new, more efficient turbines at the end of the first 20-year contract period. This would create additional employment opportunities and ensure that the existing operational phase jobs are maintained.

Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: • The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned. • All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning.		
Residual impacts No, provided effective retrenchment package.		

Assessment on No-Go option
There is no impact as it maintains the current status quo.

4.9 ASSESSMENT OF NO-DEVELOPMENT OPTION

The primary goal of the project is to generate additional energy and improve energy security. The project also aims to reduce the carbon footprint associated with energy generation. As indicated above, energy supply constraints and the associated load shedding have had a significant impact on the economic development of the South African economy. South Africa also relies on coal-powered energy to meet more than 90% of its energy needs. South Africa is therefore one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions.

The No-Development option would represent a lost opportunity for South Africa to improve energy security and supplement is current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost.

Table 4.20: Assessment of no-development option

Nature: The no-development option would result in the lost opportunity for South Africa to improve energy security and assist to support with the development of clean, renewable energy		
	Without Mitigation [31]	**With Mitigation[32]**
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (56)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	

[31] Assumes project is not developed.
[32] Assumes project is developed.

Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: The proposed WEF should be developed, and the enhancement measures identified in the SIA and other specialist studies should be implemented.		
Residual impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		

SECTION 5: KEY FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

Section 5 lists the key findings of the study and recommendations. These findings are based on:

- A review of key planning and policy documents pertaining to the area.
- A review of social and economic issues associated with similar developments.
- Site visit and interviews with key stakeholders
- A review of relevant literature on social and economic impacts.
- The experience of the authors with other renewable energy projects.

5.2 SUMMARY OF KEY FINDINGS

The key findings of the study are summarised under the following sections:

- Fit with policy and planning.
- Construction phase impacts.
- Operational phase impacts.
- Cumulative impacts.
- Decommissioning phase impacts.
- No-development option.

5.2.1 Policy and planning issues

The development of renewable energy is strongly supported at a national, provincial, and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all refer to and support renewable energy. The BWM Spatial Development Framework (SDF) and Integrated Development Plan (IDP) also support the development of renewable energy and the site is located within the Beaufort West REDZ. The development of the proposed WEF is therefore supported by key policy and planning documents.

5.2.2 Construction phase impacts

The key social issues associated with the construction phase include:

Potential positive impacts
- Creation of employment and business opportunities.

The construction phase will extend over a period of approximately 18 months and create in the region of 200-250 employment opportunities. Members from the local communities in Beaufort West may potentially qualify for low skilled and semi-skilled and some skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. However, due to the low education and skills levels in the area the local employment opportunities are likely to be limited. The total wage bill will be in the region of R 60 million (2024 Rand values). A percentage of the wage

bill will be spent in the local economy which will also create opportunities for local businesses in Beaufort West. The capital expenditure associated with the construction phase will be approximately R 6.8 billion (2024 Rand value). Due the lack of diversification in the local economy the potential for local companies is likely to be limited. Most benefits are therefore likely to accrue to contractors and engineering companies based outside the BWM. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site.

Potential negative impacts

- Impacts associated with the presence of construction workers on local communities.
- Impacts related to the potential influx of jobseekers.
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site.
- Increased risk of grass fires associated with construction related activities.
- Nuisance impacts, such as noise, dust, and safety, associated with construction related activities and vehicles.
- Impact on productive farmland.

The findings of the SIA indicate that the significance of all the potential negative impacts with mitigation are likely to be **Low Negative**. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. Table 5.1 summarises the significance of the impacts associated with the construction phase.

Table 5.1: Summary of social impacts during construction phase

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Creation of employment and business opportunities	Medium (Positive)	Medium (Positive)
Presence of construction workers and potential impacts on family structures and social networks	Medium (Negative)	Low (Negative)
Influx of job seekers	Low (Negative)	Low (Negative)
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Medium (Negative)	Low (Negative)
Increased risk of grass fires	Medium (Negative)	Low (Negative)
Nuisance impacts associated with construction activities	Medium (Negative)	Low (Negative)
Loss of farmland	Medium (Negative)	Low (Negative)

5.2.3 Operational phase impacts

Potential positive impacts

- Establishment of infrastructure to improve energy security and support renewable sector.
- Creation of employment opportunities.
- Benefits for local landowners.
- Benefits associated with socio-economic contributions to community development.

The proposed project will supplement South Africa's energy and assist to improve energy security. In addition, it will also reduce the country's reliance on coal as an energy source. This represents a positive social benefit.

Potential negative impacts
- Visual impacts and associated impacts on sense of place.
- Potential impact on property values.
- Potential impact on tourism.

The findings of the SIA indicate that the significance of all the potential negative impacts except for visual impacts will be **Low Negative** with mitigation. Most of the potential negative impacts can therefore be effectively mitigated. The significance of the impacts associated with the operational phase are summarised in Table 5.2.

