

SOCIAL IMPACT ASSESSMENT

ABERDEEN WIND ENERGY FACILITY 2

EASTERN CAPE PROVINCE

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Prepared

By

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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

Savannah Environmental was appointed to manage the Environmental Impact Assessment (EIA) process for the proposed 240 MW Aberdeen Wind Energy Facility 2 located approximately 20km west of the town of Aberdeen in the Eastern Cape Province. The site is located within the Dr Beyers Naude Local Municipality (DBNLM) in the Sarah Baartman District Municipality (SBDM). The site falls within the Beaufort West Renewable Energy Development Zone (REDZ) and forms part of a larger cluster of renewable energy projects, which includes two adjacent up to 240MW Wind Energy Facilities (Aberdeen Wind Energy Facility 1 and Aberdeen Wind Energy Facility 3).

Tony Barbour Environmental Consulting was appointed to undertake a specialist Social Impact Assessment (SIA) as part of an EIA process for the Aberdeen Wind Energy Facility 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.

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 DBNLM 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 Aberdeen Wind Energy Facility 2 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 24-30 months and create in the region of 250-300 employment opportunities. Members from the local communities in Aberdeen and Graff Reinet 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. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. The total wage bill will be in the region of R 150 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area and the DBNLM.

The capital expenditure associated with the construction phase will be approximately R 6 billion (2023 Rand value). This will create opportunities for local companies and the regional and local economy. 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 DBNLM. 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)

Impact of heavy vehicles and 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.
- Potential wake loss impact on Eskom Wind Energy Facility.

The findings of the SIA indicate that the significance of all the potential negative impacts with the exception of visual impacts will be **Low Negative** with mitigation. The majority 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	Medium (Negative)	Medium (Negative)

Impact on property values	Low (Negative)	Low (Negative)
Impact on tourism	Low (Negative)	Low (Negative)
Potential wake loss impact on Eskom Wind Energy Facility	Low-negligible (Negative)	Low-negligible (Negative)

CUMULATIVE IMPACTS

Cumulative impact on sense of place

The establishment of the proposed WEF and other renewable energy facilities in the area will create the potential for combined and sequential visibility impacts. This impact is rated as **Medium Negative**. However, the impact on the areas sense of place should 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 establishment of renewable energy facilities and associated infrastructure.

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 (~ 40-50), 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 proposed Aberdeen Wind Energy Facility 2 will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development through socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation. The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phases are likely to be **Low Negative** with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The site is also located within the Beaufort West REDZ. The area has therefore been identified as

suitable for the establishment of renewable energy facilities and associated infrastructure. The establishment of the proposed Aberdeen Wind Energy Facility 2 is therefore supported by the findings of the SIA.

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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 <i>curriculum vitae</i> ;	Section 1.5, Annexure A
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 1.6, Annexure B
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1, Section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.2, 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;	Interviews in 2021 (Annexure A)
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.2, 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, Section 5,
(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;	N/A
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4,
(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, Section 5
(k) any mitigation measures for inclusion in the EMPr;	Section 4
(l) any conditions for inclusion in the environmental authorisation;	Section 4, Section 5
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(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 5.3
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report	Annexure A, lists key stakeholders interviewed
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Annexure A, lists key stakeholders interviewed
(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	Comply with the Assessment Protocols that were

<p>apply.</p>	<p>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 September 2020, there are no sensitivity layers on the Screening Tool for Socio-economic-features. Part A has therefore not been compiled for this assessment.</p>
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ACRONYMS

BESS	Battery Energy Storage System
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DM	District Municipality
HD	Historically Disadvantaged
DBNLM	Dr Beyers Naude Local Municipality
EC	Eastern Cape
EIA	Environmental Impact Assessment
IDP	Integrated Development Plan
IPP	Independent Power Producer
kV	Kilovolts
LED	Local Economic Development
LM	Local Municipality
MW	Megawatt
PGDS	Provincial Growth and Development Strategy
SDF	Spatial Development Framework
WEF	Wind Energy Facility
SIA	Social Impact Assessment

SECTION 1: INTRODUCTION

1.1 INTRODUCTION

Savannah Environmental was appointed to manage the Environmental Impact Assessment (EIA) process for the proposed 240 MW Aberdeen Wind Energy Facility 2 located approximately 20km west of the town of Aberdeen in the Eastern Cape Province. The site is located within the Dr Beyers Naude Local Municipality (DBNLM) in the Sarah Baartman District Municipality (SBDM). The site falls within the Beaufort West Renewable Energy Development Zone (REDZ) and forms part of a larger cluster of renewable energy projects, which includes two adjacent up to 240MW Wind Energy Facilities (Aberdeen Wind Energy Facility 1 and Aberdeen Wind Energy Facility 3).

Tony Barbour Environmental Consulting was appointed to undertake a specialist Social Impact Assessment (SIA) as part of an EIA process for the Aberdeen Wind Energy 2.

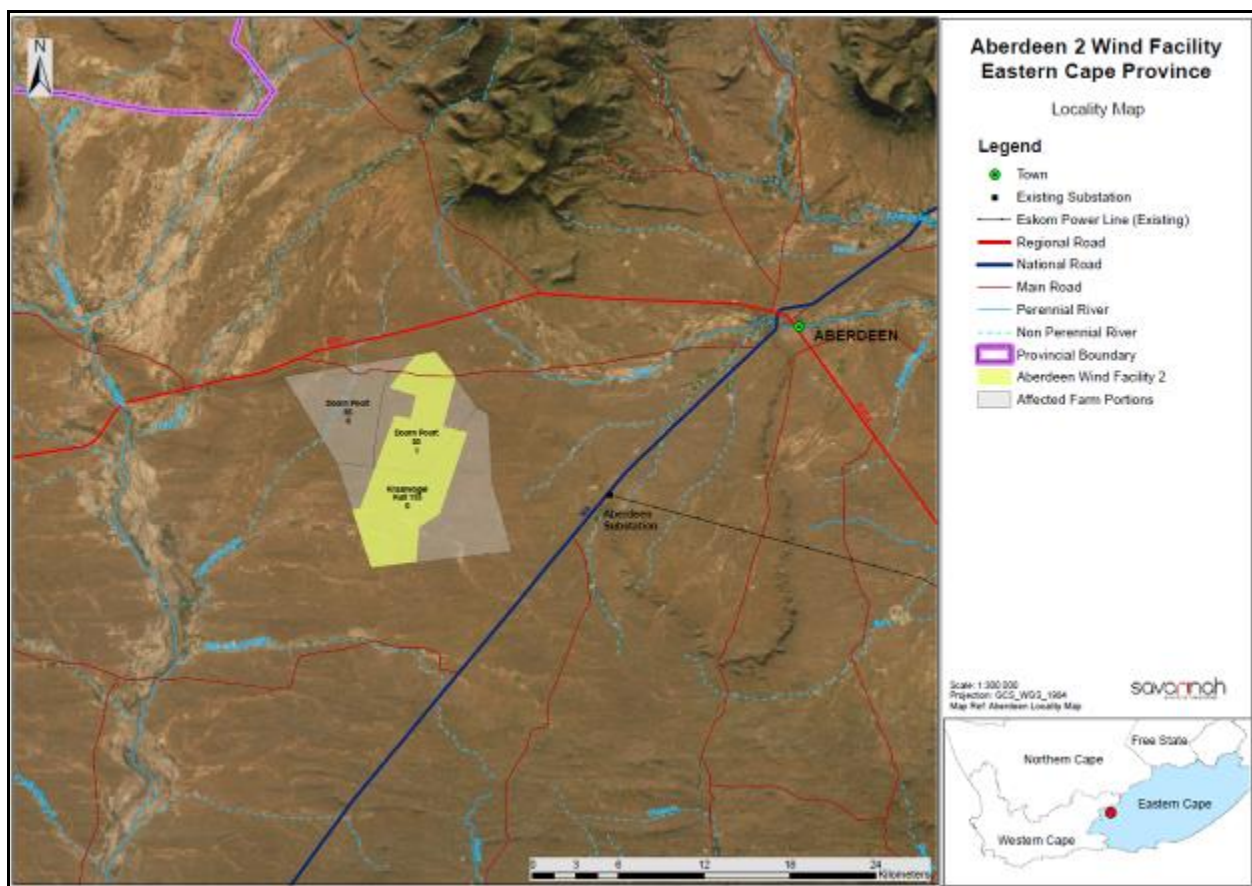


Figure 1.1: Location of Aberdeen Aberdeen Wind Energy 2

1.2 PROJECT DESCRIPTION

Aberdeen Wind Facility 2 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure on a site located approximately 20km west of the town of Aberdeen in the Eastern Cape Province. The site is located within the Dr Beyers Naude Local Municipality in the Sarah Baartman District Municipality. The project site comprises the following farm portion:

- Remaining Portion of Farm Doornpoort 93.
- Portion 1 of Farm Doornpoort 93.
- Remaining Portion of Kraanvogelkuil 155.

The site falls within the Beaufort West Renewable Energy Development Zone (REDZ) and forms part of a larger cluster of renewable energy projects, which includes two adjacent up to 240MW Wind Energy Facilities (Aberdeen Wind Facility 1 and Aberdeen Wind Facility 3).

The Aberdeen Wind Facility 2 will have a contracted capacity of up to 240MW and comprise up to 41 wind turbines with a capacity of up to 8MW each. The project will have a preferred project site of approximately 6 465 ha, and an estimated disturbance area of up to 62 ha. The Aberdeen Wind Facility 2 project site is proposed to accommodate the following infrastructure:

- Up to 41 wind turbines with a maximum hub height of up to 200m, rotor diameter of up to 200m, blade length of up to 100m and have a rotor tip height of up to 300m. The turbine foundations will have a combined permanent footprint of 6ha and 13ha for all turbine crane hardstands is required. Photograph 1.1 illustrates a typical wind turbine.
- Medium-voltage (MV) power lines internal to the wind farm will be trenched and located adjacent to internal access roads, where feasible.
- Up to 132kV on-site facility substation up to 2ha in extent.
- Battery Energy Storage System (BESS) with a footprint of up to 5ha. Photograph 1.2 illustrates a typical BESS facility.
- A main access road of approximately 2.5km in length and up to 10m in width¹.
- An internal road network between project components inclusive of stormwater infrastructure. A 12 m wide road corridor may be temporarily impacted during construction and rehabilitated to 6 m wide after construction.
- Gate house and security: up to 0.5 ha.
- Operation and Maintenance buildings (includes control centre, offices, warehouses, workshop, canteen, visitors centre, staff lockers, etc.): Up to 2 ha.
- Site camp up to 1 ha.
- Construction laydown areas up to 9ha.

The power generated from the project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan.

¹ Access to the facility will be via an existing gravel road off the R61. The gravel road is well established (~10m wide excluding road reserve), however it's likely upgrades will be required at the access point off the R61 and potentially at water crossings.



Photograph 1.1: Typical example of wind turbine



Photograph 1.2: Example of BESS located in storage containers

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 Wind Energy Facility 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

Demographic data

Some of the provincial documents refer to the 2011 Census data and do not include data from the 2016 Household Community Survey. However, where required the relevant 2016 data has been provided.

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 300 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 eighteen 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 STRUCTURE

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 fit²” 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 Resource Plan (IRP) for South Africa (2019).
- National Infrastructure Plan (NIP) (2012 and 2021).
- National Development Plan (2011).
- Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2015).
- Eastern Cape Provincial Development Plan-2030 Vision.
- Eastern Cape Provincial Growth and Development Program.
- Eastern Cape Sustainable Energy Strategy 2012.
- Dr Beyers Naude Municipality Integrated Development Plan (2020/21).
- Dr Beyers Naude Municipality Spatial Development Framework (2021).

Section 2 also provides a review of the Renewable Energy Programme in South Africa and a summary of some of the key social issues associated with wind farms based on international experience. A summary of a review of international studies on the potential impacts on property values and tourism is also provided.

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:

² 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.

“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 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 WEF, 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 Protocol³, Government

³ 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

is 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 Integrated Resource Plan (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

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).

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, 1 588MW of Medupi, 800MW 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 (Decommissioning)	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	

<ul style="list-style-type: none"> Installed Capacity Committed/Already Contracted Capacity Capacity Decommissioned New Additional Capacity Extension of Koeberg Plant Design Life Includes Distributed Generation Capacity for own use 	<ul style="list-style-type: none"> • 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.
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Figure 2.1: Summary of energy allocations and commitments (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

Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. 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 to create jobs, through a series of partnerships between the State and the private sector. The Green Economy is one of the five priority areas, 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 support investments is 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 2021⁴. 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.
- SA will need to commit to emission reductions as a global citizen.

2.2.8 Strategic Environmental Assessment (SEA) for Wind and Solar PV Energy in South Africa

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2015) identified eight (8) **Renewable Energy Development Zones** (REDZs) (Phase 1 REDZs). The REDZs identified areas where large scale wind energy facilities can be

⁴ Gazette No. 44951

developed in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. On 17 February 2016, the Cabinet of the Republic of South Africa (Cabinet) approved the gazetting of Renewable Energy Development Zones (REDZs). 8 REDZs and 5 Power Corridors have been identified. On 26 February 2021, Minister Barbara Dallas Creecy, published Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 which identified 3 additional REDZs (Phase 2 REDZs) for implementation as well as the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large-scale wind and solar photovoltaic energy facilities in these REDZs. The total number of REDZ is therefore 11 (Figure 2.2). The proposed project is located within the Beaufort West REDZ.

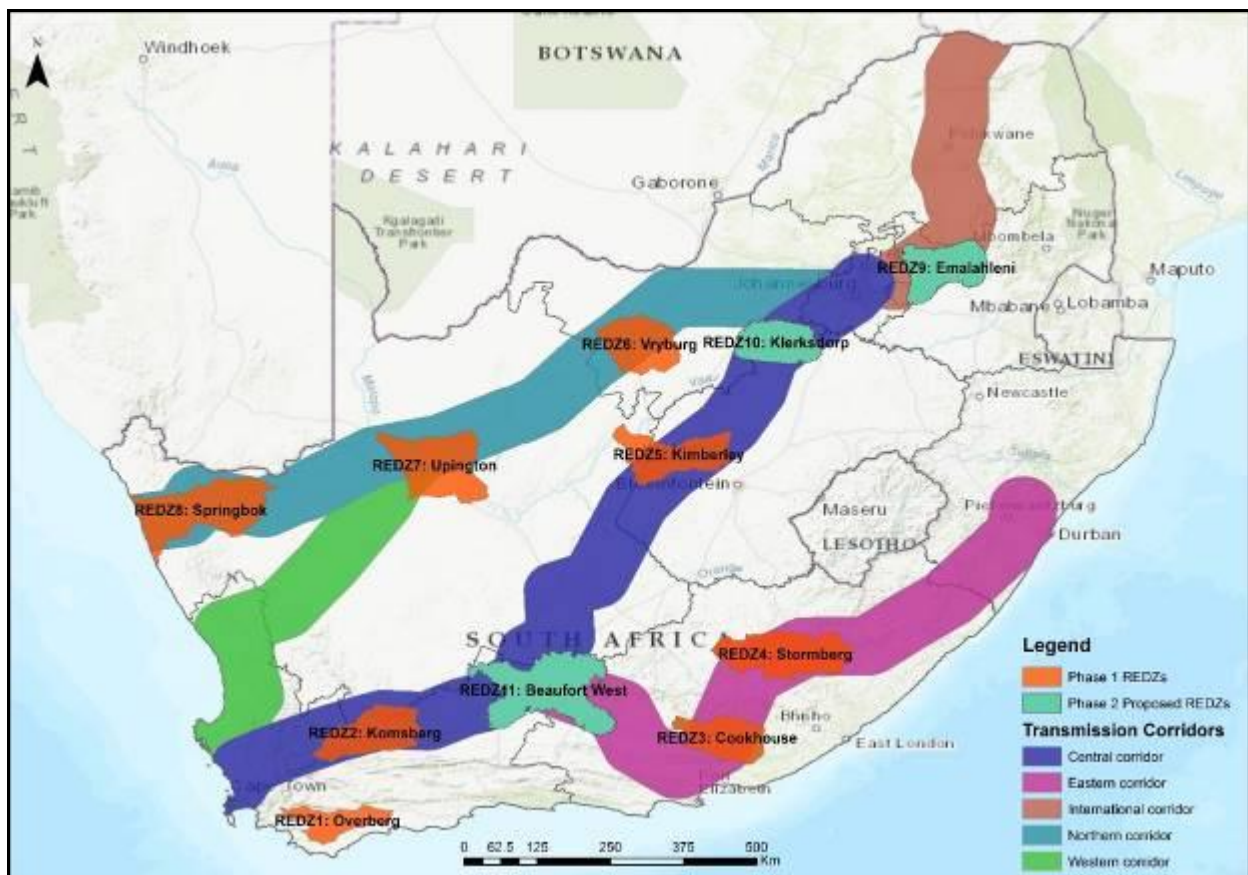


Figure 2.2: Location of Renewable Development Zones and Transmission Corridors in South Africa (Source CSIR)

2.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

2.3.1 Eastern Cape Provincial Development Plan-2030 Vision

The vision set out for 2030 is stated as a point along a journey towards ubuntu, where by 2030 the Eastern Cape will seek to achieve the commitment for the province where:

- There has been proliferation of innovation and industry, and citizens who can feed themselves.

- All children and youth manifesting our shared belief that they are the cornerstone of the future.
- Participatory local development action is driven by committed, capable citizens and conscientious institutional agents.

The 2030 vision notes that the sustainable future for the Eastern Cape rests on a people-centred development to achieve five related goals as agreed by all stakeholders involved in the process to develop this plan. These goals are:

The provincial development plan (PDP) identifies five goals, namely:

- Goal 1: A growing, inclusive and equitable economy.
- Goal 2: An educated, empowered, and innovative citizenry.
- Goal 3: A healthy population.
- Goal 4: Vibrant and equitably enabled communities.
- Goal 5: Capable, conscientious, and accountable institutions.

The relevant goals are listed below.

Goal 1: A growing, inclusive and equitable economy

The PDP promotes a growing, inclusive, and equitable economy. This includes a larger and more efficient provincial economy that optimally exploits the competitive advantages of the Eastern Cape, increased employment and reduced inequalities of income and wealth. The economic goal will be achieved through five strategic objectives, of which improved economic infrastructure that promotes new economic activity and development of high potential economic sectors are of relevance to the project.

In terms of improved economic infrastructure, the PDP notes that this includes positioning the Eastern Cape as a key investment hub in the energy sector and ensuring reliable energy supplies to high potential sectors. Strategic Action 1.1.6 notes that the province is positioning itself as an investment hub in the energy sector (wind farms, imported liquefied natural gas, shale-gas, and nuclear energy). This will provide opportunities to develop the capital goods sector and heavy industries.

The rapid development of high-potential economic sectors includes the energy sector with the aim of developing the province as an energy hub. Tourism is also identified as a key sector, including eco-tourism.

Goal 4: Vibrant and equitably enabled communities

Strategic objective 4.3 seeks to ensure universal access to adequate, reliable, and basic infrastructure for all by 2030. Linked to this Strategic Action, 4.3.2 outlines the requirements to ensure adequate energy infrastructure for household and public facility access and universal access to energy by 2030. The development of renewable energy hubs for remote rural areas are a potential solution, using solar, wind and biomass/biogas is identified as means to achieving this.

The PDP also identifies four catalytic flagships that are aimed at meeting the development goals and addressing the socio-economic challenges facing the province. The following are relevant to the project.

Infrastructure

The third catalytic flagship focuses on the provision and maintenance of infrastructure, including energy infrastructure. The initiative also aims to encourage private sector

investment in infrastructure and develop appropriate technology. The REIPPP creates the opportunity for private sector investment in renewable energy infrastructure.

Ilima labantu

Ilima labantu is an agricultural development initiative that aims to revive the rural economy and encourage other areas of development in the province. The Eastern Cape is endowed with significant natural resources that can be used to help address its food security needs, expand its capacity to provide jobs, raise income levels and trigger development in allied industries and other sectors. The establishment of Community Trusts associated with the REIPPPP creates opportunities to support agricultural development in rural areas.

Ematholeni!

Ematholeni! (children first!). The focus is on creating and improving education opportunities and facilities in the Eastern Cape, starting with better-coordinated early childhood development (ECD). The establishment of Community Trusts associated with the REIPPPP creates opportunities to support education programmes in rural areas.

2.3.2 Eastern Cape Provincial Growth and Development Program

The Eastern Cape Provincial Growth and Development Programme (PGDP) (2004-2014) sets out the vision and plan for development for the Eastern Cape up until 2014. It highlights, in particular, strategies to fight poverty, promote economic and social development, and create jobs. In as far as could be established, no updated version of the Program is available.

The strategy document does not highlight any specific measures to promote the development of renewable energy sources. However, an analysis of energy sources within the province reveals that 23% of the population of the province still rely on paraffin for their energy needs while 25% rely on candles for lighting.

Section 5 of the PGDP (2004-2014) identifies six strategic objective areas or programs aimed at addressing the challenges facing the province. The PGDP indicates that the programmes have been selected for their potential in leveraging significant resources, creating a large multiplier effect, and providing a foundation for accelerated economic growth. Of specific relevance to the proposed development is the Strategic Infrastructure Programme. This programme indicates that enabling economic and logistics infrastructure – energy, roads, rail, ports, and air transport among others – is a necessary condition for economic growth and development. Specific reference is therefore made to energy infrastructure.

The report notes that development of infrastructure, especially in the former homelands, is a necessary condition to eradicate poverty through:

- The elimination of social backlogs in access roads, schools and clinics and water and sanitation.
- To leverage economic growth through access roads and improving the road, rail and air networks of the province.

Energy demands and electricity infrastructure rollout forms part of the Strategic Infrastructure Programme of the PGDP. The PGDP states that the, "...economic and logistics infrastructure – energy, roads, rail, ports, and air transport among others – is a necessary condition for economic growth and development."

The Strategic Infrastructure Programme also seeks to consolidate and build on this coastal advantage through the provision of world-class infrastructure and logistics capability at the Coega and East London IDZs and improving connectivity and linkages with major industrial centers such as Johannesburg.

The high-level objectives of the Strategic Infrastructure Programme include consolidating and building upon the strengths of the Province's globally-competitive industrial sector through the development of world-class infrastructure and logistics capability in the East London and Coega IDZs (Industrial Development Zones). A reliable energy supply will be critical to achieving these objectives. The proposed WEF will assist to contribute to the future energy requirements of the Eastern Cape, and its proximity to the Coega IDZs will also benefit these key initiatives.

2.3.3 Eastern Cape Sustainable Energy Strategy 2012

The Eastern Cape Sustainable Energy Strategy developed in 2012 responds to a number of imperatives, including the need for improved provincial energy security and self-sufficiency, improved access to energy among the poorest in the province, and the need to stimulate a green and low-carbon economy underpinning decent and sustainable jobs. These imperatives are even more relevant in 2022.

The vision set out in 2012 was "The Eastern Cape provides the most enabling environment for sustainable energy investment and implementation in the country". The mission statement linked to the vision is "To encourage sustainable, affordable and environmentally friendly energy production and efficient use within the Eastern Cape Province by creating an enabling environment for energy production and sustainable technology, skills and industry development".

The strategy also identifies a set of goals to achieve the vision, namely:

- Goal 1: Job creation and skills development.
- Goal 2: Alleviate energy poverty.
- Goal 3: Reduce CO₂ emissions and environmental pollution.
- Goal 4: Improve industrial competitiveness.
- Goal 5: Promote renewable energy production in the Province.
- Goal 6: Promote the development of a renewable energy manufacturing industry and technology development.

Goal 3: Reduce CO₂ emissions and environmental pollution.

A key objective of Goal 3 is to reduce Greenhouse gas emissions and combat climate change. Goal 4

Goal 4: Improve industrial competitiveness

Providing clean energy to manufacturers will assist them in improving the environmental performance, and therefore market competitiveness, of their products.

Goal 5: Promote renewable energy production in the Province

The production of renewable energy in the province will promote provincial energy security and self-sufficiency, improve local economies (particularly in rural areas), and assist with job creation both in urban and rural areas.

Goal 6: Promote the development of a renewable energy manufacturing industry and technology development

Meeting goal 6 will create jobs and develop skills and industrial expertise.

The strategy lists a number of recommendations, of which the following are relevant to the development.

Recommendation 1

The development of a sustainable energy sector should form an integral and important part of the Province's development initiatives such as the Provincial Growth and Development Plan and the Green Economy theme of the Provincial Industrial Development Strategy and Implementation Plan.

Recommendation 4

Develop an Eastern Cape Provincial locational perspective on renewable energy, this includes guidance on the appropriate location of renewable energy developments. This includes environmental sensitivity analysis using existing data from various environmental planning processes which indicate ecosystem sensitivities and general parameters that renewable energy developments should work within to avoid controversy and prevent environmental damage and unsustainable development patterns emerging.

2.3.4 Dr Beyers Naude Local Municipality Integrated Development Plan

The vision of the DBNLM is "A responsive, developmental and unifying Local Government providing quality services to its citizens in a safe, healthy and well managed environment, with equal opportunities for all."

The IDP lists five Key Performance Areas (KPAs), namely:

- KPA 1 Organizational Transformation & Institutional Development
- KPA 2 Service Delivery & Infrastructure Planning
- KPA 3 Local Economic Development
- KPA 4 Financial Viability
- KPA 5 Good Governance & Public Participation

KPA 3, local economic development, is the most relevant KPA to the development. The IDP identifies a number of challenges facing economic development in the DBNLM, including high levels of unemployment and poverty. The IDP also notes that a key constraint to economic growth in the DBNLM is the shortage of water. The IDP lists a number of requirements that are required to supporting Local Economic Development (LED). The following are relevant to the proposed development.

- Creation of an environment conducive to economic development through the provision of economic and other infrastructure and investment incentives.
- Creation of employment opportunities and poverty eradication programmes that support and involve SMMEs.
- Created opportunities for skills development and training (internships, learnerships, apprenticeships etc).
- Support Basic Education & Training (ABET, skills development courses).
- Provide community facilities (sports, recreation, and cultural facilities).

The IDP also identifies climate change and the associated droughts as a key threat / risk to economic development.

With reference to renewable energy the IDP notes that the Municipality supports renewable energy and green technology and is actively seeking ways and means to play a meaningful

role in alleviating the country’s energy crisis, by partnering with or supporting initiatives for alternative and renewable energy. However, the IDP also notes that the development of renewable energy projects should not impact on the natural environment and or the health and the livelihoods of its communities. Of specific reference the IDP does refer to the potential threats posed by proposed wind farms.

The proposed development area is located in Ward 1. Table 2.1 provides a summary of the baseline socio-economic conditions and also the key challenges facing Ward 1. The challenges include:

- Unemployment and low skills levels.
- Lack of sports and recreation facilities
- Land for commercial and agricultural development.

Table 2.1: Ward 1 overview

WARD 1 QUICK FACTS (Based on StatsSA 2011 Census results)*				
Size of Ward	5,858 km ²	Number of households		2,241
Main Places	Lotusville & Thembalesizwe			
Main Economic Drivers	Agriculture and Government Services			
Main Employers	Private Sector (mainly Agricultural, Commercial and some small private enterprise)			
	Public Sector (e.g. Municipality, Depts of Health, Education, SAPS)			
	(most of above employers are situated in neighbouring Ward 7)			
Population Stats	Total	Male	Female	Youth (15 – 34 yrs)
	8,048	49%	51%	
Employment Status	Employed	Unemployed	NEA	% of Youth Unemp.
	35%	20 + 7 = 27%	38%	
Sectors of Employment	Formal	Informal	Pvt Households	Unknown
	53%	32%	11%	4%
BIGGEST CHALLENGES IN THE WARD				
<ul style="list-style-type: none"> ▪ Rural roads ▪ Streets & Stormwater in urban areas ▪ RDP/Lowcost Housing rectifications ▪ Sewerage systems ▪ Electricity Provider (Eskom vs Municipality) 		<ul style="list-style-type: none"> ▪ Land for agricultural & commercial development ▪ Landfill site ▪ Sport & Recreation facilities ▪ Unemployment, lack of skills 		

2.3.5 Dr Beyers Naude Spatial Development Framework

Dr Beyers Naudé Local Municipality is third largest Local Municipality in the country and covers an area of 28,653 km². The main settlements include Graaff-Reinet, Willowmore, Aberdeen, Jansenville, Steytlerville, Nieu-Bethesda, Klipplaat and Rietbron; plus a number of smaller settlements and surrounding farms. The town of Graaff-Reinet, 4th oldest in South Africa and referred to as the “Gem of the Karoo”, is a hub of agri-tourism activity and the political and administrative seat of the Municipality.

In terms of the settlements and their functions Aberdeen is identified as a sub-district centre. The SDF notes that the town is located at the junction of the N9 and R61 national and regional distributors and serves an important agricultural service centre to the surrounding community who practice primary stock and game farming activities.

Furthermore, the town is surrounded by primarily privately owned agricultural land units. The urban area comprises of Aberdeen Town, Lotusville and Thembalesizwe settlements.

In terms of potential project linked socio-economic development opportunities, the SDF notes that adequate vacant and partly serviced land is available in Aberdeen for community facilities. This land can be rezoned for community needs and facilities. New spatial planning must provide for all land use and facilities identified by the municipality and residents of Aberdeen. The SDF indicates that the population of Aberdeen was 5 133, made up of 1 407 households.

The vision of the DBNLM SDF is "A resilient and prosperous community living in a pleasant, healthy environment with sustainable well-planned development and integrated settlements".

The SDF notes that the spatial vision can be expanded into four primary spatial goals:

- Spatial Goal 1: Integrated and Efficient Settlements.
- Spatial Goal 2: Tourism and Agricultural Development.
- Spatial Goal 3: Sustainable Resource Use.
- Spatial Goal 4: Mainstream Spatial Planning.

Spatial Goal 3 lists a number of objectives that are relevant to the proposed development. The following are of specific relevance.

Alternative energy production

Green energy production developments (Solar and wind) are supported in principle provided that any negative impacts on the tourism and agricultural economy are avoided. These developments, particularly wind energy production facilities, have a high visual impact on the surrounding area and should be located away from existing and future tourism focus area - Preferably outside of the 10km 'buffer' surrounding the World Heritage Site.

The SDF makes specific reference to renewable energy and refers to projects located near Aberdeen. The SDF also refers to the potential impacts associated with the establishment of renewable energy projects, including potential damage to roads and other infrastructure and their strain on the region's scarce water resources, is a concern. Reference is also made to the traffic impacts associated with the transportation of wind turbine components.

Use of appropriate technology

Alternative and appropriate technologies are utilised to reduce the demand on non-renewable fuel energy and scarce resource.

Adopting the current protected area network

The protected area network together with the proposed ecological linkages is acknowledged in the spatial plan and the appropriate land use management guidelines implemented. The areas that have been identified for protected area expansion have been mapped and are subjected to similar land use management guidelines as for the protected area.

In terms of economic activities tourism and ecotourism are the two key economic drivers in the DBNLM. The key tourist and eco-tourism assets include the Camdeboo National Park with the Valley of Desolation.

The SDF highlights the risks posed by climate change. The area falls within the semi-arid Karoo that is characterised by high summer temperatures and cold, dry winters. The annual

rainfall is low and there are extended dry spells. Drought conditions resulting in water shortages have been experienced in Steytleville, Jansenville and in Graaff-Reinet. As indicated in Figure 2.3, the average rainfall in the study area is 201-400mm per annum.

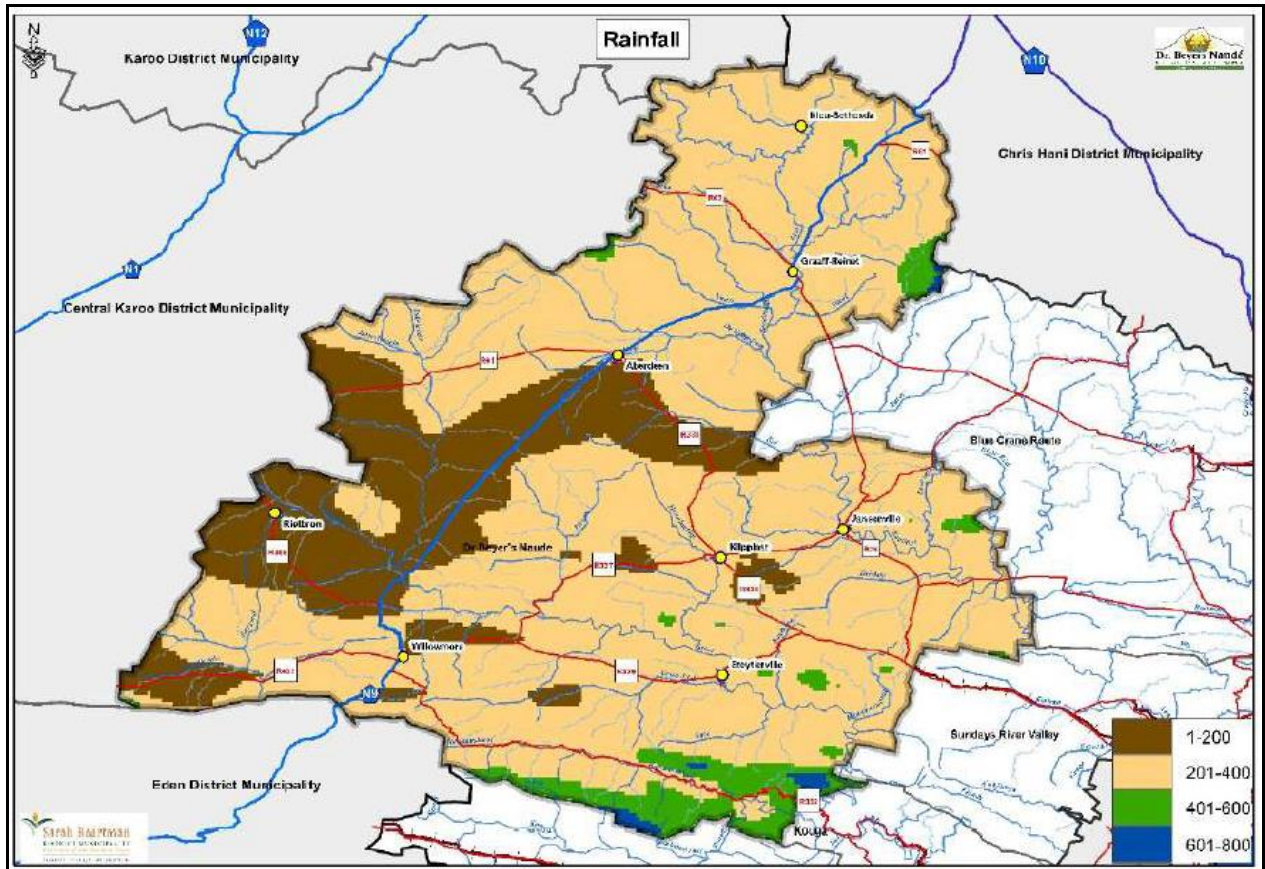


Figure 2.3: Average rainfall Dr Beyers Naudé Local Municipality

The SDF is informed by the Eastern Cape Biodiversity Conservation Plan which aims to mainstream biodiversity into the municipal planning process, in particular the Spatial Development Frameworks (SDFs), in protecting biodiversity and promoting appropriate development. The ECBCP allocates the whole landscape of the Eastern Cape into Biodiversity Land Management Classes (BLMCs), based on how biodiversity should be managed there – i.e. in accordance with its CBA status. As indicated in Figure 2.4 and 2.5 the study area does not appear to be located in a protected or core biodiversity area (CBA 1, 2 or 3).

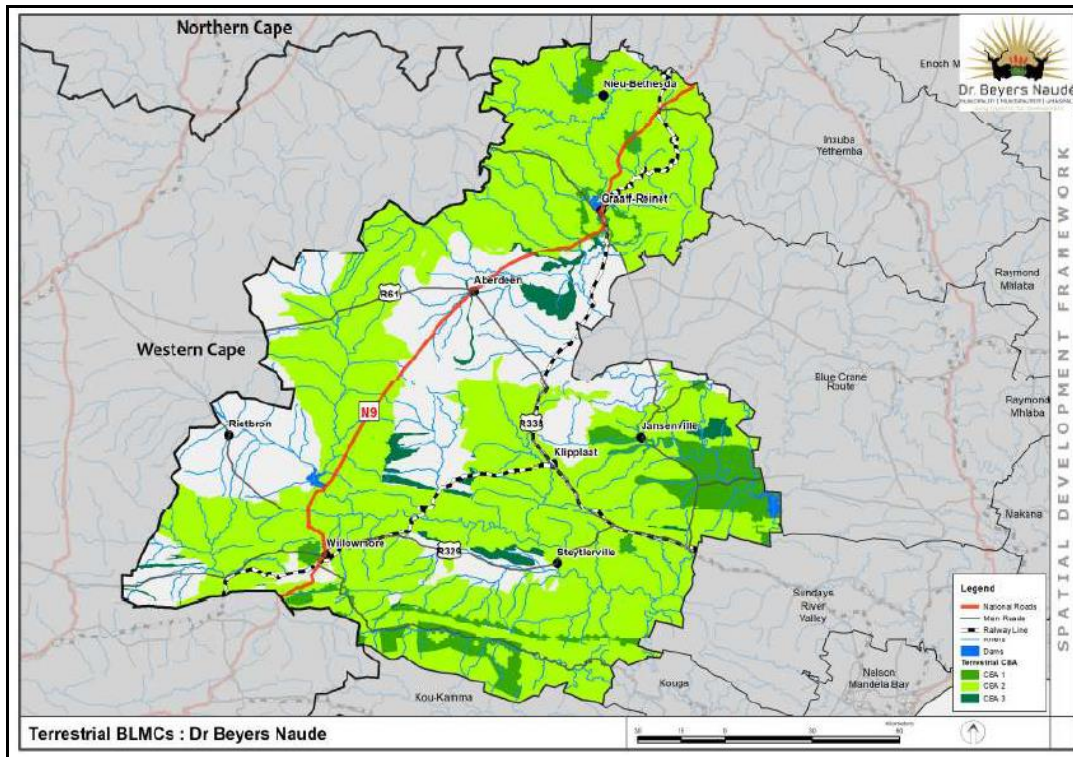


Figure 2.4: Biodiversity Land Management Classes Dr Beyers Naudé Local Municipality

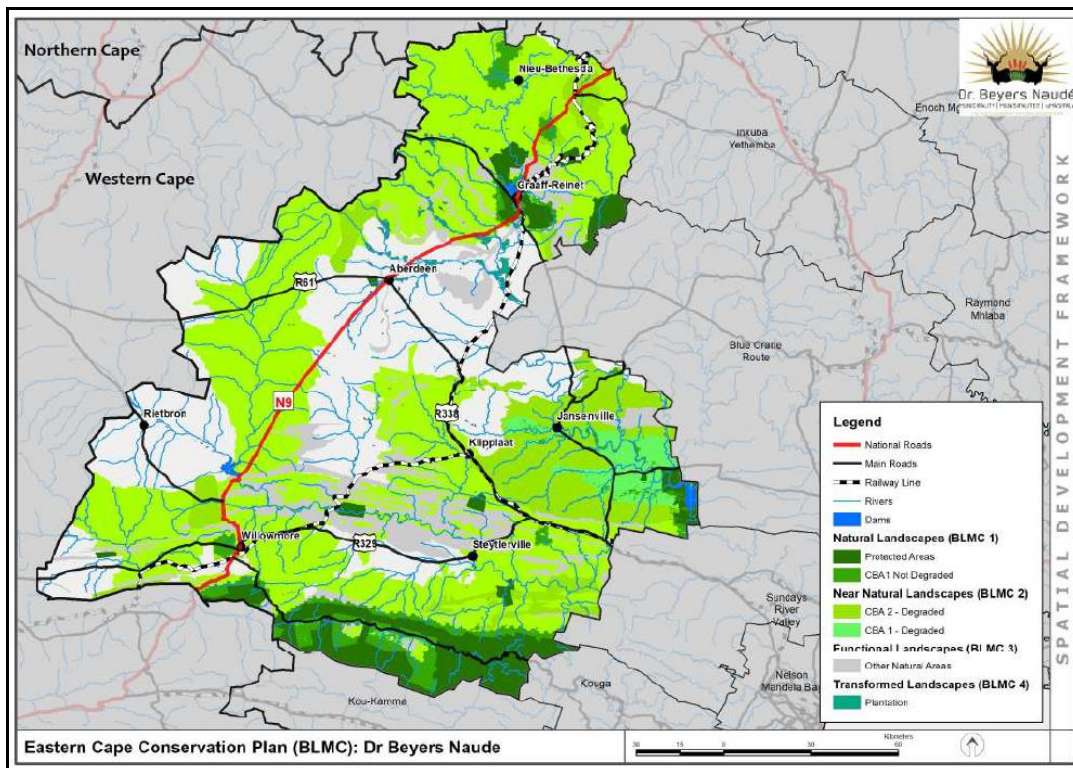


Figure 2.5: Conservation and CBA areas Dr Beyers Naudé Local Municipality

In terms of agricultural potential, as indicated in Figure 2.6, the study area is located in an area defined as low potential grazing land (light brown).

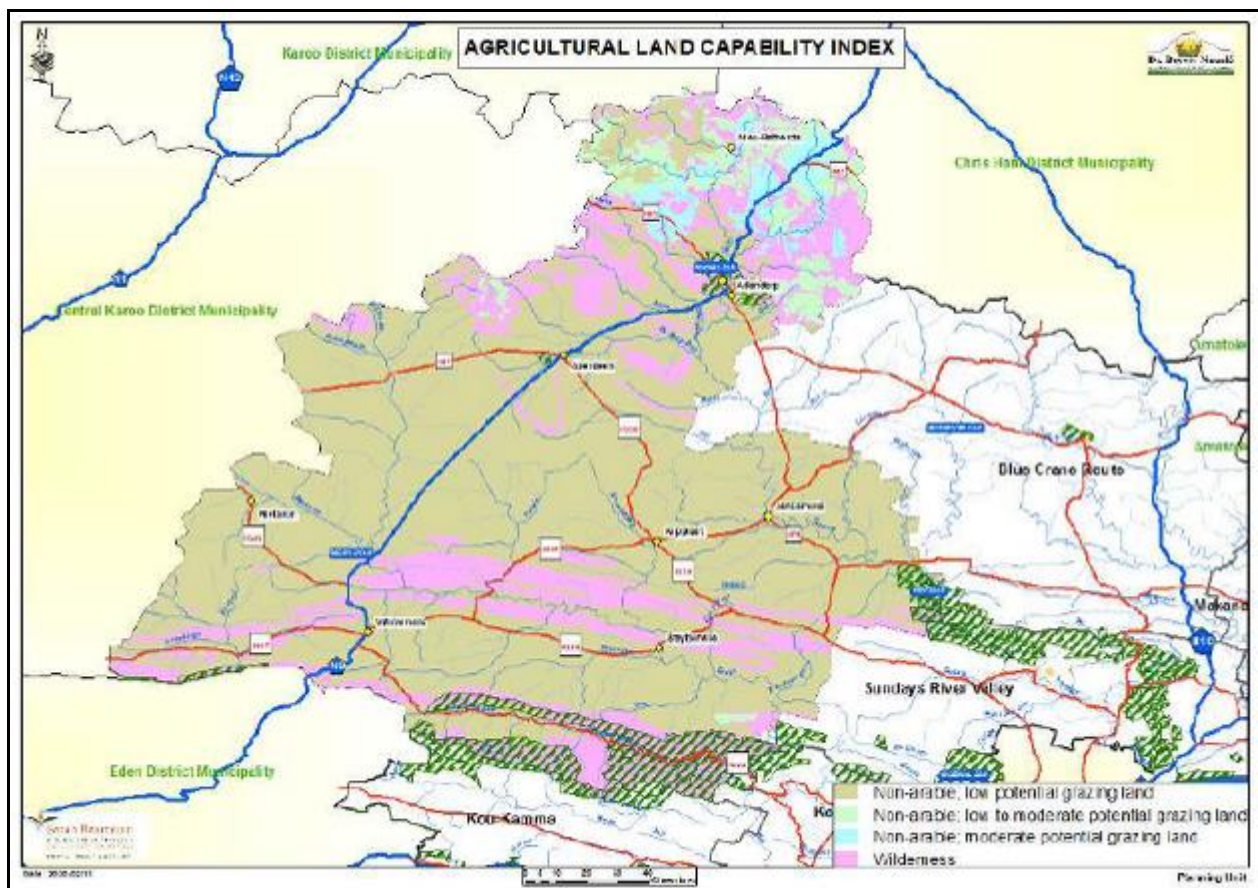


Figure 2.6: Agricultural potential Dr Beyers Naudé Local Municipality

A SWOT analysis was undertaken as part of the SDF process. The following are relevant to the SIA.

Strengths

- The rich biodiversity provides for nature-based community initiatives that support poverty alleviation by creating jobs in industries such as ecotourism.
- Game Farming

Weaknesses and threats

- Climate change
- Increase in population will increase pressure on the provision of infrastructure, services and land for future urban development.
- Low education levels.
- High poverty, low-income levels, and high levels of unemployment.
- Limited opportunities for development and job creation.
- High Grant dependence.
- Eskom supply reliability and “load shedding”.
- Current backlogs in services which will be exacerbated by population growth.

2.4 OVERVIEW 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 (December 2021), 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 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. By 2030, 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, 2022⁵):

- 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 IPPPPP 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.

⁵ IPP Office (2022). RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROCUREMENT PROGRAMME (REIPPPP) BID WINDOW 6 BIDDERS' CONFERENCE, 7 JULY 2022 [online]. Accessed July 2022. <https://www.ipp-renewables.co.za/PressCentre/GetPressRelease?fileid=16a21004-f9fd-ec11-9578-2c59e59ac9cd&fileName=BW6%20Bidders%20Conference%20Consolidated.pdf>.

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 in completion, 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 costs⁶), 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.

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).

⁶ 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)

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 Content⁷

The report notes that the REIPPPP 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 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.

⁷ Local content is expressed as a % of the total project value and not procurement or total project costs.

Leveraging employment opportunities

To date, a total of 63 291 job years⁸ 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 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%.

⁸ The equivalent of a full-time employment opportunity for one person for one year

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 CO₂ (MtonCO₂) 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 (20.5MtonCO₂) achieved with only partial operations. A total of 72.1 Mton CO₂ 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 2.2). 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 2.2: 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	
		Energy efficient motors	-566	4	VL, VL, VL	VL, VL, VL	
	Industrial	Mechanical insulation	666	89	VL, VL, VL	VL, VL, VL	
ENERGY & RESOURCE EFFICIENCY SUB-TOTAL				67 977	2 686		
EMMISSIONS 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	
EMMISSIONS 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 (CO₂) 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 CO₂ 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 2.7).

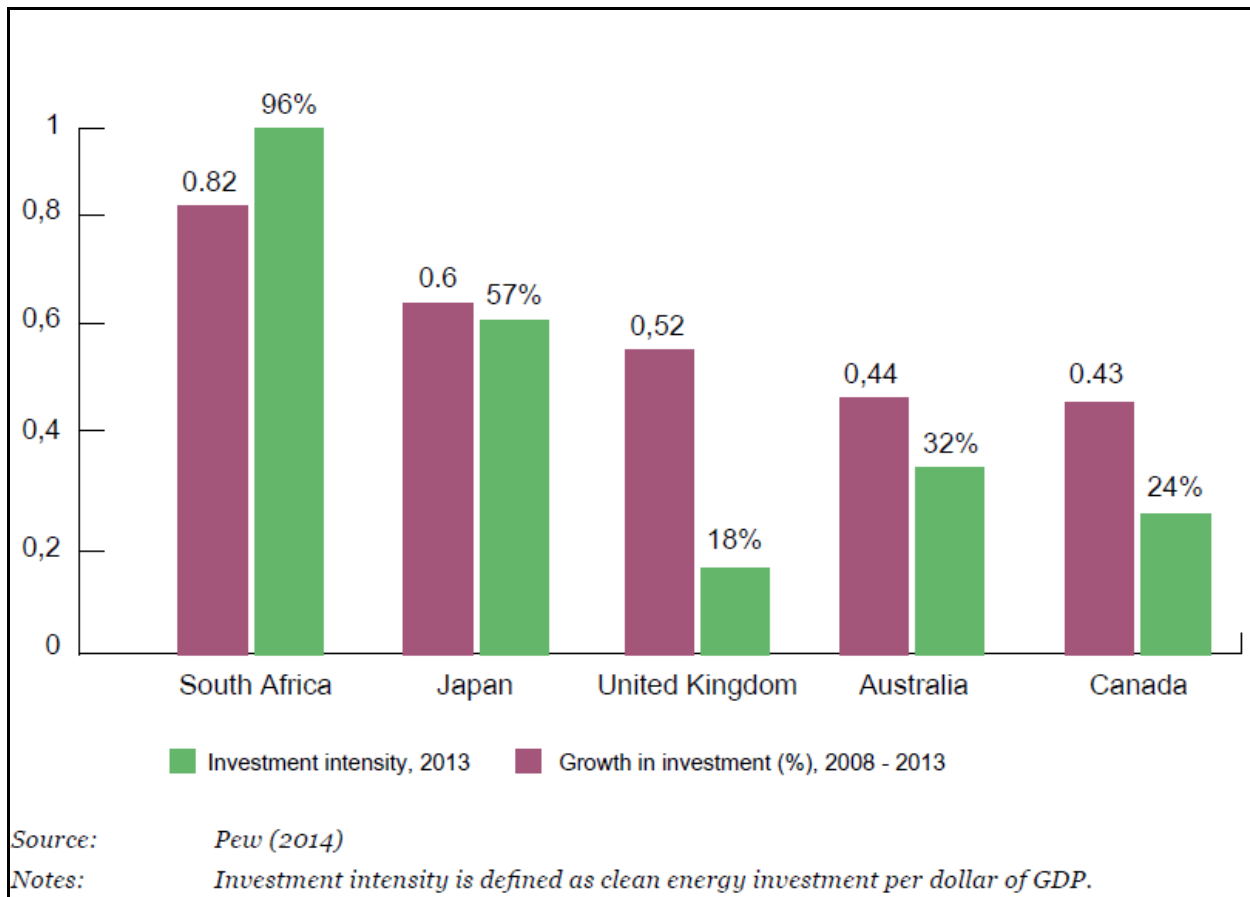


Figure 2.7: South Africa leads as a clean energy investment destination

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 flexibility 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 Report* (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 The potential for local community benefits from wind farms in South Africa

In her thesis, Tait⁹ 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.

⁹ 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

2.5 INTERNATIONAL EXPERIENCE WITH WIND FARMS

Three documents were reviewed, namely:

- National Wind Farm Development Guidelines produced by the Environment Protection and Heritage Council (EPHC) of Australia (Draft, July, 2010). The guidelines highlight the potential social and biophysical impacts associated with WFs. Given the similarities between South Africa and Australia, such as large, unobstructed landscapes and climates, these guidelines are regarded as relevant to the South Africa situation.
- Research on wind energy development in Scotland undertaken by Warren and Birnie in 2009 (Warren, Charles R. and Birnie, Richard V.(2009) 'Re-powering Scotland: Wind Farms and the 'Energy or Environment?' Debate'). The Scottish experience is also regarded as relevant to the South Africa context for a number of reasons. Firstly, installed wind power capacity has expanded rapidly in Scotland over the past decade. Before 1995 no wind farms existed. By late 2008, there were 59 operational onshore wind farms, 65 consented to or under construction and a further 103 in the planning process (BWEA, 2008). South Africa faces a similar situation, with a rush of applicants seeking approval for WFs. Secondly, the impact on the landscape, specifically the Scottish Highlands, was one of the key concerns raised in Scotland. The impact on undeveloped, natural landscapes is also likely to become an issue of growing concern in South Africa.
- Review of the potential health impacts associated with wind farms undertaken by the Australian Health and Medical Research Council (July 2010).

It should be noted that the section is not specific to the site but merely a review of international literature.

Landscape impacts

The guidelines also note that landscapes change over time, both naturally and through human intervention. In addition, landscape values, being subjective, change not only with time, but also from person to person. As a result there are a wide variety of opinions of what is valued and what is not. The perceptions by which we value landscapes are influenced by a range of factors such as visual, cultural, spiritual, environmental, and based on memories or different aesthetics (National Wind Farm Development Guidelines, DRAFT - July 2010).

The guidelines 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 wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

Cumulative impacts may be visual and aesthetic, but they can also occur in relation to non-visual values in the landscape. Non-visual values include sounds/noise, associations, memories, knowledge and experiences or other cultural or natural values. As an example, the Guidelines indicate that locating four wind farms in a valley previously best known for its historic wineries might change the balance of perception about the valley's associational character, irrespective of whether all four wind farms were sited in a single view shed (National Wind Farm Development Guidelines, DRAFT - July 2010).

In the Scottish case, the primary argument employed to oppose wind farms related to the impact on valued landscapes. As in the South African case, the visual impacts are exacerbated by the fact that the locations with the greatest wind resources are often precisely those exposed upland areas which are most valued for their scenic qualities, and which are often ecologically sensitive. The establishment of wind farms together with the associated service roads and infrastructure, transforms landscapes which are perceived to be natural into 'landscapes of power' (Pasqualetti et al., 2002, p. 3).

Health related impacts

The potential health impacts typically associated with WFs include, noise, dust shadow flicker and electromagnetic radiation. The findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation and may therefore in fact result in the minimisation of adverse health impacts for the population as a whole (WHO, 2004).

The overall conclusion of the review undertaken by the Australian Health and Medical Research Council (July, 2010) is that, based on current evidence, wind turbines do not pose a threat to health if planning guidelines are followed.

2.6 IMPACT OF WIND FARMS ON TOURISM

A review of international literature in the impact of wind farms was undertaken as part of the SIA. Three articles were reviewed, namely¹⁰:

- 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.

The most comprehensive appears to be a review undertaken by Professor Cara Aitchison from the University of Edinburgh in 2012 which formed part Renewable Energy Inquiry by Scottish Government. The research by Aitchison found that previous research from other areas of the UK has demonstrated that wind farms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction) (Glasgow Caledonian University, 2008; University of the West of England, 2004). In addition, to date, there is no evidence to demonstrate that any wind farm development in the UK or overseas has resulted in any adverse impact on tourism. In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development. The study by the Glasgow Caledonian University (2008) found that only a negligible fraction of tourists will change their decision whether to return to Scotland as a whole because they have seen a wind farm during their visit.

¹⁰ Annexure E contains a more detailed review of the documents.

The study also found that 51.0% of respondents indicated that they thought wind farms could be tourist attractions. In this regard the visitor centre at the Whitelee Wind Farm in east Ayrshire Scotland run by ScottishPower Renewables has become one of the most popular 'eco-attractions' in Scotland, receiving 200 000 visitors since it opened in 2009. The potential impact of the proposed WEF on the perceptions of visitors, specifically international visitors, has been raised by owners of adjacent game farming operations.

2.7 IMPACT ON WIND FARMS ON PROPERTY VALUES

The literature review undertaken as part of the SIA 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 overseas¹¹. The literature reviewed was based on an attempt by the authors of the SIA to identify what appear to be "scientifically" based studies that have been undertaken by reputable institutions. In this regard it is apparent that there are a number of articles available on the internet relating to the impact of wind farms on property values that lack scientific vigour. The literature review also sought to identify research undertaken since 2010. The literature review does not represent an exhaustive 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.

Three of the articles indicate that wind farms have the potential to impact on property values, while two indicate that the impacts are negligible and or non-existent.

In terms of the proposed project the most relevant study is the Urbis study (2016). The authors of the study found that appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values.

¹¹ Annexure F contains a more detailed review of the documents.

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.
- Provincial context.
- Overview of district and local municipalities.
- Site and the surrounding land uses.

3.2 ADMINISTRATIVE CONTEXT

The DBNLM was established on 8 August 2016 as a result of a merger between the former Municipalities of Camdeboo, Ikwezi and Baviaans. The municipality is one of seven local municipalities that make up the Sarah Baartman District Municipality (SBDM). Graaff-Reinet is the administrative seat of the DBNM (Figure 3.1). The Wind Energy Facility site is in Ward 1 of the DBNLM (Figure 3.2).

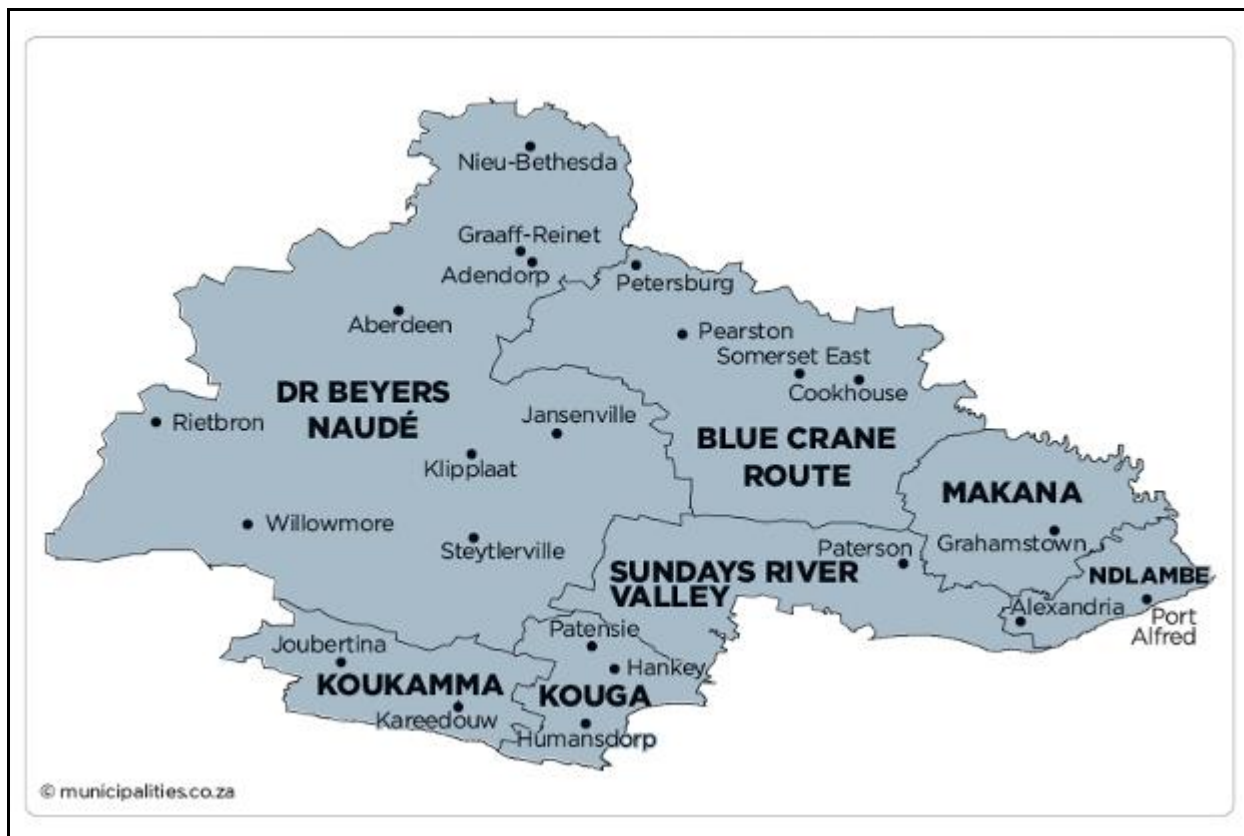


Figure 3.1: Local municipalities within Sarah Baartman District Municipality

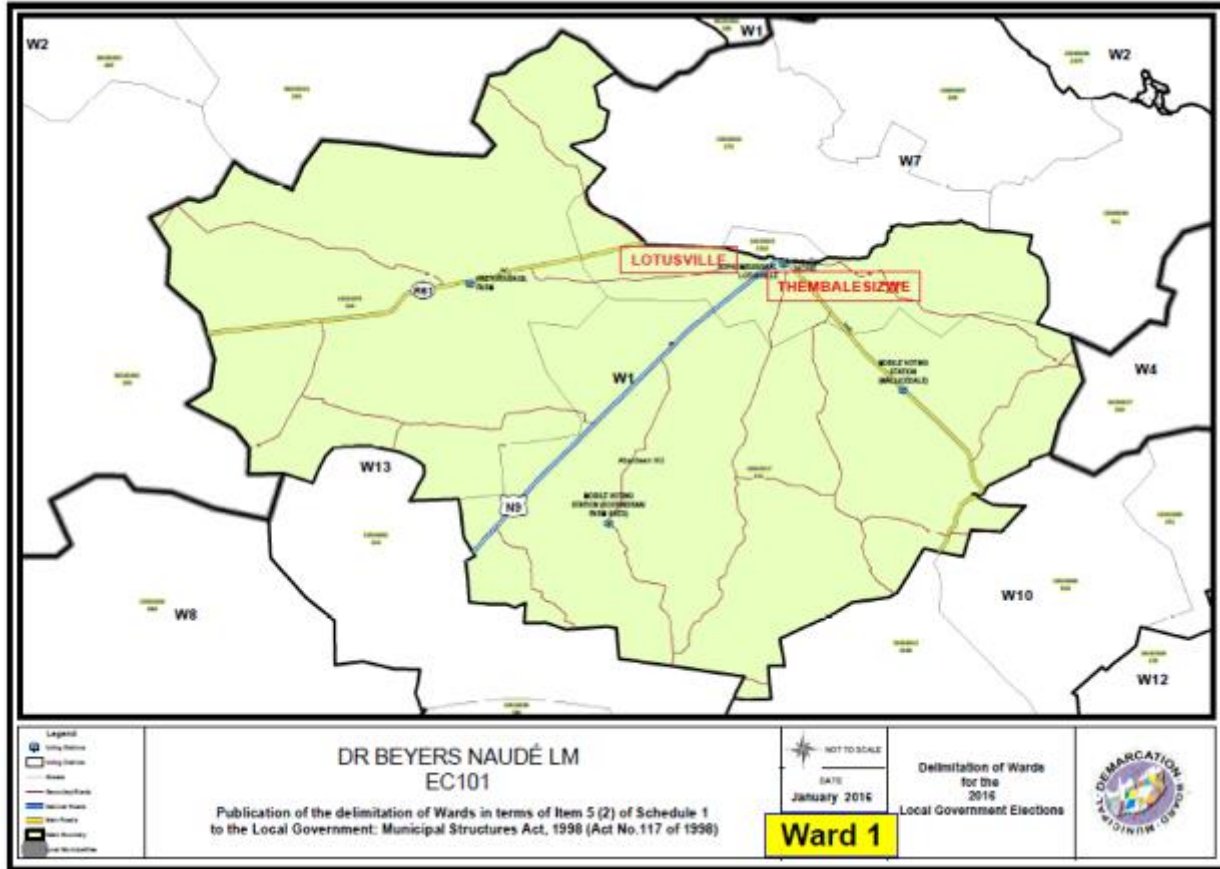


Figure 3.2: Ward 2

3.3 DEMOGRAPHIC OVERVIEW OF DR BEYERS NAUDE MUNICIPALITY

Population

Based on the Household Community Survey (2016), the population of the DBNLM increased from 79 291 in 2011 to 82 197 in 2016. Based on Census 2011 data, the DBNLM represented around 17.5% (79 291) of the SBDM’s population (450 584). The total number of households in 2016 was 20 749, giving an average household size of 4. Of the total number of households, the majority were houses (90.5%), followed by backyard structures (4.4%) and shacks (3.6%). The percentage of informal structures is therefore low when compared to the SBDM where shacks made up 9.4% of the total number of houses.

In terms of language, the majority of the population are Coloured (67.3%), followed by Black African (25.1%) and Whites (7.6%). In terms of age breakdown, under 18 age group made up 41.1%, 18-64 made up 52.9% and the over 65 group the remaining 6%. The dominant language was Afrikaans (75.4%), followed by IsiXhosa (20.9%) and English (2.1%).

The dependency ratio for the DBNLM in 2011 was 60, which was higher than the SBDM (52). The dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. A higher dependency ratio typically translates into a greater likelihood of grant dependencies.

The population of Ward 1 in 2011 was 8 048, made up of 2 241 households. Of the total number of households in Ward 1 the majority were formal houses (94.2%). In terms of population group, majority of the population in Ward 1 were Coloured (77.7%), followed by Black African (18%) and Whites (3.8%). The dominant language was Afrikaans (83.4%), followed by IsiXhosa (13.4%) and English (1.6%).

In terms of age breakdown, under 18 age group made up 37.2%, 18-64 made up 57.4% and the over 65 group the remaining 5.4% in Ward 1. Based on these figures the dependency ratio for Ward 1 was 74.2%. These figures are considerably higher than the ratio for the SBDM (52). A high dependency ratio typically translates into a greater likelihood of grant dependencies and also places increasing pressure on local authorities to generate income to cover costs associated with service delivery.

Household income

Based on the data from the 2016 data, 10.3% of the population of the DBNLM had no formal income, 3.4% earned under R 4 800 per annum, 6.4% earn between R 5 000 and R 10 000, 22.4% between R 10 000 and 20 000 and 24.4% between R 20 000 and R 40 000 per annum (Household Community Survey 2016). Based on the data from the 2011 Census the data for Ward 1, 11% had no formal income, 5.5% earned under R 4 800 per annum, 9% earned between R 5 000 and R 10 000, 26.9 % between R 10 000 and 20 000 and 25.2% between R 20 000 and R 40 000 per annum (Census 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. This equates to R 38 400 per annum. Based on this measure, in the region of 66.9% of households in the DBNLM live close to or below the poverty line. In 2011 this figure was 65.3%. The figure for Ward 1 was 80.3%. The low-income levels reflect the limited formal employment opportunities in the DBNLM and Ward 1 and the dependence on the agricultural sector. 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 district and local municipality.

The COVID 19 pandemic is likely have had a further impact on household income levels.

Employment

According to Census 2011, 24.9% of the SBDM's working age population was officially unemployed in 2011, with the youth unemployment rate considerably higher, namely 31.4%. According to the 2019/2020 DBNLM IDP Review, the 2018/2019 unemployment rate for the SBLM is between 30% and 33%. The IDP notes that according to StatsSA, the number of unemployed persons in the Eastern Cape continues to increase, and it remains the province with the highest unemployment rate in the country.

The relevant figures for the DBNLM were somewhat higher, namely 26% and 33%, respectively. No information for youth unemployment was collected in 2016. However, the national youth unemployment level in 2019 was 39.6%, one of the highest in the world. Youth unemployment in the DBNLM is therefore still likely to be high. Due to the COVID 19 pandemic unemployment levels are likely to be higher.

Education

Education levels in the DBNLM improved between 2011 and 2016 with the percentage of the population over 20 years of age with no schooling dropping from 10% to 5.4%. The percentage of the population over the age of 20 with matric also increased from 20.3% to 26.6%. These figures are higher than the provincial averages of 8 % (no-education) and 26.2% (matric). The overall education levels in the DBNLM are therefore higher than the provincial averages.

Based on the 2011 Census the education levels of for Ward 1 indicate that 14.7% of the population over the age of 20 had no education, 11.6% had matric, and 3% has an undergraduate qualification. The matric rate for Ward 1 was considerably lower than the provincial level of 22.6%. The low education levels in Ward 1 are linked to the rural nature of the area and create challenges in terms of meeting local employment targets during the construction phase.

3.4 MUNICIPAL SERVICES

Access to water

Based on the 2011 Census, 75.9% of households in Ward 1 were provided with water by a service provider, namely the DBNLM, while 19.9% relied on boreholes and 2% on rainwater tanks. The high percentage that relies on boreholes in Ward 1 reflects the rural nature of the area. Due to the rural, dispersed nature of the area, it is both difficult and costly to provide municipal services, hence the reliance on boreholes.

Sanitation

Based on the 2011 Census data 86.1% of the households in Ward 1 had flush toilets, 0.8% relied on bucket latrines, while 10.6% reported no access to toilet facilities.

Refuse collection

75.8% of the households in Ward 1 had their waste collected by a service provider on a regular basis, while 22.9% disposed of their waste at their own dump. The relatively high percentage of households that use their own dump reflects the sparsely populated, rural nature of the area and the challenges associated with providing services across large distances.

3.5 HEALTH, COMMUNITY AND SAFETY FACILITIES

Health facilities

The IDP notes that the DBNLM boasts the recently upgraded Midlands Provincial Hospital (situated in Graaff-Reinet). The facilities in Aberdeen include 1 primary health care clinic, 1 mobile clinic and 1 provincially aided hospital (Table 3.1).

Table 3.1: Health care facilities in DBNLM

CATEGORY	GRAAFF-REINET	ABERDEEN	NIEU-BETHESDA	JANSENVILLE	KLIPPLAAT	WILLOWMORE	STEYTLERVILLE	RIETBRON	TOTAL
Primary Health Care Clinics	3	1	1	2	1	1	1	1	11
Mobile Clinics	2	1	0	1	0	1	1	1	7
Community Health Centre (Day Hospital)	1	0	0	0	0	0	0	0	1
TB Hospital	1	0	0	0	0	0	0	0	1
Provincial Hospitals	1	0	0	0	0	0	0	0	1
Provincially-aided Hospitals	0	1	0	1	0	1	0	0	3

Community facilities

The IDP notes that all of the towns have Community Halls and Libraries. The more remote settlements utilize Church or School Halls (in some instances, even School classrooms) for public meetings and gatherings. The sports, recreation, and community facilities in Aberdeen include 3 community halls, a library, four sports fields for soccer/ rugby, a swimming pool, tennis and netball courts, two play parks and a caravan park. (Table 3.2).

Table 3.2: Sports and community facilities in DBNLM

MUNICIPAL-OWNED FACILITIES	GRAAFF-REINET	ABERDEEN	NIEU-BETHESDA	JANSENVILLE	KLIPPLAAT	WATERFORD	WILLOWMORE	STEYTLERVILLE	RIETBRON	BAVIAANSKLOOF	TOTAL
Town- and Community Halls	4	3	1	3	3	1	3	2	1	1	22
Libraries	4	1	1	1	1	-	1	1	1	1	12
Multi-code Sports complexes	2	-	-	-	-	-	-	-	-	0	2
Rugby & Soccer Fields	5	4	1	3	2	-	1	1	1	1	19
Cricket Fields	2	-	1	-	-	-	1	1	-	0	5
Tennis & Netball Courts	1	1	1	-	-	-	-	-	-	0	3
Swimming Pools	2	1	-	-	-	-	-	-	-	0	3
Play Parks	7	2	1	-	-	-	-	-	-	1	11
Caravan Parks	1	1	1	1	-	-	1	-	-	-	5

Education facilities

The IDP notes that the DBNLM has 47 schools registered with the Department of Education. Of interest the IDP notes that there are 3 primary and 1 high school in Aberdeen, but no pre-primary schools. There is also one farm school (Table 3.3).

Table 3.3: Education facilities in DBNLM

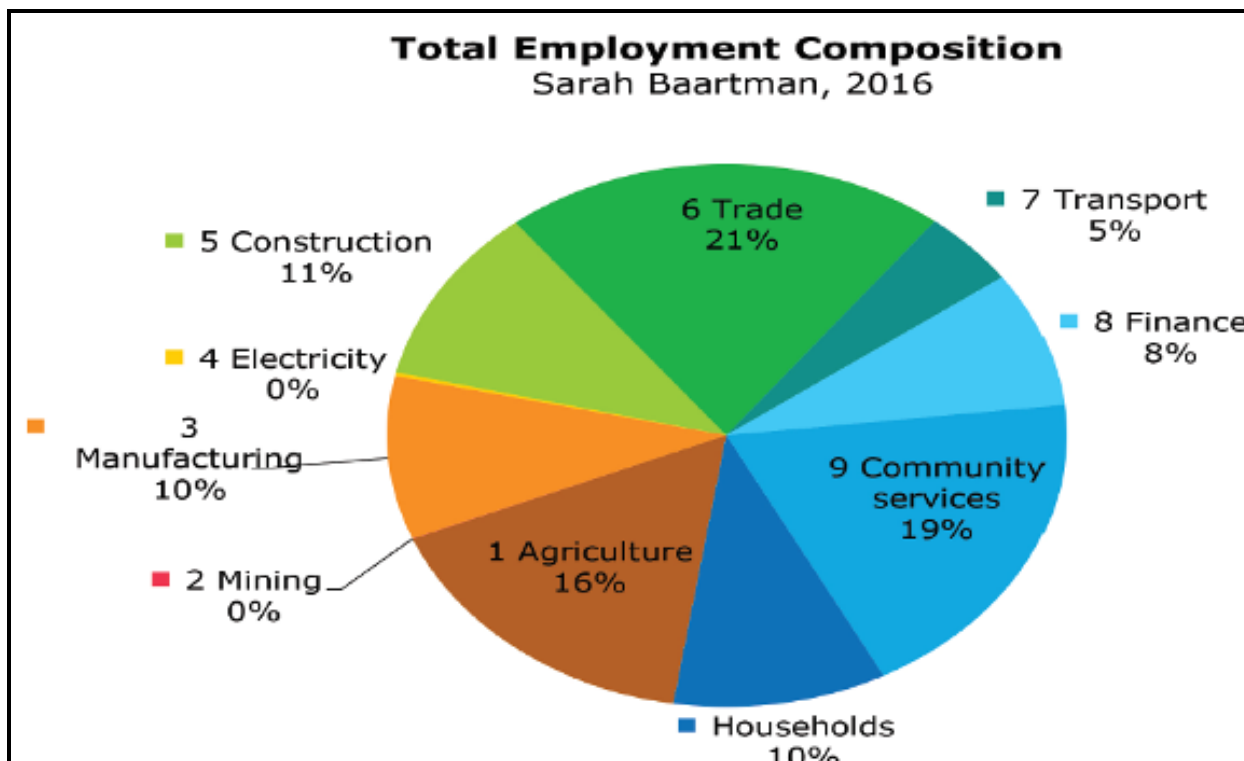
CATEGORY	GRAAFF-REINET	ABERDEEN	NIEU-BETHESDA	JANSENVILLE	KLIPPLAAT	WATERFORD	WOLWEFONTEIN	WILLOWMORE	STEYTLERVILLE	RIETBRON	TOTAL
Pre-primary	2	0	0	0	0	0	0	2	0	0	4
Primary	10	3	1	0	2	1	1	2	2	2	24
Secondary (High)	5	1	0	2	1	0	0	1	1	0	11
Farm Schools (Primary)	6	1	1	0	0	0	0	0	0	0	8

3.6 ECONOMIC OVERVIEW

According to the 2019/2020 SBDM IDP Review, The SBDM is the third largest economy in the Eastern Cape Province, and the largest economy outside the largely “urban economies” of the Nelson Mandela Bay Municipality and Buffalo City Municipality. The predominant sectors in terms the District’s economy are agriculture and tourism, contributing approximately R690 million and R680 million respectively to the Gross Geographic Product (GGP) of the District. These sectors also hold the greatest potential for economic development in the DM.

The key established agricultural sub-sectors in the SBDM are red meat, wool & mohair, dairy, poultry, pork, chicory, and pineapple. Agricultural production around Graaff-Reinet is focused on red meat, wool, and mohair production. Key diversification sectors in the DM include essential oils, exotic fruit, bee keeping and aquaculture. Water is the key limiting factor to agricultural development in the DM.

In terms of the SBDM’s economic sectors’ relative contribution to employment, the three biggest sectors in 2016 were Trade (21%), Community Services (19%) and Agriculture (16%), with Construction (11%), Manufacturing (105) and Finance (8%) making further substantial contributions (Figure 3.3).



Source: SBDM IDP 2019/2020 Review

Figure 3.3: Employment contribution by economic sector in the SBDM in 2016

According to the 6-year (2016-2021) Gross Value Added (GVA) projections included in the IDP Review (Table 3.4), the agricultural sector is expected to grow the fastest of the DM's sectors until 2021, namely at an average of 3.89% annually from R 1.33 billion in 2017 to R 1.61 billion in 2021. The community services sector is estimated to be the largest sector within the SBDM by 2021, with a total share of 28.6% of the total GVA (as measured in current prices), growing at an average annual rate of 1.3%.

No separate figures for the Tourism sector are available. However, according to the 2019/2020 IDP Review, during the period 2006-2016, the number of bed nights spent by domestic tourists in the DM decreased at an average annual rate of -5.27%, while in the same period the international tourists increased by an average annual rate of 1.75%. The total number of bed nights spent by tourists in the DM decreased at an average annual growth rate of -3.55% from 3.01 million in 2006 to 2.1 million in 2016. The reason(s) for these decreases are not addressed in the IDP.

Like the SBDM, Agriculture and Tourism are the key sectors and drivers of the DBNLM economy. The LM also enjoys comparative advantages with regard to these two sectors. This is linked to the Graaff-Reinet area being the country's leading producer of mohair, and one of its key wool producing districts (agriculture), and unique tourism assets associated with the historic town of Graaff-Reinet, the Owl House in Nieu-Bethesda, and wilderness resources associated with the general Great Karoo landscape and the Baviaanskloof Mega-Reserve in the south of the LM.

Table 3.4: SBDM GVA by broad economic sector for the period 2016-2021 (in R Billion at 2010 values)

	2016	2017	2018	2019	2020	2021	Average Annual growth
Agriculture	1.33	1.44	1.48	1.52	1.56	1.61	3.89%
Mining	0.18	0.18	0.18	0.18	0.19	0.19	0.17%
Manufacturing	1.90	1.90	1.93	1.96	2.01	2.07	1.76%
Electricity	0.18	0.18	0.18	0.18	0.19	0.20	1.18%
Construction	1.66	1.69	1.72	1.76	1.82	1.89	2.67%
Trade	4.71	4.75	4.83	4.94	5.11	5.28	2.32%
Transport	1.70	1.72	1.75	1.79	1.84	1.90	2.23%
Finance	3.54	3.56	3.64	3.73	3.84	3.96	2.26%
Community services	6.41	6.50	6.51	6.58	6.69	6.84	1.31%
Total Industries	21.61	21.92	22.22	22.65	23.24	23.93	2.06%

Source: SBDM IDP 2019/2020 Review

In 2016, the DBNLM's Gross Domestic Product (GDP) was R4.65 billion, its GVA R2.98 billion, in both instances a ~3% gain over 2006 (Table 8). In terms of GVA, Community Services (R931.1 million) was the biggest sectoral contributor in 2016, followed by Finance, Trade and Manufacturing (Table 3.5). The LM's spatially dominant Agriculture sector only contributed R153.1 million to GVA in 2016. Projections to 2021 indicate that the LM's GVA is expected to increase to R3.3 billion by that date. The relative contributions of the relevant sectors are anticipated to remain unchanged.

Table 3.5: Key economic indicators for the DBNLM 2006-2021 (in R Billion at 2010 values)

REGIONAL GROSS DOMESTIC PRODUCT		R4.65 billion	Average annual growth of 3.02% from 2006		
REGIONAL GROSS VALUE ADDED		R2.98 billion	Average annual growth of 3.01% from 2006		
TOTAL PERSONAL INCOME		R3.74 billion	Average annual growth of 2.5% from 2006		
PER CAPITA INCOME		R44,400	Substantial increase year-on-year from 2006		
GINI CO-EFFICIENT		0.58	10% improvement from 2006 to 2016		
POVERTY GAP		26.9%	11% improvement from 2006 go 2016		
PER SECTOR GVA FOR 2016			PER SECTOR GVA FORECAST FOR 2021		
1	Community Services	R931.1 million	1	Community Services	R1 billion
2	Trade	R492.1 million	2	Finance	R558.5 million
3	Finance	R501.2 million	3	Trade	R554.6 million
4	Manufacturing	R310.2 million	4	Manufacturing	R343.4 million
5	Transport	R237.2 million	5	Construction	R266.3 million
6	Construction	R231.1 million	6	Transport	R264.9 million
7	Mining	R153.1 million	7	Mining	R153.1 million
8	Agriculture	R119.8 million	8	Agriculture	R146.0 million
9	Electricity	R8.9 million	9	Electricity	R9.6 million
REGIONAL GVA TOTAL		R2.98 billion	REGIONAL GVA TOTAL		R3.3 billion

Source: DBNLM IDP 2019/2020 Review

According to the DBNLM IDP 2019/ 2020 Review, the Karoo region does not lend itself well to industrialization. Most of its small to medium-sized industries are situated in Graaff-Reinet, and some of the main manufacturers (and biggest employers) have only established their business in the industrial area in recent years. There is scope for expansion in Graaff-Reinet.

Government Services generate good employment opportunities in the LM, and the DBNLM is one of the biggest employers. A number of Sector Departments have offices in the larger towns, particularly Graaff-Reinet. Commercial and retail enterprise are relatively strongly represented in Graaff-Reinet and Willowmore, and to a lesser degree in the smaller towns of Aberdeen, Steytleville and Jansenville. Mining of minerals such as sand, stone and clay also provides employment opportunities in the region, but there is concern about natural resources being over-exploited and causing irreversible damage to the environment.

According to the IDP Review, SMMEs are finding it quite hard to survive in the current poor economic climate. The lack of a sustainable water supply, affordable and regular transportation, skills and expertise are identified as some of the key challenges curtailing economic growth in the region.

3.7 OVERVIEW OF STUDY AREA

3.7.1 Introduction

The study area is located approximately 15-20 km west of the small town of Aberdeen (Figure 3.4). Aberdeen is located in the Dr Beyers Naudé Local Municipality (Sarah Baartman District Municipality) in the central western part of the Eastern Cape Province. Graaff-Reinet, located approximately 65 km north east of the site, is the largest town in the

Dr Beyers Naudé LM, and also serves as its administrative seat and regional services centre. Other settlements in the DBNLM include Jansenville, Steylerville, Willowmore and Klipplaat. The large town of Beaufort West (Western Cape Province) and the N1 corridor are located approximately 100 km west of the site.

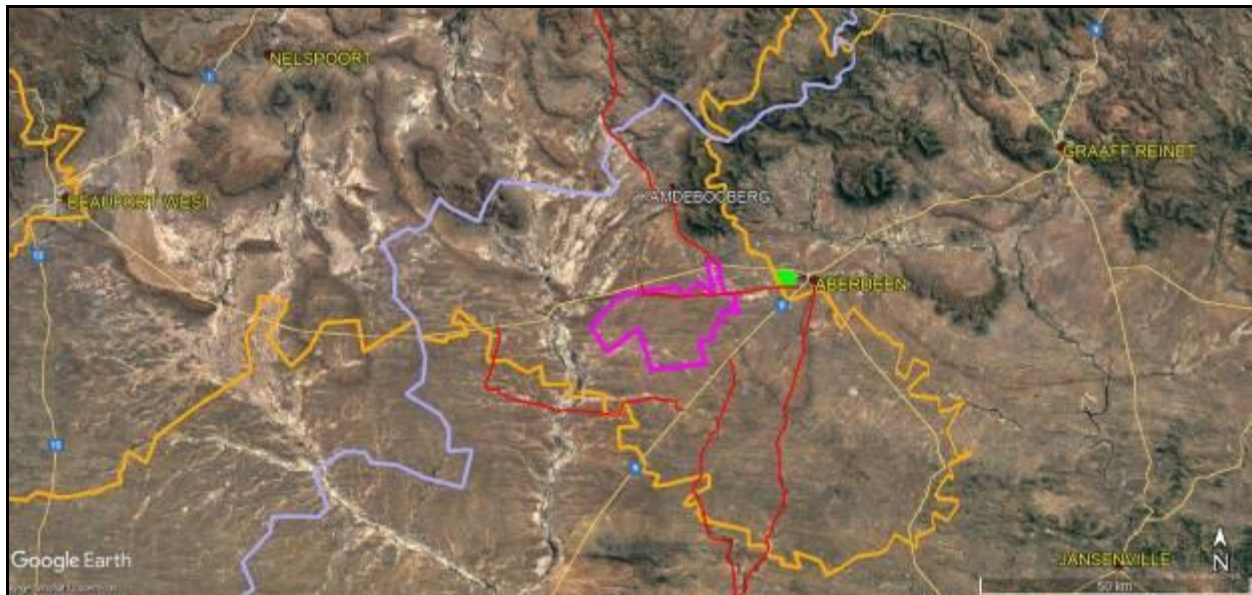


Figure 3.4: Aberdeen WEF (1, 2 and 3) study area (pink) in relation to Beaufort West REDZ (orange), provincial boundary (grey), public gravel roads (red) and Fonteimbos Nature Reserve (green fill)

Aberdeen is located at the intersection of the N9 (Graaff-Reinet-Willowmore), the R61 (Aberdeen-Beaufort West) and the R338 (Aberdeen-Klipplaat). The R61 is a key taxi route between the Western and Eastern Cape Provinces. Traffic volumes peak over holiday periods, especially Easter weekend and Christmas season. Access to properties in the immediate study area is directly off the R61 or N9, or one of two public gravel roads – the Rietbron and Doringpoort Roads – linking the R61 and the N9. The east-west aligned Doringpoort road traverses the northern portion of the site.

The study area is located in the northern portion of the vast Central Karoo plain, near the transition into the Great Escarpment. Kamdebooberg is located approximately 5 km north of the site (Photograph 3.1, 3.2 and 3.3). The study area and surrounding plain is classified as arid, receiving a mean annual rainfall of 100-200 mm/year, mainly in summer. Rainfall increases progressively northward from the site as elevation increases, with portions of the Kamdebooberg falling within the 600-700 mm isohyet. The plains veld consists of karroid scrub, with trees essentially limited to ephemeral watercourses and farm yards. The site is traversed by two ephemeral watercourses, namely the Kraai River (north eastern portion) and the Gannaleegte River (western portion). The study area is prone to extended periods of drought and is currently recovering from a severe decade-long drought.



Source: S Winter

Photograph 3.1: View of Kamdebooberg from R61 looking north



Source: S Winter

Photograph 3.2: View from N9 looking south with site to the right



Source: S Winter

Photograph 3.3: View looking west over the site

The study area economy is strongly anchored in agriculture, with extensive small stock grazing the predominant land use. Veld carrying capacities range between 17 ha per 1 Large stock unit (LSU = head of cattle) (along the ephemeral rivers) to 14:1 for the site and increasing to 12:1 on the slopes of the Kamdebooberg. Cropping activities are limited, and largely confined to the banks of ephemeral watercourses. Plantings are mainly of fodder crops, typically for own use. Relatively few employment opportunities are associated with extensive stock farming. The study area settlement pattern is sparse. This is linked to the nature of extensive stockfarming. Farming units are typically large, and consist of a number of properties. In many instances, inhabitation is limited to one or two properties, with the balance serving only as stock posts. Limited dedicated tourism is associated with the study area. Tourist accommodation in and around Aberdeen is mainly linked to passing traffic. Only one proclaimed nature reserve is located in meaningful proximity to the site, namely the Aberdeen Nature Reserve located approximately 10 km to the east of the site at the intersection between the R61 and the N6 (Photograph 3.4). The 1 500-ha local authority reserve is located in the floodplain of the Kraai River. It features a perennial spring and dinosaur tracks. It accommodates antelope and a rich variety of bird life. It offers hiking trails but no accommodation.



Source: S Winter

Photograph 3.4: View looking south from R61 towards site with Aberdeen Nature reserve in foreground

3.7.2 Affected properties

The Aberdeen Wind Energy Facility site (1, 2 and 3) is located on 9-10 properties which are owned by 4 land owners. (Figure 3.5 and Table 3.6). All the properties are exclusively used for farming small stock, mainly sheep. The properties form part of larger operations based on off-site properties and are essentially used as uninhabited stock posts. Dwellings are located on 7 of the site properties, but only those on Farm 94/1 are inhabited, namely by the owner and 9 farm worker households (Photograph 3.5). Labour resides on the site adjacent Pretoriuskuil Farm. No tourism or commercial hunting operations are associated with the site properties.



Figure 3.5: Aberdeen WEF site (pink) in relation to affected land owners: Mr Lategan (light blue fill) Mr Marx (dark green), Mr Paxton (dark blue) and Mr Smit (grey). Also indicated are adjacent properties (yellow), public gravel roads (red), existing Eskom lines (orange), Fonteinbos NR (green fill), and approved Eskom 200 MW Aberdeen WEF (white)

Table 3.6: Overview of directly affected properties

OWNER ¹²	PROPERTY	DWELLINGS	USE
	Kraai Rivier 149/RE	n.a.	Part of a larger stock farming operation based to the north of the site; Used as stock posts; No inhabitation; No dedicated labour; No tourism or paid hunting
	Kraai Rivier 149/3	Karoorivier (uninhabited)	
	Kraai Rivier Outspan 150/RE	n.a.	
	Kraai Rivier Outspan 150/1	n.a.	
	Wildebeeste Poortjie 153/3	Skoongesig (uninhabited)	
	Farm 94/1	Perseverance	Owner + 9 labourer families reside on property; Used for stock farming; No tourism or paid hunting
	Kraanvogel Kuil 155	Kraanvoëlkuil (uninhabited)	Part of a larger stock farming operation based in Aberdeen area; Used as stock post; No inhabitation; No dedicated labour; No tourism or paid hunting
	Doornpoort 93/RE	Doornpoort (ruin)	Part of a larger stock farming operation based to the north of the site; Labour force based on site-adjacent
	Doornpoort	Windermere	

¹² The owners' names have not been included to protect their privacy. DFFE will have access to the names.

	93/1	(uninhabited)	Pretoriuskuil; Used as stock posts; No inhabitation; No dedicated labour; No tourism or paid hunting
	Koppies Kraal 157/RE	Althro (uninhabited)	



Source: S Winter

Photograph 3.5: Farmstead on Perseverance

The site properties border onto 25 properties. All of the relevant properties are primarily used for stock farming, with some also including ostriches. In as far as could be established, only 3 of these properties are currently inhabited, namely Mon Repos (Wildebeste Poortje 153/RE), Kaapse Poortjie (Wildebeste Poortje 153/1/RE), and Pretoriuskuil (Farm 91/RE). Sheds and uninhabited farmsteads (e.g., Uitsig, Gannaleegte, Sypher) are located on a number of others. Tourist accommodation in and around Aberdeen is mainly linked to passing traffic. The Karoo Secret Guest Farm is located approximately 12km from the area. A guest accommodation facility (dwelling) is located in the farm yard on Kaapse Poortjie. The facility caters mainly for travellers on the N9. The owner has indicated that the facility is not sensitive to visual impacts from the proposed WEF (Lategan, Mr Jacobus, pers. comm).

No major energy generation or transmission infrastructure is associated with the study area. A 66 kV line feeds onto a small substation on the portion of Kaapse Poortjie east of the N9 from the east. No other transmission lines are located in the study area. The site of the approved 200 MW Eskom Aberdeen WEF is located adjacent to the north of the study site (see below).

3.7.3 Other renewable energy facilities

The Aberdeen Wind Farm Facility site is located in the Beaufort West REDZ. The DFFE's Renewable Energy Applications website indicates one (1) historic application is located within a 30 km radius of the site, namely the Eskom 200 MW Aberdeen WEF adjacent to the north of the site (Figure 3.6). The 200 MW Eskom WEF was approved in 2016. It would consist of 100 turbines (140 m hub height). Eskom in August 2021 announced that it plans to construct the Aberdeen WEF as part of phase 2 of its REF build programme up to 2030. The Phase 2 projects are envisaged for construction 2023-5.

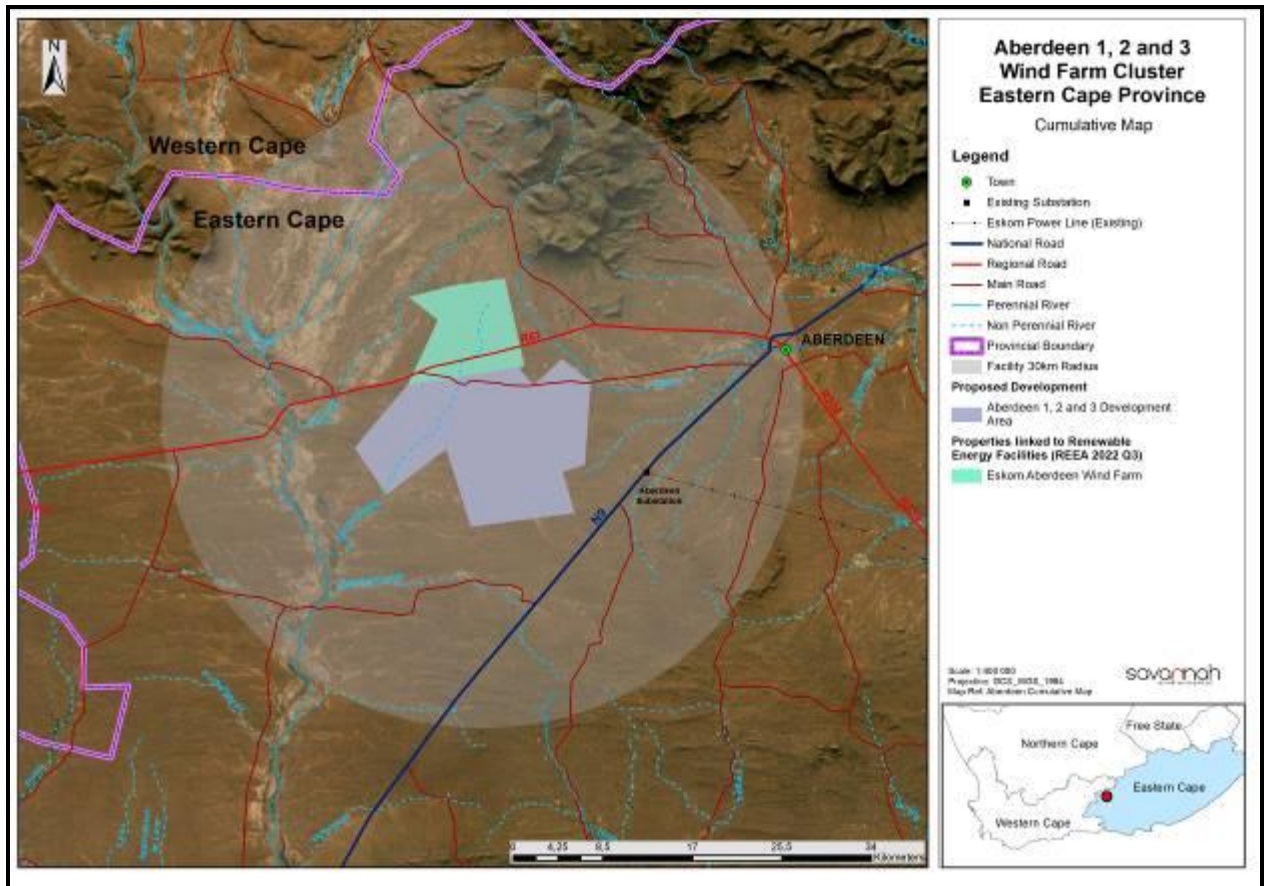


Figure 3.6: Aberdeen WEF site (mauve) in relation to approved Eskom Aberdeen WEF (light green); red circle indicates 30 km radius from site.

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 DBNLM 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 Aberdeen Wind Energy Facility 2 is therefore supported by key policy and planning documents.

4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

Potential positive impacts

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

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, training, and business opportunities

The construction phase will extend over a period of approximately 24-30 months and create in the region of 250-300 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 Aberdeen and Graaf Reinet, would be in a position to qualify for most of the low skilled and semi-skilled employment opportunities. Most of these employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. The total wage bill will be in the region of R 150 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area.

Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. However, in the absence of specific commitments from the developer to maximise local employment targets, the potential opportunities for local employment may be reduced. In addition, the low education and skills levels in the area may hamper potential opportunities for local communities. Where feasible, the implementation of a training and skills development programme prior to the commencement of construction would also increase the potential to employ local community members. The number of low skilled and semi-skilled positions taken up by members from the local community will depend on the effective implementation of these enhancement measures by the proponent in consultation with the DBNLM. Due to the small size of the local towns in the area, the ability to find suitably qualified and educated local workers may however be limited.

The capital expenditure associated with the construction phase will be approximately R 6 billion (2023 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 DBNLM. 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 years¹³ 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.

¹³ The equivalent of a full-time employment opportunity for one person for one year.

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 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	Highly probable (4)	Highly probable (4)
Significance	Medium (40)	Medium (44)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	
<p>Enhancement Measures: In order to enhance local employment and business opportunities associated with the construction phase, the following measures should be implemented:</p> <p>Employment</p> <ul style="list-style-type: none"> • 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 DBNLM 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 DBNLM 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 nearby towns of Aberdeen and Graff Reinet. 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. The potential impact on the local community will therefore be negligible. The balance of semi-skilled and skilled workers will be accommodated in the nearby towns of Aberdeen and Graff Reinet.

While the risks associated with construction workers at a community level will be low, 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 for community as a whole (2)	Short term for community as a whole (2)
Magnitude	Moderate for the community as a whole (6)	Low for community as a whole (4)
Probability	Probable (3)	Probable (3)
Significance	Medium for the community as a whole (30)	Low for the community as a whole (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	
<p>Recommended enhancement measures:</p> <ul style="list-style-type: none"> • 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 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 should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. • 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, COVID-19 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 contractor 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 tend 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 Aberdeen and Graff Reinet. The risks associated with the influx of job seekers 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	
<p>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:</p> <ul style="list-style-type: none"> • 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, in consultation with the DBNLM should investigate the option of establishing a MC to monitor and identify potential problems that may arise due to the influx of job seekers to the area. • 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. • No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. 		
<p>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.</p>		

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 farmers 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 also 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 feedback from interviews with local landowners, stock theft was identified as a key concern.

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
<p>Recommended mitigation measures:</p> <ul style="list-style-type: none"> 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. 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 MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee 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 losses 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 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. The potential risk of grass fires will be higher during the dry, windy winter months from May to October.

Table 4.5: 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		
<ul style="list-style-type: none"> • 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 must compensate farmers for any 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.

4.3.6 Nuisance impacts associated with construction related activities

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 4.6: 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 potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include:		
<ul style="list-style-type: none"> • 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.
- 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.
- 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.

4.3.7 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 grazing. The impact on farmland associated with the construction phase can 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. Existing internal roads should be used where possible. This requires careful site planning and management of operations. In the event that new roads are required, these roads should be rehabilitated on completion of the construction phase. In addition, the landowners will be compensated for the loss of land.

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	Yes, loss of farmland. However, disturbed areas can be rehabilitated

	rehabilitated	
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
<p>Recommended mitigation measures</p> <p>The potential impacts associated with damage to, and loss of farmland can be effectively mitigated. The aspects that should be covered include:</p> <ul style="list-style-type: none"> • 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. 		
<p>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.</p>		

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

- Establishment of infrastructure to improve energy security and support the 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.
- Potential wake loss impact on adjacent Eskom Wind Energy Facility.

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 generators¹⁴. 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 of revenue during due to load shedding period¹⁵.

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.

¹⁴ 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

¹⁵ "How does load shedding affect small business in SA?". *The Yoco Small Business Pulse* (3: Q1 2019): 3

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
Can impact be mitigated?	Yes	
Recommended mitigation measures		
The proponent should:		
<ul style="list-style-type: none"> • 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 opportunities

The proposed development will create in the region of 40-50 full time employment opportunities during the operational phase, of which 55% will be unskilled, 35% semi-skilled, and 15% skilled. The annual operating budget will be in the region of R 50 million (2023 Rand values), including wages. A percentage of the annual operating budget will be spent in the local economy which will benefit local businesses.

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	
<p>Enhancement Measures: In order to enhance local employment and business opportunities associated with the construction phase, the following measures should be implemented:</p> <p>Employment</p> <ul style="list-style-type: none"> • 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 contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. • Before the construction phase commences the proponent should meet with representatives from the DM 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. <p>Business</p> <ul style="list-style-type: none"> • The proponent should liaise with the DBNLM 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. <p>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.</p>		

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 enter into rental agreements with the affected landowners for the use of the land for the establishment of the proposed WEF. In terms of the rental agreement, the affected landowner will be paid an annual amount dependent upon the number of wind turbines located on the property. The additional income will reduce the risk to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. 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 20-25 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. In this regard 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.

The Green Jobs study (2011) found that the case for renewable energy is enhanced by the positive effect on rural or regional development. Renewable energy facilities located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues.

The establishment of Community Trusts projects do therefore create significant benefits for local rural communities. However, Community Trusts can also be mismanaged. This is an issue that will need to be addressed when setting up the trust.

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 Enhancement¹⁶
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
Can impact be enhanced?	Yes	
<p>Recommended enhancement measures To maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:</p> <ul style="list-style-type: none"> • The proponents should liaise with the DBNLM 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. 		
<p>Residual impacts: Promotion of social and economic development and improvement in the overall well-being of the community</p>		

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 has the potential to impact on the areas existing rural sense of place. Due the location of the proposed WEF and the nature of WEFs it will not be possible to effectively mitigate the impact on the areas sense of place. However, based on experience from other WEF projects, while some people regard the impact on the areas sense of place as negative, others have indicated that the impacts are regarded as acceptable and do not distract from the areas character. Many stakeholders have indicated that they find wind turbines to be an attraction as opposed to a negative visual impact. Perceptions of what constitutes a negative visual impact therefore can therefore differ.

None of the landowners interviewed raised concerns about visual impacts.

The findings of the VIA (Logis, January 2023) indicate that the operation of the Aberdeen Wind Facility 1 is expected to have a high visual impact on observers traveling along the

¹⁶ Enhancement assumes effective management of the community trust

roads within a 5km-10km radius of the wind turbine structures, and moderate impact at a distance of 10-20km. The night time impacts linked to aviation lights also represent concern, specifically given the relatively low incidence of receptors and light sources in the area. This impact was rated as high without mitigation. However, the use of aircraft activated lights would reduce this to moderate.

In conclusion, the VIA notes that in spite of the predominantly high residual ratings the visual impacts are not considered to be a fatal flaw for a development of this nature. The site is also located in the Beaufort West REDZ.

Table 4.12: Visual impact and impact on sense of place

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 recommendations contained in the VIA should be implemented.		
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.

4.4.6 Potential impact on property values

As indicated in Section 2.5, 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 energy facilities 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.

The literature reviewed was based on an attempt by the authors of the SIA to identify what appears to be “academically and or scientifically” based studies that have been undertaken by reputable institutions post 2010. However, the literature review does not represent an exhaustive review. The key findings of the literature review are summarised below.

Stephen Gibbons (April 2014)

The overall findings of the study indicate that wind energy facilities reduce house prices in postcodes where the turbines are visible and reduce prices relative to postcodes close to wind farms where the wind farms are not visible. The overall finding is that “averaging over wind farms of all sizes, this price reduction is around 5-6% within 2km, falling to less than 2% between 2 and 4km, and less than 1% by 14km which is at the limit of likely visibility”. The study notes that small wind farms have no impact beyond 4km, whereas the largest wind farms (20+ turbines) reduce prices by 12% within 2km and reduce prices by small amounts right out to 14km (by around 1.5%).

Martin D. Heintzelman and Carrie M. Tuttle (March 2011)

The findings of the study indicate that nearby wind energy facilities significantly reduce property values. In this regard, based on the repeat sales model, the construction of turbines within 0.5 miles (0.8 km) of the property resulted in a 10.87%-17.77% decline in sales price depending on the initial distance to the nearest turbine and the particular specification. At a distance of 1 mile (1.6km) (about 20% of the sample), the decline in value was between 7.73% and 14.87%. The study notes that from a policy perspective, these results indicate that there is a need to compensate local homeowners/communities for allowing wind development within their borders.

The paper concludes that the results of the study appear to indicate that proximity to wind turbines does have a negative and significant impact on property values. Importantly, the best and most consistent measure of these effects appears to be the simple, continuous, proximity measure, the (inverse distance) to the nearest turbine.

Ben Hoen, et al (August 2013)

The study was based on data from more than 50 000 home sales among 27 counties in nine states of the USA. The homes were located within 10 miles of 67 different wind facilities, and 1 198 sales were within 1 mile (1.6 km) (331 of which were within a half mile (0.8km)) of a turbine. The findings of the study indicated that across all model specifications, there was no statistical evidence that home prices near wind turbines were affected in either the post-construction or post-announcement/pre-construction periods. Therefore, if effects do exist, either the average impacts are relatively small (within the margin of error in the models) and/or sporadic (impacting only a small subset of homes). In addition, the sample

size and analytical methods enabled the study to bracket the size of effects that would be detected, if those effects were present at all.

Based on the results, the study found that it is *highly unlikely* that the actual average effect for homes that sold in the sample areas within 1 mile of an existing turbine is larger than +/-4.9%. In other words, the average value of these homes could be as much as 4.9% higher than it would have been without the presence of wind turbines, as much as 4.9% lower, the same (i.e., zero effect), or anywhere in between. Similarly, it is highly unlikely that the average actual effect for homes sold in the sample area within a half mile of an existing turbine is larger than +/-9.0%. In other words, the average value of these homes could be as much as 9% higher than it would have been without the presence of wind turbines, as much as 9% lower, the same (i.e., zero effect), or anywhere in between. The study notes that, regardless of these potential maximum effects, the core results of the study consistently show no sizable statistically significant impact of wind turbines on nearby property values.

Urbis Pty Ltd (2016)

Based on the outcome of the study the authors were of the opinion that wind energy facilities may not significantly impact rural properties used for agricultural purposes. However, the study found that there is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas. In conclusion, the authors of the Urbis study found:

- Appropriately located wind energy facilities within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values.
- There is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low. In addition, none of the landowners interviewed raised concerns about potential impact on property values.

Table 4.13: 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 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.

4.4.7 Potential impact on tourism

A review of international literature on the impact of wind energy facilities on tourism was undertaken as part of the SIA (Section 2.6). The key findings are summarised below. 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.

The research by Aitchison (2012) found that that previous research from other areas of the UK has demonstrated that wind farms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction) (Glasgow Caledonian University, 2008; University of the West of England, 2004). In addition, to date, there is no evidence to demonstrate that any wind farm development in the UK or overseas has resulted in any adverse impact on tourism. In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development.

In addition, all of the studies that have sought to predict impact have demonstrated that any negative impact of wind farms on tourism will be more than outweighed by the increase in tourists that are attracted by wind farms, by the increase in employment brought about by the development of wind farms and/or by the continuing growth of tourism. The study by the Glasgow Caledonian University (2008) found that only a negligible fraction of tourists will change their decision whether to return to Scotland as a whole because they have seen a wind farm during their visit. The study also found that 51.0% of respondents indicated that they thought wind farms could be tourist attractions. In this regard the visitor centre at the Whitelee Wind Farm in east Ayrshire Scotland run by ScottishPower Renewables has become one of the most popular 'eco-attractions' in Scotland, receiving 200 000 visitors since it opened in 2009.

The study by Regeneris Consulting (2014) found that there was no evidence that wind farms would deter tourists from traveling along designated visitor or tourists' routes. The study indicated that small minorities of visitors would be encouraged, whilst others would be discouraged. Overall, however, there was no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere. The findings of the literature review also indicate that wind farms do not impact on tourist routes.

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 DBNLM and the study area. In this regard there are limited number of tourist facilities located in close proximity of the site. This was confirmed by the local landowners interviewed. The Karoo Karoo Secret Guest Farm is located approximately 12km from the area and may experience visual impacts.

Table 4.14: 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 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.

4.4.8 Potential wake loss impact on adjacent Eskom Wind Energy Facility

A study on the potential wake impact of the Aberdeen Wind Energy Facility Project (1, 2 and 3) on the adjacent Eskom Wind Energy Facility located to the north of the project site was undertaken by Acciona Energy in February 2023. The results of study found that wake losses associated with the Aberdeen Wind Farm Facilities (1, 2 and 3) on the Eskom Wind Energy Facility were insignificant. The study was based on a worst-case theoretical analysis of the existing 83 wind turbine layout.

Based on the findings of the Acciona Energy study the potential wake loss impact on the economic viability of the adjacent Eskom Wind Facility is regarded a low to negligible.

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).

Based on the DFF&E's Renewable Energy Applications website there is one (1) historic application located within a 30km radius of the site, namely the Eskom 200 MW Aberdeen Wind Energy Facility adjacent to the north of the site (see Figure 3.5). The potential for combined and sequential visibility therefore exists.

However, the Aberdeen Wind Energy Facility site (WEF 1, 2 and 3) is located in the Beaufort West REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities and the associated infrastructure.

The findings of the VIA (Logis 2023) note the cumulative visual impact is expected to be high, depending on the observer's sensitivity to wind turbine structures. In spite of this, the cumulative visual impact is still considered to be within acceptable limits, due to its location within the Beaufort West REDZ.

Table 4.15: Cumulative impacts on sense of place and the landscape

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 (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)
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 of the VIA should be implemented.		

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 establishment of the proposed WEF and other renewable energy projects in the area does have the potential to place pressure on the local towns in the DBNLM and the Beaufort West REDZ, including Aberdeen and Graff Reinet. The impact will depend on the timing of the construction phase for the different projects. However, 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 Beaufort West REDZ and the DBNLM. These benefits will create opportunities for investment in the DBNLM, 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 20-25 year period to SED. This will provide revenue that can be used by the DBNLM to invest in up-grading local services where required. It 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 process undertaken by the DBNLM.

Table 4.16: 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 DBNLM 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) ¹⁷
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 proponent should liaise with the DBNLM to address potential impacts on local services.		

Assessment on No-Go option

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

4.7 CUMULATIVE IMPACT ON LOCAL ECONOMY

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 DBNLM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities.

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.

¹⁷ With effective mitigation and planning, the significance will be Low Negative.

Table 4.17: Cumulative impacts on local economy

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

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. 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. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

Given the moderate number of people employed during the operational phase (~ 40-50), the social impacts at a community level associated with decommissioning can be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative). Decommissioning will also create temporary employment opportunities, which would represent a positive temporary impact. The significance would be Low (positive) with enhancement due to limited opportunities and short duration.

Table 4.18: 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	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> • 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 assist in providing additional capacity to Eskom to assist in addressing the current energy supply constraints. 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 of carbon emissions.

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.

Table 4.19: 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 Enhancement ¹⁸	With Enhancement ¹⁹
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	
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 mitigation and 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.		

¹⁸ Assumes project is not developed.

¹⁹ Assumes project is developed.

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 in the Northern Cape Province

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 DBNLM 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 Aberdeen Wind Energy Facility 2 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, and the opportunity for skills development and on-site training.

The construction phase will extend over a period of approximately 24-30 months and create in the region of 250-300 employment opportunities. Members from the local communities in Aberdeen and Graff Reinet 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. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a

significant, if localised, social benefit. The total wage bill will be in the region of R 150 million (2023 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area and the DBNLM.

The capital expenditure associated with the construction phase will be approximately R 6 billion (2023 Rand value). This will create opportunities for local companies and the regional and local economy. 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 DBNLM. 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)
Impact of heavy vehicles and construction activities	Medium (Negative)	Low (Negative)
Loss of farmland	Medium (Negative)	Low (Negative)

5.2.3 Operational phase impacts

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 plant.
- Visual impacts and associated impacts on sense of place.
- Potential impact on property values.
- Potential impact on tourism.
- Potential wake loss impact on Eskom Wind Energy Facility.

The findings of the SIA indicate that the significance of all the potential negative impacts with the exception of visual impacts will be **Low Negative** with mitigation. The majority 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	Medium (Negative)	Medium (Negative)
Impact on property values	Low (Negative)	Low (Negative)
Impact on tourism	Low (Negative)	Low (Negative)
Potential wake loss impact on Eskom Wind Energy Facility	Low-negligible (Negative)	Low-negligible (Negative)

5.2.4 Assessment of cumulative impacts

Cumulative impact on sense of place

The establishment of the proposed Wind Energy Facility and other renewable energy facilities in the area will create the potential for combined and sequential visibility impacts. This impact is rated as **Medium Negative**. However, the impact on the areas sense of

place should 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 establishment of renewable energy facilities and associated infrastructure.

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**.

5.2.5 Decommissioning phase

Given the moderate number of people employed during the operational phase (~ 40-50), 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 proposed Aberdeen Wind Energy Facility 2 will result in several social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phases. The project will also contribute to local economic development through socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation. The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phases are likely to be **Low Negative** with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The site is also located within the Beaufort West REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities and associated infrastructure. The establishment of the proposed Aberdeen Wind Energy Facility 2 is therefore supported by the findings of the SIA.

ANNEXURE A

INTERVIEWS

- Lategan, Mr Jacobus (telephonic 2022-10-03). Wildebeeste Poortje 153/1/RE; Sypher 255.
- Lategan, Mr Johan (telephonic 2022-09-29). Kraai Rivier 149/RE and 149/3; Kraai Rivier Outspan 150/RE and 150/1; Wildebeeste Poortje 153/3.
- Marx, Mr Fanie (telephonic 2022-10-04). Wildebeeste Poortje 153/RE; Mon Repos 154.
- Marx, Mr Morné (telephonic 2022-09-29).
- Marx, Mr Pen (telephonic 2022-09-30). Farm 94/2; Farm 94/1; Rietfontein 95/2/RE; Kraai Rivier 149/4.
- Paxton, Mr Grant (telephonic 2022-10-03). Kraanvogel Kuil 155.
- Scholtz, Mr Pieter (telephonic 2022-09-30). Farm 158; Ganna Leegte 159/1.
- Smit, Mr JP (telephonic 2022-09-29). Farm 91; Doornpoort 93/RE and 93/1; Kraai Rivier 149/2/RE and 149/7; Koppies Kraal 157/RE.

REFERENCES

- Acciona Energy (February 2023). Wake impact of the Aberdeen Wind Energy Facility Project (1, 2 and 3) on Eskom Wind Energy Facility
- 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 Resource Plan (IRP) for South Africa (2019).
- National Infrastructure Plan (NIP) (2012 and 2021).
- National Development Plan (2011).
- Eastern Cape Provincial Development Plan-2030 Vision.
- Eastern Cape Provincial Growth and Development Program.
- Eastern Cape Sustainable Energy Strategy 2012.
- Dr Beyers Naude Municipality Integrated Development Plan (2020/21).
- Dr Beyers Naude Municipality Spatial Development Framework (2021).
- Savannah Environmental (2016). Proposed Aberdeen 200 MW Wind Farm and Associated Infrastructure, Aberdeen, Eastern Cape – Revised Final Environmental Impact Assessment Report. Prepared for Eskom Holdings.

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 resources*.
- 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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(Cell) 082 600 8266

(E-Mail) tony@tonybarbour.co.za, tbarbour@telkomsa.net

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, 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;

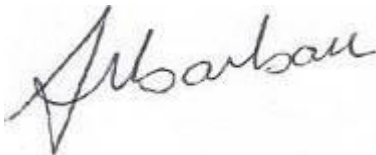
I will comply with the Act, Regulations and all other applicable legislation;

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):

18 January 2023

Date:

ANNEXURE E

IMPACT ON TOURISM: LITERATURE REVIEW

The potential impact on tourism was raised a key concern by a number of interested and affected parties during the Scoping Process and SIA. The literature review undertaken as part of the SIA seeks to comment on the potential impact of wind farms on tourism based on the findings of studies undertaken overseas, specifically in the United Kingdom. The most comprehensive appears to be a review undertaken by Professor Cara Aitchison from the University of Edinburgh in 2012 which formed part Renewable Energy Inquiry by Scottish Government.

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

The paper notes that tourism plays an increasingly important role in contributing to rural regeneration in the UK. New forms of rural tourism associated with landscape, culture and active recreation are increasingly important to rural tourism economies. Activities related to natural history and birdlife, cultural heritage and historic gardens, local food and drink and a range of active outdoor pursuits, including walking and mountain biking, are increasingly promoted as policy priorities through which wider agendas of sustainable development can be addressed.

However, the prevalence of high wind speeds in these same coastal and upland areas means that they are also the preferred destinations for wind farm developments. In spite of this proximate and apparent inter-relationship between wind farms and tourism it is only recently that research examining tourists' attitudes towards the location of wind farms in or near areas that they visit for holiday and/or leisure has been conducted in any depth (UWE, 2004, British Wind Energy Association 2006; Glasgow Caledonian University, 2008; MORI Scotland, 2002; Starling, 2006).

The paper notes that although tourism research relating to wind farm developments is limited compared with that on policy, landscape, ecology and noise it is increasingly evident that there is an emerging consensus within the research examining the actual and potential impact of wind farms on tourism. The clear consensus is that there has been no measurable economic impact, either positively or negatively, of wind farms on tourism. Similarly, there is consensus among researchers of studies that have sought to predict the potential economic impact of wind farms on tourism. Here again, there is no evidence to support the assertion that wind farms are likely to have a negative economic impact on tourism. In addition, all of the studies that have sought to predict impact have demonstrated that any negative impact of wind farms on tourism will be more than outweighed by the increase in tourists that are attracted by wind farms, by the increase in employment brought about by the development of wind farms and/or by the continuing growth of tourism.

However, despite these findings some local authorities, business owners and residents in rural areas that fall within Strategic Search Areas for wind farm developments continue to voice opposition to such developments, increasingly citing negative impact on tourism as a reason to reject planning applications.

The aim of the submission by Professor Aitchison was to clarify the evidence relating to tourism impacts of wind farms so that remaining opposition to development is based on *fact* rather than unfounded, but nonetheless understandable, *fear*.

The research undertaken by Aitchison indicates that two major academic studies of the impact of wind farms on tourism have been conducted in the UK: the University of the West of England's (UWE)(Aitchison, 2004) study titled *The Potential Impact of Fullabrook Wind Farm Proposal, North Devon: Evidence Gathering of the Impact of Wind Farms on Visitor Numbers and Tourist Experience* and Glasgow Caledonian University's (GCU) study *The Economic Impact of Wind Farms on Scottish Tourism* (2008).

Both of these studies address many of the shortcomings of earlier research in relation to weaknesses in the use of survey methods, sampling, interpretation and extrapolation of data associated with other studied. Aitchison also indicates that both university studies meet the criteria of 'originality, significance and rigour' set out in the UK Government's Research Excellence Framework which is designed to identify high quality research in UK universities (Higher Education Funding Councils, 2011). The two studies therefore arguably provide the most reliable knowledge base from which to draw conclusions about the impact of wind farms on tourism. The paper also notes that the research methodology, analysis and presentation of the UWE study findings relating to the tourism impact of wind farms were fully accepted by the Inspector in his report and were seen as a model of good practice in research design, implementation and analysis (The Planning Inspectorate, 2007).

The UWE study was designed to provide evidence of the potential impact of the proposed wind farm development on both visitor numbers and tourist expenditure. The findings of the study revealed overwhelming support for renewable energy in general and the proposed wind farm in particular. The findings demonstrated that the construction of Fullabrook wind farm would not have a detrimental impact on visitor numbers, tourist experience or tourist expenditure in the area of North Devon.

The findings from the study demonstrated that the potential impact of a wind farm in North Devon on day visitor and tourist numbers would be as follows:

- A total of 86.7% (n=170) respondents stated that the presence of a wind farm would neither encourage nor discourage them from visiting;
- A further 7.2% (n=14) of those surveyed said that a wind farm would either marginally encourage or strongly encourage them to visit the area;
- A further 6.1% (n=12) said that the presence of a wind farm would either marginally discourage or strongly discourage them from visiting.

The findings of the study indicated that the potential impact of wind farms on the tourist experience was:

- The majority of respondents (58.2%, n=114) thought that wind farms have 'no overall impact' on the visitor or tourist experience;
- A total of 18.4% (n=36) of those questioned thought that wind farms have a positive impact on the visitor or tourist experience;
- A total of 14.8% (n=29) thought that wind farms have a negative impact on the visitor or tourist experience.

The findings of the research therefore contradicted the argument that tourists would inevitably view the turbines as having a detrimental impact on the attractiveness of the landscape and would therefore be put off visiting North Devon as suggested by North Devon

Marketing Bureau on behalf of North Devon District Council (2004). The findings from the UWE study in North Devon broadly accord with those of the other major academic study of the impact of wind farms on tourism; that conducted by Glasgow Caledonian University (GCU) in 2008 into *The Economic Impact of Wind Farms on Scottish Tourism*. The GCU study found that only a negligible fraction of tourists will change their decision whether to return to Scotland as a whole because they have seen a wind farm during their visit' (Glasgow Caledonian University 2008).

The study also found that 51.0% of respondents indicated that they thought wind farms could be tourist attractions. In this regard the *Investigation into the Potential Impact of Wind Farms on Tourism in Wales*, by the Wales Tourist Board in 2003 found that 68% of those questioned would be interested in attending a visitor centre at a wind farm, while the visitor centre at the Whitelee Wind Farm in east Ayrshire has become one of the most popular 'eco-attractions' in Scotland. The visitor centre run by ScottishPower Renewables has received 200 000 visitors since it opened in 2009 and an estimated 50 000 more have used the 90km of access tracks at the project site for recreational purposes. The popularity of the wind farm as a visitor attraction for schools and families and outdoor sports enthusiasts has completely surpassed the expectations of the developers.

Aitchison notes that the UWE and GCU studies are consistent in their conclusion that the development of wind farms will not result in a reduction in tourist numbers, tourist experience or tourism revenue. Given the similarity between North Devon, Mid-Wales and Scotland in tourism landscapes, visitor attractions and tourists themselves, it is possible that the planned and sustainable development of wind farms in Scotland, will induce no overall financial loss in tourism-related earnings. In fact, as indicated in the UWE research, it is possible that the planned and sustainable development of wind farms in Scotland could result in a small increase in visitor numbers and tourist-related expenditure. This is most likely to be the case where renewable energy projects are developed in tandem with the development of visitor attractions.

The paper by Aitchison also indicates that previous research from other areas of the UK has demonstrated that wind farms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction) (Glasgow Caledonian University, 2008; University of the West of England, 2004). Moreover, to date, there is no evidence to demonstrate that any wind farm development in the UK or overseas has resulted in any adverse impact on tourism. In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development.

Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government

The report notes that Scottish tourism depends heavily on the country's landscape, with 92% of visitors stating that scenery was important in their choice of Scotland as a holiday destination, the natural environment being important to 89% of visitors (Tourism Attitudes Survey 2005). As part of the general policy to create a more successful country, with increasing sustainable economic growth, the Tourism sector has agreed a target of 50% revenue growth in the ten years to 2015. As in South Africa, tourism is therefore regarded as a key sector. Likewise, the natural environment is identified as a key tourist asset.

As part of the study some 40 studies in the UK and Ireland were reviewed. In addition, to ensure that international experiences were considered the review also examined reports from Denmark, Norway, the US, Australia, Sweden and Germany. The findings of the review can be summarised as follows:

- There is often strong hostility to developments at the planning stage on the grounds of the scenic impact and the perceived knock on effect on tourism. However developments in the most sensitive locations do not appear to have been given approval so that where negative impacts on tourism might have been a real outcome there is, in practice, little evidence of a negative effect;
- There is a loss of value to a significant number of individuals but there are also some who believe that wind turbines enhance the scene;
- An established wind farm can be a tourist attraction in the same way as a hydro-electric power station. This of course is only true whilst a visit remains a novel occurrence;
- In Denmark, a majority of tourists regard wind turbines as a positive feature of the landscape;
- Over time hostility to wind farms lessens and they become an accepted even valued part of the scenery. Those closest seem to like them most;
- Overall there is no evidence to suggest a serious negative **economic** impact of wind farms on tourists.

The study also included an intercept survey which focused on tourists most of whom had had a recent experience of a wind farm. The aim was primarily to identify if the experience had altered the likelihood of a return to Scotland. The findings of the survey indicated that vast majority (99%) of those who had seen a wind farm suggested that the experience would not have any affect. Indeed there were as many tourists for whom the experience increased the likelihood of return as decreased. Surprisingly there was no difference between those who has a close and extensive experience and those who had a minimal experience. Those who had not seen a farm were more likely to state a decrease in the likelihood of return, which was even stronger when all tourists were faced with a potential extension of the relevant wind farm. However even then this only related to a small minority of tourists.

The study concludes that the "Overall the finding of the research is that if the tourism and renewable industries work together to ensure that suitably sized wind farms are sensitively sited, whilst at the same time affording parts of Scotland protection from development, then the impacts on anticipated growth paths are expected to be so small that there is no reason to believe that Scottish Government targets for both sectors are incompatible' (Glasgow Caledonian University).

Regeneris Consulting, (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector

The key findings of the study indicate that visitor responses and reactions to wind farms are subjective and depend on the individual's own judgements and interpretation of the relative value of wind farms and their aesthetics. In this regard a key factor is the reaction of individual tourists to the impact of wind farms in the landscape. This is potentially very important to the performance of tourism in many parts of Wales, where surveys have shown that beautiful and unspoiled countryside is an important reason for the visit and a key contributor to visitor enjoyment.

However, the study notes that previous studies have shown that while individuals vary widely in their reaction to wind farms, a clear majority do not react negatively to them in

the landscape and will not change their destination choice on account of the presence of wind farms. In this regard there are a number of factors which could influence people's perceptions of wind farms. These are likely to include their views on renewable energy and the effectiveness of wind farms as a means of energy production. The research suggests that these wider perceptions play a role in how tourists weigh up the positive and negative aspects of wind farm development.

In this regard the study notes that based on current evidence of visitor responses and reactions, and the balance of public support for wind energy over time, there is little to suggest that the planned increase in onshore wind production would result in significant changes in visitor numbers, even in those areas where there may be multiple wind farm developments.

However, the study does indicate that there is also a potential danger that the increased rate of development in some parts of Wales could change the value judgements made by some visitors if they feel a point is reached when wind farms become too dominant a presence on Welsh landscapes. This could alter their perceptions of the relative merits of wind turbines and in turn change their visitor behaviour. The study indicates that while this is acknowledged as a potential risk, risk also needs to be considered in light of the fact that wind farms will become a more common sight in the UK and Europe in general. This increased familiarity with turbines could mean that many visitors become more tolerant of turbines as a feature of rural landscapes, and their visiting behaviour may change little as a result.

Likewise, it is also important to recognise that the wider perceptions that influence visitor reactions are not set in stone. They are likely to be influenced by a wide set of factors related to climate change and energy production over the next ten years, including changes in energy prices and views on the relative merits of wind energy compared to alternatives, such as fracking or other forms of renewable energy.

While most of the evidence points toward limited impacts on tourism from wind farms, there are examples of certain locations which are, on balance, more sensitive to wind farm development. This is on account of their landscapes, types of visitor, limited product diversity and proximity to wind farms. This is particularly the case where the key visitor markets are older people visiting for the tranquillity, remoteness and natural scenery offered in some parts of Wales.

However, the study also notes that in these more sensitive locations, the findings of the study indicate that the potential negative effect on visitor numbers may still be low overall, but in some circumstances could be moderate. The greatest concern exists amongst areas and businesses closest to wind farms and appealing to visitor markets most sensitive to changes in landscape quality. The case studies did highlight some businesses reporting negative reaction from visitors and also holding back investment on account of the uncertain impact, although a majority were not affected negatively at all.

The study also found that there was no evidence that wind farms would deter tourists from traveling along designated visitor or tourists routes. The study indicated that small minorities of visitors would be encouraged, whilst others would be discouraged. Overall, however, there was no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere.

ANNEXURE F

IMPACT ON PROPERTY VALUES: LITERATURE REVIEW

The potential impact on property values was raised as a concern by a number of interested and affected parties interviewed during the SIA, specifically owners of game farms located to the east of the site. The literature review undertaken as part of the SIA does not constitute a property evaluation study, but merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas.

The literature reviewed was based on an attempt by the authors of the SIA to identify what appear to be “scientifically” based studies that have been undertaken by reputable institutions. In this regard it is apparent that there are a number of articles available on the internet relating to the impact of wind farms on property values that lack scientific vigour. The literature review also sought to identify research undertaken since 2010. The literature review does not represent an exhaustive 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.

Three of the articles indicate that wind farms have the potential to impact on property values, while two indicate that the impacts are negligible and or non-existent.

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

The paper notes that there has been a rapid expansion of wind farm developments in the UK, like other areas in Europe and parts of the US, since the mid-1990s. While renewable energy technology clearly provides potential global environmental benefits in terms of reduced CO₂ emissions and slower depletion of natural energy resources, like most power generation and transmission infrastructure, the plant, access services and transmission equipment associated with renewable electricity generation may involve environmental

costs. This is particularly so in the case of wind turbine developments, where the sites that are optimal in terms of energy efficiency are typically in rural, coastal and wilderness locations that offer many natural environmental amenities. These natural amenities include the aesthetic appeal of landscape, outdoor recreational opportunities and the existence values of wilderness habitats. The visual impacts of these 'wind farms' may be especially important because they are often on high ground with extensive visibility. As a result there has been significant opposition from local residents and other stakeholders with interests in environmental preservation. This opposition suggests that the environmental costs may be important. It is interesting to note that similar trends have also started to emerge in South Africa.

Gibbons states that the paper provides quantitative evidence on the local benefits and costs of wind farm developments in England and Wales, focussing on the effects of wind turbine visibility, and the implied cost in terms of loss of visual landscape amenities. The approach is based on "hedonic" pricing which uses housing costs to reveal local preferences for views of wind farms. This is feasible, because wind farms are increasingly encroaching on rural, semi-rural and even urban residential areas in terms of their proximity and visibility, so the context provides a large sample of housing sales that potentially affected (at the time of writing, around 1.8% of residential postcodes are within 4 km of operational or proposed wind farm developments). The paper notes that the study offers a significant advance over previous studies in the US and UK, which have mostly been based on relatively small samples of housing transactions and cross-sectional price comparisons. Estimation in this current work is based on quasi experimental, difference-in-difference based research designs that compare price changes occurring in postcodes where wind farms become visible, with postcodes in appropriate comparator groups. These comparator groups include: places where wind farms became visible in the past, or where they will become visible in the future and places close to where wind farms became operational but where the turbines are hidden by the terrain. The postcode fixed effects design implies that the analysis is based on repeat sales of the same, or similar housing units within postcode groups (typically 17 houses grouped together).

The study also notes that there have been several previous attempts to quantify impacts on house prices in the US, including the study in the US by Hoen et al (2013), which attempts a difference-in-difference comparison for wind farms, but using cross-sectional comparisons between houses at different distances from the turbines. The conclusions of the Hoen et al study was there is 'no statistical evidence that home values near turbines were affected' by wind turbines. Gibbons does however note that the Hoen et al study (2013) uses fairly sparse data on 61 wind farms across nine US states. While the sample contains over 50 000 transactions, very few of transactions are in areas near the wind farms. In this regard on 1 198 (2%) transactions were reported within 1 mile of current or future turbines and only 300 post.

The study undertaken by Gibbons has nearly 38 000 quarterly, postcode-specific housing price observations over 12 years, each representing one or more housing transactions within 2km of wind farms (about 1.25 miles). Turbines are potentially visible for 36 000 (94.7%) of these. The study therefore notes that there is a much greater chance than in previous work of detecting price effects if these are indeed present. The overall finding is that operational wind farm developments reduce prices in locations where the turbines are visible, relative to where they are not visible, and that the effects are causal. This price reduction is around 5-6% on average for housing with a visible wind farm within 2km, falling to under 2% between 2-4km, and to near zero between 8-14km, which is at the limit of likely visibility. Evidence from comparisons with places close to wind farms, but where wind farms are less visible suggests that the price reductions are directly attributable to

turbine visibility. As might be expected, large visible wind farms have much bigger impacts that extend over a wider area.

The conclusion of the study notes that the fairly crowded geographical setting, with numerous wind farms developed within sight of residential property, provides a unique opportunity to examine the visual impacts of wind farms through hedonic property value methods. In undertaking the study comparisons were made between house price changes occurring in areas where nearby wind farms become operational and visible, with the price changes occurring where nearby wind farms become operational but are hidden from view. The overall findings of the study indicate that wind farms reduce house prices in postcodes where the turbines are visible, and reduce prices relative to postcodes close to wind farms where the wind farms are not visible. The overall finding is that "averaging over wind farms of all sizes, this price reduction is around 5-6% within 2km, falling to less than 2% between 2 and 4km, and less than 1% by 14km which is at the limit of likely visibility". The study notes that small wind farms have no impact beyond 4km, whereas the largest wind farms (20+ turbines) reduce prices by 12% within 2km, and reduce prices by small amounts right out to 14km (by around 1.5%).

The study also found that there are small (~2%) increases in neighbouring prices where the wind farms are not visible, although these are only statistically significant in the 4-8km band. The paper also notes that the findings are in line with existing literature that suggests that other tall power infrastructure has negative impacts on prices (e.g. high voltage power lines, Sims and Dent 2005).

Urbis Pty Ltd (2016). Review of the Impact of Wind Farms on Property Values, Commissioned by the Office of Environment and Heritage, NSW, Australia

The purpose of the study was to analyse the impact of wind farm development on the value of surrounding properties in NSW. A 2009 study commissioned by the NSW Valuer-General's Office to address concerns in the community that wind farms have a detrimental impact on property values found that there was no conclusive evidence available at the time to indicate a universal fall in the value of properties surrounding wind farm developments. The follow up study undertaken by Urbis was commissioned by Office of Environment and Heritage (OEH), New South Wales (NSW), Australia. The Australian experience is regarded as highly relative to South Africa given the similarities between the two countries both in terms of the development of the wind energy sector and the rural landscapes and properties affected.

In terms of potential limitations the study does note that in most cases there were a limited number of transactions over the 15-year period from 2000 to 2015. This paper does note that this is typical of rural and rural residential areas that have a relatively low population density and larger individual properties. The study notes that the limited data availability precluded a broad based statistical analysis (e.g. multiple regression or Monte Carlo analysis) to establish any trends in value change as a result of proximity to wind farm infrastructure.

The study sought to determine what sample size is required to undertake an analysis of sales data within a 2 kilometre radius of a wind farm. Adopting a confidence level of 95%, a minimum sample of 97 transactions would be required to arrive at a result accurate within 10%. This increases to a sample size of 385 transactions to arrive at a result accurate within 5%.

The wind farms reviewed in the study experienced far fewer than 100 sales transactions, ranging from 9 to 44 sales within a 2 kilometre radius over the past 15 years (between 2000 and 2015). Based on this there was insufficient data to undertake a traditional statistical analysis that would produce a result with a sufficient degree of confidence. As a result the study adopted a same property repeat sale approach to test value change of properties within 2 km of wind farms relative to the comparable property market within each relevant Local Government Area.

The study notes that Australia had 1 866 wind turbines spread across 71 wind farms at the end of 2014. Approximately 82% of these wind turbines were located in wind farms with more than 50 MW installed capacity with the remaining 18% installed in smaller wind farms under 50 MW. The majority of wind farms in South Africa also tend to be over 50 MW. Of relevance to the current project, the majority of Australia's wind resources are concentrated in its south-western, southern and south-eastern regions, typically closer to the coast or in elevated exposed areas. The study notes that while wind farms are broadly viewed as a sustainable source of energy the level of acceptance begins to fall away the closer respondents reside to the development. In this regard a survey found that 81% of the respondents supported the development of wind farms within NSW. This dropped to 73% for one within their local region and 59% for one 1–2 km from their residence.

The findings of the survey clearly illustrate that proximity to the development impacts the level of acceptance of wind farms. The concerns typically raised regarding wind farms located within 1-2 kilometres of their homes included noise (61%), negative visual impact (38%) and health (23%). A study undertaken in the UK by Bond et al (2013) found that the five most frequently cited reasons for objection to wind farms were; visual eyesore (22.9%); effect on wildlife (11.4%); turbine noise (11.4%); construction traffic (6.8%) and industrialisation of the countryside (6.4%).

Apart from surveying residents, another way of exploring community perceptions about wind farms is to analyse data from property sales. A range of quantitative evaluation techniques such as hedonic price can identify differences between wind farm affected and non-affected transactions. Put simply, transactions are analysed based on specific characteristics such as proximity to wind farms or other non-amenities. This comes in the form of a 'hedonic analysis', which is effectively a multivariate regression analysis of the impact of 'quality' on the price of a commodity.

The study notes that research has shown that public perception of negative non-physical property attributes such as views, noise and odour can impact the value of residential property. However, accurately identifying the impact of a dis-amenity, be it wind farms or other impacts, is a challenging exercise that requires a large sample size of property transactions covering a number of years, with data that include a measure of the dis-amenity (e.g. distance from wind farm development, degree of visual impact) to establish statistically significant results (Bond et al. 2013).

The study undertaken by Urbis (2016) includes a review of relevant literature, and refers to research undertaken by Hoen (2009 & 2013), noting that Hoen found no statistical evidence that home values near wind turbines were affected in the post-construction or post-announcement/ pre-construction periods. Hoen (2009 & 2013) also concluded that if there was an effect, it is possible that the impact is sporadic, affecting only particular types of homes or in markets where consumer preferences were ill-disposed to wind farms. However, other studies found mixed results. Research by Heintzelman and Tuttle (2012) found that when testing across three different US counties, that in some instances there was a negative relationship between proximity to wind turbines and property values;

however, it was not consistent and there was no identifiable factor driving the difference. The authors of the report note that the lack of consistency between the results may point to a qualitative factor associated with the wind farm itself, or a difference in consumer preferences between counties when it comes to co-location with wind farms. This would make it difficult to draw conclusive implications about compensating all landholders in close proximity to wind farms.

Research undertaken by Sunak and Madlener (2014) in Germany found that the asking prices for properties whose view was strongly affected by the construction of wind turbines decreased by 10–17%, while properties with a minor or marginal view experienced no price effect. The impact of visual amenity is complex however, with the angle of view, distance and size of the wind farm all playing a part in the potential negative impact on a property's amenity.

The 2009 NSW Valuer-General's assessment of the impact of wind farms on property values did not conduct a hedonic analysis like many of the international studies because:

- The sample of comparable sales transactions was limited;
- Wind farm development occurred on rural land, with low population density;
- There was significant variation in property characteristics (view from the dwelling, lot size, improvements, etc.) and the level of visual impact;
- The complex array of factors that impact property prices was difficult to capture.

The Urbis study notes that similar limitations also impacted the study undertaken in 2016. This was despite the time that has passed and the increase in the number of wind farms between the 2009 study and 2016. The 2009 NSW Valuer-General's assessment of the impact of wind farms on property values reviewed 45 property transactions within eight study areas. Of these only five were identified as potentially being adversely affected by their view of a wind farm: a small impact was observed for one township property, and potential impacts were observed on four out of 13 lifestyle properties. There were no observed impacts on the 12 rural properties analysed.

The 2009 study found that properties in rural/agricultural areas appeared to be the least affected by wind farm development, with no reductions found near any of the eight wind farms investigated. The only properties where a possible effect was observed were lifestyle properties in Victoria within 500 metres of a wind farm, some of which were found to have lower than expected land values. Generally, the 2009 NSW Valuer-General's assessment of the impact of wind farms on property values found that the separation distance identified in NSW appears to be sufficient to ameliorate any dis-amenity associated with the presence of wind farm development. Ultimately the 2009 NSW Valuer-General's assessment of the impact of wind farms on property values found that the wind farms that had been developed up to that time had not negatively affected property values in the majority of cases. For the minority of transactions that showed a fall in value, other factors may have been involved.

The literature review of Australian and international studies on the impact of wind farms on property values revealed that the majority of published reports conclude that there is no impact or a limited definable impact of wind farms on property values. Those studies which identified a negative impact are based in the northern hemisphere and are associated with countries with higher population densities and a greater number of traditional residential and lifestyle properties affected by wind farms. This is generally contrary to the Australian experience, with most wind farms being located in low population density environments that derive the majority of their value from productive farming purposes.

The key conclusions of the study note that there is insufficient sales data to provide a definitive answer to the question of whether wind farm development in NSW impacts on surrounding land values utilising statistically robust quantitative analysis techniques. The study was therefore based on the best available data and traditional valuation sales analysis techniques to compare the change in values around wind farms over time and qualitative information from a review of the international literature on the impact of wind farms on property values.

Based on the outcome of these research techniques, the opinion of the authors was that that wind farms may not significantly impact rural properties used for agricultural purposes. However, the study found that there is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

Based on the available literature and the sales evidence analysed around wind farms in Australia, the study notes that “in our professional opinion, there are some factors that may be more likely to negatively influence property values around wind farms. Whilst evidence to support these effects in the present Australian context is somewhat limited, the following factors are worthy of consideration”:

- Proximity to residential dwellings – Issues surrounding noise, shadow flicker and close visual impacts are likely to be exacerbated if wind turbines are located close to residential dwellings, and therefore any such perceived diminution of residential amenity has the potential to influence property values;
- Proximity to higher density populations – The location of wind farms near areas of higher population density could be expected to result, in absolute terms if nothing else, in an increase in perceived and actual impacts on a larger number of residential use properties;
- Uncertainty – Community concern around the development of a local wind farm and its potential impacts may increase the amount of time required to sell a property, as potential buyers defer their decision until specific details of the proposed wind farm are known. (note that historic data that allows comprehensive analysis of time-on-market impacts is limited; however, the available evidence does not indicate that an increase in the time required to sell a property near a wind farm has corresponded to a loss in value.)

It is clear that the properties located around wind farms (particularly in NSW) are predominantly rural or rural residential in nature. There are very few smaller residential properties (such as those in towns) that are within close proximity of a wind turbine. For rural properties used for primary production, there is no direct loss of productivity resulting from wind farms. Therefore they are unlikely to negatively impact the value of such properties.

The types of locations chosen to date for wind farms in NSW have differed from many chosen for wind farms in the USA and Europe. Overseas countries with relatively high population densities have situated wind farms close to small urban centres or villages more often. This could account for a small number of overseas studies finding a property value reduction associated with the development of a wind farm; however, most studies undertaken in the northern hemisphere have essentially supported the notion that wind farms have a limited impact on property values. The findings from the northern hemisphere

studies that have identified a negative impact are also more likely to be associated with a greater number of traditional residential and lifestyle properties affected by wind farms.

In conclusion, the authors of the Urbis study indicated that the review of case studies in NSW and Victoria did not identify any conclusive trends that would indicate that wind farms have negatively impacted on property values. A property resale analysis indicated that all of the properties examined as part of the study demonstrated capital growth that was aligned with the broader property market of the time. As such, the circumstances of wind farms in NSW and the differences between those circumstances and those in other countries where similar studies have been conducted, have led the study to reach the following conclusions:

- Appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values;
- There is limited available sales data to make a conclusive finding relating to value impacts on residential or lifestyle properties located close to wind farm turbines, noting that wind farms in NSW have been constructed in predominantly rural areas.

Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing Model, FCN Working Paper No. 3/2012

The paper notes that the extensively promoted expansion of renewable energy technologies is mostly justified by referring to the advantages and benign attributes associated with them. In the case of wind power, these attributes are, e.g., a “green” and CO₂-free energy generation without fuel costs as well as reasonable land consumption (Ackermann and Söder, 2002; Manwell, et al., 2009, pp.443-447; BWE, 2012). However, the paper notes that there are also negative impacts associated with wind farms, including changes to landscapes and vistas. The negative externalities associated with wind farm sites have led to public concerns relating to the impact on the environment and landscape. The authors indicate that at the time of preparing the paper there were, to their knowledge, only four peer-reviewed papers on the topic of impacts on property values., namely, Sims and Dent, 2007; Sims et al., 2008; Laposa and Mueller, 2010; Heintzelman and Tuttle, 2011.

Sims and Dent (2007) investigated the impact of a wind farm near Cornwall, UK, on house prices, using a hedonic pricing approach and comparative sales analysis. Applying straightforward OLS regression, they found some correlation between the distance to a wind farm and property values. Due to data limitations, the overall model results had a fairly weak explanatory power. Sims et al. (2008) modelled the impact of wind farm proximity to houses for a region near Cornwall, UK. There was some evidence to suggest that noise and flicker effects as well as visibility may influence property value in a wind farm’s vicinity. The hedonic analysis, in which standard OLS regression techniques were used, showed no significant impacts caused by the wind farm.

Laposa and Müller (2010) examined the impact of wind farm project announcements on property values for northern Colorado, US. Including observations before and after the announcement of the wind farm project, they applied a hedonic pricing model using standard OLS regression. The results obtained indicate a significant impact of the project announcement at the 10% level. However, they conclude that this impact is likely more attributable to the beginning of the national housing crisis rather than the announcement itself. Heintzelman and Tuttle (2011) study exploring the impacts of new wind facilities on property values in northern New York, US found that nearby wind facilities can significantly reduce property values. Decreasing the distance to the wind farm to one mile indicated a

property price devaluation of between 7.73% and 14.87%. In addition, they controlled for omitted variables and endogeneity biases by applying a repeat-sales analysis.

The aim of the study by Sunak and Madlener was to investigate the impacts of wind farms on the surrounding area through property values, by means of a geographically-weighted hedonic pricing model. The main focus of the study was to assess the potential visual impacts associated with wind farms. A wind farm near the cities of Rheine and Neuenkirchen in the federal state of North Rhine-Westphalia (Germany), constructed in 2002, was chosen for conducting a pilot application of the model developed for the study. In 2000, the federal district administration announced the construction of a wind farm consisting of nine turbines, which were built in July 2002. The nine turbines, each with a capacity of 1.5 MW, have hub heights of 100 meters and rotor sizes of 77 meters. The areas of northern North Rhine-Westphalia is very flat with an average altitude only varying between 30 and 90 m above sea level. The wind farm therefore substantially influences the landscape.

The study focused on property sales within an area of 119 km² in the north of the federal state of North Rhine-Westphalia, including parts of the city of Rheine and the city of Neuenkirchen. Both cities, at least two districts in the case of Rheine (Mesum and Hauenhorst), are in the immediate proximity of the wind farm site. This northern region of North Rhine-Westphalia can be defined as a semi-urban region mainly characterized by medium- and small-sized towns. In 2011, a population of 26 900 lived within a radius of about 5.5 km around the site. The area is therefore more densely populated than the study area.

The distance of the wind turbines from affected properties ranged from 945 m to 5.5 km. To measure the visibility of the wind farm site, the study calculated viewsheds for each property. A precise measurement of the view crucially depends on capturing all features in the landscape that are visible from the observer's point of view. The view of a certain feature in the landscape might be hindered by heights, slopes, vegetation, or buildings. In order to calculate viewsheds as precisely as possible, a digital surface model was applied with an accuracy of one meter. The digital surface model included height level information of the terrain, the vegetation, and buildings. The study also looked at aural impacts (noise) of wind turbines. The research indicated that increases of the dB-level above the average ambient noise level in urban or semi-urban regions are only measurable within the immediate vicinity of a turbine of about 350 m (Hau, 2006; Rogers et al., 2006; Harrison, 2011). The shortest distance to a property is 945 m. As such aural impacts were not considered by the study.

Three different global model specifications were applied. The first two models included 452 properties that were sold after the construction of the wind farm. The findings of the study indicated that proximity to wind farms negatively affects property prices within the first two kilometres. The approach also enabled the study to investigate the impact of the wind farm project announcement and construction by means of dummy variables. The findings of the study indicate that there was no evidence for an announcement effect. Alternatively, the construction of the wind farm is negatively related to the property price. The study concludes that "it seems obvious to deduce that wind farm presence is significantly influencing the surrounding property prices".

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

The study area where the research was undertaken was New York State, which is a leader in wind power development in the US. In 1999, New York had 0 MW of installed wind capacity, but by 2009 had 14 existing facilities with a combined capacity of nearly 1300 MW, ranking it in the top 10 of states in terms of installed capacity. The paper notes that when discussing wind power development it is important to understand the costs that such development might impose. Unlike traditional energy sources, where external/environmental costs are spread over a large geographic area through the transport of pollutants, the costs of wind development are largely, but not exclusively, borne by local residents. Only local residents are likely to be negatively affected by any health impacts, and are the people who would be most impacted by aesthetic damages, either visual or audible. These impacts are likely to be capitalized into property values and, as a consequence, property values are likely to be a reasonable measuring stick of the imposed external costs of wind development.

The paper, although dated (2011), indicates that the literature assessing impact on property values is limited. The study looked at data on 11 369 arms-length residential and agricultural property transactions between 2000 and 2009 in Clinton, Franklin, and Lewis Counties in Northern New York to explore the effects of relatively new wind facilities. The findings of the study indicate that nearby wind facilities do impact on property values. In this regard, based on the repeat sales model, the construction of turbines within 0.5 miles (0.8 km) of the property resulted in a 10.87%-17.77% decline in sales price depending on the initial distance to the nearest turbine and the particular specification. At a distance of 1 mile (1.6km) (about 20% of the sample), the decline in value was between 7.73% and 14.87%. The study notes that from a policy perspective, these results indicate that there is a need to compensate local homeowners/communities for allowing wind development within their borders.

The paper concludes that the results of the study appear to indicate that proximity to wind turbines does have a negative and significant impact on property values. Importantly, the best and most consistent measure of these effects appears to be the simple, continuous, proximity measure, the (inverse distance) to the nearest turbine.

This study does not say anything about the societal benefits from wind power and should not be interpreted as saying that wind development should be stopped. However, when comparing the environmental benefits of wind power one must not only include the take into account the costs to developers, but also the external costs to property owners located close to new wind facilities. In this regard the study notes that property values are an important component of any cost-benefit analysis and should be accounted for as new projects are proposed and go through the approval process.

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

The paper notes that previous research on the effects of wind energy facilities on surrounding home values has been limited by small samples of relevant home-sale data and the inability to account adequately for confounding home-value factors and spatial dependence in the data. The authors note that this study helps fill those gaps by collecting

data from more than 50 000 home sales among 27 counties in nine states of the USA. The homes were located within 10 miles of 67 different wind facilities, and 1 198 sales were within 1 mile (1.6 km) (331 of which were within a half mile (0.8km)) of a turbine. This total represents 2 % of the total survey and, as indicated above, has been raised an issue by commentators.

The approach was aimed at answering the following questions:

- Did homes that sold prior to the wind facilities' announcement (PA)—and located within a short distance (e.g., within a half mile) from where the turbines were eventually located—sell at lower prices than homes located farther away?
- Did homes that sold after the wind facilities' announcement but before construction (PAPC)—and located within a short distance (e.g., within a half mile)—sell at lower prices than homes located farther away?
- Did homes that sold after the wind facilities' construction (PC)—and located within a short distance (e.g., within a half mile)—sell at lower prices than homes located farther away?
- For question 3 above, if no statistically identifiable effects are found, what is the likely maximum effect possible given the margins of error around the estimates?

In order to answer these questions the hedonic pricing model (Rosen, 1974; Freeman, 1979) was used. The paper notes this approach allows one to disentangle and control for the potentially competing influences of home, site, neighbourhood, and market characteristics on property values, and to uniquely determine how home values near announced or operating facilities are affected.

The summary of the key findings notes that previous published and academic research on this topic has tended to indicate that wind facilities, after they have been constructed, produce little or no effect on home values. At the same time, some evidence has emerged indicating potential home-value effects occurring after a wind facility has been announced but before construction. The paper indicates that previous studies, however, have been limited by their relatively small sample sizes, particularly in relation to the important population of homes located very close to wind turbines, and have sometimes treated the variable for distance to wind turbines in a problematic fashion.

This study by Hoen seeks to fill this gap by collecting a very large data sample and analyzing it with methods that account for confounding factors and spatial dependence. AsWe collected data from more than 50,000 home sales among 27 counties in nine states. These homes were within 10 miles of 67 different then-current or existing wind facilities, with 1,198 sales that were within 1 mile of a turbine—many more than were collected by previous research efforts. The data span the periods well before announcement of the wind facilities to well after their construction.

The findings of the study indicated that across all model specifications, there was no statistical evidence that home prices near wind turbines were affected in either the post-construction or post-announcement/pre-construction periods. Therefore, if effects do exist, either the average impacts are relatively small (within the margin of error in the models) and/or sporadic (impacting only a small subset of homes). In addition, the sample size and analytical methods enabled the study to bracket the size of effects that would be detected, if those effects were present at all.

Based on the results, the study found that it is *highly unlikely* that the actual average effect for homes that sold in the sample areas within 1 mile (1.6km) of an existing turbine is

larger than +/-4.9%. In other words, the average value of these homes could be as much as 4.9% higher than it would have been without the presence of wind turbines, as much as 4.9% lower, the same (i.e., zero effect), or anywhere in between. Similarly, it is highly unlikely that the average actual effect for homes sold in the sample area within a half mile of an existing turbine is larger than +/-9.0%. In other words, the average value of these homes could be as much as 9% higher than it would have been without the presence of wind turbines, as much as 9% lower, the same (i.e., zero effect), or anywhere in between. The study notes that, regardless of these potential maximum effects, the core results of the study consistently show no sizable statistically significant impact of wind turbines on nearby property values.