Table 5.2: Summary of social impacts during operational phase

Impact	Significance No Mitigation/Enhancement	Significance With Mitigation/Enhancement
Establishment of infrastructure to improve energy security and support renewable sector	High (Positive)	High (Positive)
Creation of employment and business opportunities during maintenance	Low (Positive)	Medium (Positive)
Benefits associated with socio-economic contributions to community development	Medium (Positive)	High (Positive)
Benefits for landowners	Low (Positive)	High (Positive)
Visual impact and impact on sense of place[33]	High (Negative)	High (Negative)
Visual impact and impact on sense of place[34]	Low (Negative)	Low (Negative)
Impact on property values	Low (Negative)	Low (Negative)
Impact on tourism	Low (Negative)	Low (Negative)

5.2.4 Assessment of cumulative impacts

Cumulative impact on sense of place
The findings of the VIA (Logis 2024) indicate the cumulative visual impact of the proposed Karoo Wind Power Phase 2 facility, together with the other authorised WEFs within a 30 km radius (is expected to be **very high**, depending on the observer's sensitivity to wind turbine structures. While the visual quality of the landscape is considered high and taking into consideration the potential visual impacts on sensitive visual receptors, the cumulative visual impact is considered to be within acceptable limits owing to its location within the Beaufort West REDZ.

Cumulative impact on local services and accommodation
The significance of this impact with mitigation was rated as **Low Negative**.

[33] Based on findings of VIA (Logis 2024)
[34] Significance for observers that do not regard wind turbines as a negative visual impact

Cumulative impact on local economy
The significance of this impact with enhancement was rated as **High Positive**.

5.2.5 Decommissioning phase

Given the moderate number of people employed during the operational phase (~ 15-20), the potential negative social impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be **Low Negative**.

5.2.6 Assessment of no-development option

The No-Development option would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with clean, renewable energy. Given South Africa's current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost. The No-Development option is not supported by the findings of the SIA.

5.3 CONCLUSIONS

The findings of the SIA indicate that the development of the proposed Karoo 2 WEF and associated infrastructure will create employment and business opportunities during both the construction and operational phase of the project. Except for the visual impact on sense of place, all the potential negative impacts can be effectively mitigated.

SED contributions associated with the project will also benefit the local community. The enhancement measures listed in the report should be implemented to maximise the potential benefits. The significance of this impact is rated as **High Positive**. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated a coal-based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The Karoo 2 WEF is also located within the Beaufort West REDZ. The area has therefore been identified as suitable for the development of renewable energy facilities and associated infrastructure.

Statement and reasoned opinion
The establishment of the Karoo 2 WEF and associated infrastructure is supported by the findings of the SIA.

Recommendations
- The recommendations of the VIA should be considered.
- Radar activated civil aviation lights should be installed on all wind turbines.
- The proponents should engage with the owner of Quagga Fontein 82 to discuss concerns relating to specific turbine locations.
- WEF developers should liaise with local farmers and Provincial Roads Department to address the potential cumulative impacts on the R381.

ANNEXURE A

INTERVIEWS

- De Villiers, Ms Eeva telephonic 2024-03-12). Farm 424/RE.
- Du Plessis, Mr Rian (telephonic 2024-03-11). Grootvlei 95/RE.
- Ihlenfeldt, Ms Jeanine (e-mail 2024-03-05). Farm 437.
- Jack, Mr Andrew (telephonic 2024-02-19). Spits Kop 81; Chairman: Nuweveld Farmers' Association.
- January, Mr Roland (2024-02-22). Park Manager: Karoo National Park.
- Koster, Mr Graeme (2024-02-22, telephonic 2024-03-06). Guaggafontein 83/1, Bastaards Kraal 94, Klaverfontein 95/RE, Witte Hart 96, Waterfall 97/RE, Waterfall 97/2, Middle Kraal 98/RE, Waterval 101/RE, Waterval 101/1, Waterval 101/2, Waterval 101/3.
- Manuel, Mr Jeffrey (telephonic 2024-03-13). Manager: SANParks Park Planning and Development.
- Minnaar, Mr Gerald (2024-02-21, telephonic 2024-03-05). Annex Waterfall 102, Matjies Valie 103/RE, Matjies Valie 103/4, Matjies Valie 103/5, Matjieskloof 110/2, Grasplaats 113/RE.
- Moolman, Mr Johan (2024-02-21, telephonic 2024-03-06). Farm 42, Quagga Fontein 82, Riverine Rabbit.
- Moolman, Ms Marietha (e-mail 2024-03-15). Farm 42, Quagga Fontein 82, Riverine Rabbit.
- Neethling, Mr Paul (telephonic 2024-03-xx). Matjiesfontein 412.
- Nel, Mr Riaan (2024-02-22). Senior Section Ranger: Karoo National Park.
- Pienaar, Ms Phyllis (telephonic 2024-03-13). Western Cape Department of Agriculture: Land Care Officer: Dundee 80, Scheurfontein 112/1, Grasplaats 113/2, Farm 421.
- Steenkamp, Ms Marette (e-mail 2024-03-11; telephonic 2024-03-13). Farm 425.
- Terblanche, Mr Christiaan (2024-02-22, e-mail 2024-03-06, e-mail 2024-03-07). Matjies Valie 103/1, Matjies Valie 103/2/RE, Matjies Valie 103/6.

REFERENCES

- National Energy Act (2008).
- White Paper on the Energy Policy of the Republic of South Africa (December 1998).
- White Paper on Renewable Energy (November 2003).
- Integrated Energy Plan (2016).
- Integrated Resource Plan (IRP) for South Africa (2010-2030).
- National Development Plan (2011).
- New Growth Path Framework.
- National Infrastructure Plan.
- Western Cape Provincial Spatial Development Framework (2014).
- Western Cape Infrastructure Framework (2013).
- Western Cape Provincial Strategic Plan (2014).
- Western Cape Green Economy Strategy (2013).
- One Cape 2040 (2012).
- Central Karoo District Municipality Spatial Development Framework (2020).
- Beaufort West Municipality Integrated Development Plan (IDP) (2022-2027).
- Beaufort West Municipality Spatial Development Framework (Draft 2023).
- SANParks, 2017. Karoo National Park – Park Management Plan 2017-2027.

ANNEXURE B

METHODOLOGY FOR THE ASSESSMENT OF POTENTIAL IMPACTS

Direct, indirect, and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, where it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score between 1 and 5 will be assigned as appropriate (with a score of 1 being low and a score of 5 being high).
- The **duration**, where it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The *degree* to which the impact can be *reversed*.
- The *degree* to which the impact may cause *irreplaceable loss of reso*urces.
- The *degree* to which the impact can be *mitigated.*

The **significance** is determined by combining the criteria in the following formula:

S=(E+D+M)P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

ANNEXURE C

Tony Barbour
ENVIRONMENTAL CONSULTING

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Tony Barbour's has 30 years' experience in the field of environmental consulting and management. His experience includes working for ten years as a consultant in the private sector followed by four years at the University of Cape Town's Environmental Evaluation Unit. He has worked as an independent consultant since 2004, with a key focus on Social Impact Assessment. His other areas of interest include Strategic Environmental Assessment and review work.

EDUCATION

- BSc (Geology and Economics) Rhodes (1984).
- B Economics (Honours) Rhodes (1985).
- MSc (Environmental Science), University of Cape Town (1992).

EMPLOYMENT RECORD

- Independent Consultant: November 2004 – current.
- University of Cape Town: August 1996-October 2004**:** Environmental Evaluation Unit (EEU), University of Cape Town. Senior Environmental Consultant and Researcher.
- Private sector: 1991-August 2000: 1991-1996**:** Ninham Shand Consulting (Now Aurecon, Cape Town). Senior Environmental Scientist; 1996-August 2000: Steffen, Robertson and Kirsten (SRK Consulting) – Associate Director, Manager Environmental Section, SRK Cape Town.

LECTURING

- University of Cape Town: Resource Economics; SEA and EIA (1991-2004).
- University of Cape Town: Social Impact Assessment (2004-current).
- Cape Technikon: Resource Economics and Waste Management (1994-1998).
- Peninsula Technikon: Resource Economics and Waste Management (1996-1998).

RELEVANT EXPERIENCE AND EXPERTISE

Tony Barbour has undertaken in the region of 300 SIA's, including SIAs for infrastructure projects, dams, pipelines, and roads. All of the SIAs include interacting with and liaising with affected communities. In addition, he is the author of the Guidelines for undertaking SIAs as part of the EIA process commissioned by the Western Cape Provincial Environmental Authorities in 2007. These guidelines have been used throughout South Africa.

Tony was also the project manager for a study commissioned in 2005 by the then South African Department of Water Affairs and Forestry for the development of a Social Assessment and Development Framework. The aim of the framework was to enable the Department of Water Affairs and Forestry to identify, assess and manage social impacts associated with large infrastructure projects, such as dams. The study also included the development of guidelines for Social Impact Assessment, Conflict Management, Relocation and Resettlement and Monitoring and Evaluation.

Countries with work experience include South Africa, Namibia, Angola, Botswana, Zambia, Lesotho, Swaziland, Ghana, Senegal, Nigeria, Mozambique, Mauritius, Kenya, Ethiopia, Oman, South Sudan, Sudan, Rwanda, and Armenia.

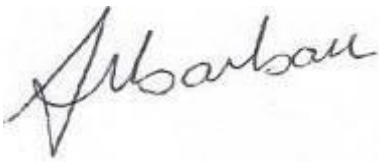
ANNEXURE D

The specialist declaration of independence in terms of the Regulations_

I, Tony ~~Barbour~~ ~~_____~~, declare that -- General

declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

Tony Barbour Environmental Consulting and Research

Name of company (if applicable):

15 June 2024

Date: