SOCIAL IMPACT ASSESSMENT

MERINO WIND ENERGY FACILITY

NORTHERN 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 140 MW Merino Wind Energy Facility (WEF) located approximately 35 km west of the town of Richmond in the Northern Cape Province. A Battery Energy Storage System (BESS) will be attached to the WEF. The project site is situated within the Ubuntu Local Municipality (ULM), which is located within the Pixley Ka Seme District Municipality (PKSDM). The Merino WEF is one of two WEFs and three 100 MW PV Solar Energy Facilities (SEFs) proposed in the area and referred to as the Great Karoo Renewable Energy (GKRE) cluster.

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 PKSDM SDF and IDP and ULM IDP also support the development of renewable energy. The development of the proposed WEF is therefore supported by key policy and planning documents.

CONSTRUCTION PHASE

The key social issues associated with the construction phase include:

Potential positive impacts

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

The construction phase will extend over a period of approximately 14 months and create in the region of 350 employment opportunities. Based on information provided by the proponent, approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. Members from the local communities in Victoria West and Richmond may potentially qualify for low skilled and semi-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 31 million (2021 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 ULM.

The capital expenditure associated with the construction phase will be approximately R 2 billion (2021 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 ULM. 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 the 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
- The establishment of infrastructure to improve energy security and support the 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.

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. The significance of the impacts associated with the operational phase are summarised in Table 2.

Table 2: Summary of social impacts during the 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)	Medium (Positive)
Visual impact and impact on sense of place	Medium (Negative)	Low (Negative)
Impact on property values	Medium (Negative)	Low (Negative)
Impact on tourism	Medium (Negative)	Low (Negative)

CUMULATIVE IMPACTS

Cumulative impact on sense of place
The potential visual impact of the proposed WEF and associated infrastructure on the area's sense of place is likely to be limited. The cumulative impacts on sense of place are also likely to be low with mitigation.

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 **Medium Positive**.

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 Merino WEF 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 though 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 phase 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 establishment of the proposed Merino WEF 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 *curriculum vitae*;	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

apply.	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.

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
EIA	Environmental Impact Assessment
ULM	Ubuntu Local Municipality
IDP	Integrated Development Plan
IPP	Independent Power Producer
PKSDM	Pixley Ka Seme District Municipality
kV	Kilovolts
LED	Local Economic Development
LM	Local Municipality
NC	Northern Cape
NCPPGDS	Northern Cape Province Provincial Growth and Development Strategy
NCSDF	Northern Cape Spatial Development Framework
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 140 MW Merino Wind Energy Facility (WEF) located approximately 35 km west of the town of Richmond in the Northern Cape Province. A Battery Energy Storage System (BESS) will be attached to the WEF. The project site is situated within the Ubuntu Local Municipality (ULM), which is located within the Pixley Ka Seme District Municipality (PKSDM). The Merino WEF is one of two WEFs and three 100 MW PV Solar Energy Facilities (SEFs) proposed in the area and referred to as the Great Karoo Renewable Energy (GKRE) cluster (Figure 1.1).

Tony Barbour Environmental Consulting was appointed to undertake a specialist Social Impact Assessment (SIA) as part of an EIA process.

Figure 1.1: Location of Great Karoo Renewable Energy Cluster (Red Arrow)

1.2 PROJECT DESCRIPTION

A wind energy facility (WEF) consists of multiple wind turbines which are used to capture the kinetic energy of the wind and generate electricity. This captured kinetic energy is used to drive a generator located within the wind turbine and the energy is subsequently

converted into electrical energy. A typical wind turbine consists of four primary components (Figure 1.2).

- The **foundation unit** upon which the turbine is anchored to the ground. The area required for the concrete foundation is typically in the region of ~ 200 m^2.
- The **tower**, which is a hollow structure allowing access to the nacelle. The height of the tower is a key factor in determining the amount of electricity a turbine can generate. The tower houses the transformer which converts the electricity to the correct voltage for transmission into the grid. The transformer can also be placed in a small housing outside the tower depending on the design.
- The **nacelle** (generator/turbine housing). The nacelle houses the gearbox and generator as well as a wind sensor to identify wind direction. The nacelle turns automatically ensuring the blades always face into the wind to maximise the amount of electricity generated.
- The **rotor**, which is typically comprised of three rotor blades with a diameter varying between 100 and 200 m. The rotor blades use the latest advances in aeronautical engineering materials science to maximise efficiency. The greater the number of turns of the rotor the more electricity is produced.

The amount of energy a turbine can harness is dependent on the wind velocity and the length of the rotor blades. Wind turbines typically start generating power at wind speeds of between 10 - 15 km/hour, with speeds between 45 - 60 km/hour required for full power operation. In a situation where wind speeds are excessive, the turbine automatically shuts down to prevent damage. A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a WEF can be monitored and controlled remotely, with a mobile team used for maintenance, when required.

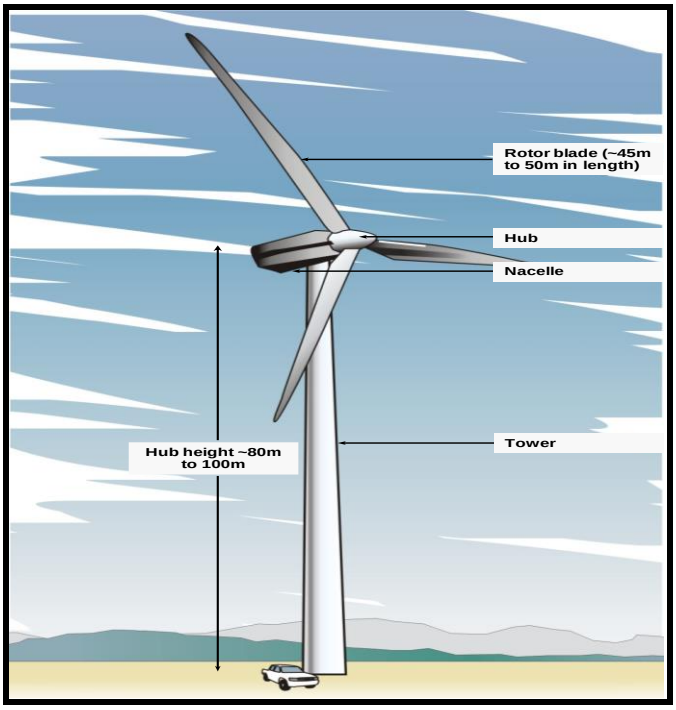


Figure 1.2: Typical example of wind turbine structure and components

The proposed Merino WEF and associated infrastructure includes the following components:

- Up to 35 wind turbines with a maximum hub height of up to 170m. The tip height of the turbines will be up to 250m.
- Concrete turbine foundations to support the turbine hardstands.
- Inverters and transformers.
- Temporary laydown areas which will accommodate storage and assembly areas.
- Cabling between the turbines, to be laid underground where practical.
- A temporary concrete batching plant.
- 33/132kV onsite facility substation.
- Underground cabling from the onsite substation to the 132kV collector substation.
- Electrical and auxiliary equipment required at the collector substation that serves that wind energy facility, including switchyard/bay, control building, fences, etc.
- Battery Energy Storage System (BESS).
- Access roads and internal distribution roads.
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.

The BESS associated with each 140 MW WEF will occupy approximately 2 - 10 ha (Photograph 1.1).

Photograph 1.1: 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 WEF and associated infrastructure.

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

Fit with planning and policy requirements
Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard, a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines

contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.

1.4.2 Limitations

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

1.5 SPECIALIST DETAILS

Tony Barbour, the lead author of this report, is an independent specialist with 28 years' experience in the field of environmental management. In terms of SIA experience Tony Barbour has undertaken in the region of 260 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 seventeen years.

1.6 DECLARATION OF INDEPENDENCE

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

1.7 REPORT STUCTURE

The report is divided into five sections, namely:

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

SECTION 2: POLICY AND PLANNING ENVIRONMENT

2.1 INTRODUCTION

Legislation and policy embody and reflect key societal norms, values and developmental goals. The legislative and policy context therefore plays an important role in identifying, assessing, and evaluating the significance of potential social impacts associated with any given proposed development. An assessment of the "policy and planning fit[1]" 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:

- The National Energy Act (2008).
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998).
- The White Paper on Renewable Energy (November 2003).
- Integrated Resource Plan (IRP) for South Africa (2010-2030).
- The National Development Plan (2011).
- Northern Cape Provincial Growth and Development Strategy (2004-2014).
- Northern Cape Climate Change Response Strategy.
- Northern Cape Spatial Development Framework (2012).
- Northern Cape Province Green Document (2017/2018).
- Pixley ka Seme District Municipality Integrated Development Plan (2019-2020).
- Pixley ka Seme District Municipality Spatial Development Framework (2017);
- Ubuntu Local Municipality Integrated Development Plan (2019-2020).

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:

"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

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

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

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

Investment in renewable energy initiatives, such as the proposed 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.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered. Advantages include:

- Minimal environmental impacts in operation in comparison with traditional supply technologies; and
- Generally lower running costs, and high labour intensities.

Disadvantages include:

- Higher capital costs in some cases.
- Lower energy densities.
- Lower levels of availability, depending on specific conditions, especially with sun and wind-based systems.

2.2.3 White Paper on Renewable Energy

The White Paper on Renewable Energy (November 2003) (further referred to as the White Paper) supplements the *White Paper on Energy Policy*, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out

Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes that while South Africa is well endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol[2], Government 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 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 Energy Plan (2016)

The development of a National Integrated Energy Plan (IEP) was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.

The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives were identified, namely:

- Objective 1: Ensure security of supply.
- Objective 2: Minimise the cost of energy.

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

- Objective 3: Promote the creation of jobs and localisation.
- Objective 4: Minimise negative environmental impacts from the energy sector.
- Objective 5: Promote the conservation of water.
- Objective 6: Diversify supply sources and primary sources of energy.
- Objective 7: Promote energy efficiency in the economy.
- Objective 8: Increase access to modern energy.

The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e. agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and also take into account the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others.

Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The IEP is therefore focused on determining the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives.

As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios:

- The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term.
- The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy.
- The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply;
- The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met.

The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of renewable energy, the document refers to wind and solar energy. The document does however appear to support solar over wind noting that solar PV and CSP with storage present excellent opportunities to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Solar technologies also present the greatest potential for job creation and localisation. Incentive programmes and special focused programmes to promote further development in the technology, as well as solar roll-out programmes, should be pursued.

In terms of existing electricity generation capacity, the IEP indicates that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth.

By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs.

In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy.

An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered.

In terms of promoting job creation and localisation potential, the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller contribution.

The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.

The IEP notes that a diversified energy mix with a reduced reliance on a single or a few primary energy sources should be pursued. In terms of renewable energy, wind and solar are identified as the key options.

Wind

Wind energy should continue to play a role in the generation of electricity. Allocations to ensure the development of wind energy projects aligned with the IRP2010 should continue to be pursued.

Solar

- Solar should play a much more significant role in the electricity generation mix than it has done historically and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV.
- Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.

With reference to the Renewable Energy Independent Power Producer (REIPP) Procurement Programme, the IEP notes:

- The REIPP Procurement Programme should be extended, and new capacity should be allocated through additional bidding windows in order ensure the ongoing deployment of renewable energy technologies;

- Experience and insights gained from the current procurement process should be used to streamline and simplify the process.
- The implementation of REIPP projects in subsequent cycles of the programme should be aligned with the spatial priorities of provincial and local government structures in the regions that are selected for implementation, in line with the Spatial Development Frameworks. This will ensure that there is long-term, sustainable infrastructure investment in the areas where REIPP projects are located. Such infrastructure includes bulk infrastructure and associated social infrastructure (e.g. education and health systems). This alignment will further assist in supporting the sustainable development objectives of provincial and local government by benefiting local communities.

The IEP indicates that Renewable Energy Development Zones (REDZs) have been identified and describe geographical areas:

- In which clusters (several projects) of wind and solar PV development will have the lowest negative impact on the environment while yielding the highest possible social and economic benefit to the country.
- That are widely agreed to have strategic importance for wind and solar PV development.
- Where the environmental and other authorisation processes have been aligned and streamlined based on scoping level pre-assessments and clear development requirements.
- Where proactive and socialised investment can be made to provide time-efficient infrastructure access.

2.2.5 Integrated Resource Plan

The integrated resource plan (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. On 6 May 2011, the Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The IRP 2010 was intended to be a 'living plan' that would be periodically revised by the DoE. However, this was never done and resulted in an energy mix that failed to adequately meet the constantly changing supply and demand scenarios in South Africa, nor did it reflect global technological advancements in the efficient and responsible generation of energy.

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.

Since the promulgated IRP 2010, the following capacity developments have taken place. A total 6 422MW under the government led Renewable Energy Independent Power Producers Programme (RE IPP Procurement Programme) has been procured, with 3 876MW currently operational and made available to the grid. In addition, IPPs have commissioned 1 005MW from two Open Cycle Gas Turbine (OCGT) peaking plants. 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 total, 18 000MW of new generation capacity has been committed to.

Provision has been made for the following new additional capacity by 2030:

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

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

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

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

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

Figure 2.1: Summary of energy allocations and commitments

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 four 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 up 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.

2.2.6 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.

2.2.7 The New Growth Path Framework

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

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

2.2.8 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan 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 plan also supports the integration of African economies. In terms of the plan, Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the 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 consist of:

- Five geographically focussed SIPs.
- Three spatial SIPs.
- Three energy SIPs.
- Three social infrastructure SIPs.
- Two knowledge SIPs.

- One regional integration SIP.
- One water and sanitation SIP.

The three energy SIPS are SIP 8, 9 and 10.

SIP 8: Green energy in support of the South African economy
- Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010).
- Support bio-fuel production facilities.

SIP 9: Electricity generation to support socio-economic development
- Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.
- Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

SIP 10: Electricity transmission and distribution for all
- Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development.
- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

2.2.9 Astronomy Geographic Advantage Act

The purpose of the Act (Act No 21 of 2007) is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Tsantsabane Municipality, has been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), Meerkat and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that has to be protected.

2.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

2.3.1 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include:

- Agriculture and Agro-processing.
- Fishing and Mariculture.
- Mining and mineral processing.
- Transport.
- Manufacturing.
- Tourism.

However, the NCPGDS also notes that economic development in these sectors also requires:

- Creating opportunities for lifelong learning.
- Improving the skills of the labour force to increase productivity.
- Increasing accessibility to knowledge and information.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

- Developing requisite levels of human and social capital.
- Improving the efficiency and effectiveness of governance and other development institutions.
- Enhancing infrastructure for economic growth and social development.

Of specific relevance to the SIA the NCPGDS makes reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The NCPGDS also highlights the importance of enterprise development and notes that the current level of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed solar energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

In this regard, care will need to be taken to ensure that the proposed development and associated renewable energy facilities do not negatively impact on the regions natural environment. In this regard, the NCPGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa.

2.3.2 Northern Cape Provincial Spatial Development Framework

Northern Cape Provincial Spatial Development Framework (NCSDF) (2012) lists a number of sectoral strategies and plans that are to be read and treated as key components of the PSDF. Of these there are a number that are relevant to the proposed STPs. These include:

- Sectoral Strategy 1: Provincial Growth and Development Strategy of the Provincial Government.
- Sectoral Strategy 2: Comprehensive Growth and Development Programme of the Department of Agriculture, Land Reform and Rural Development.
- Sectoral Strategy 5: Local Economic Development (LED) Strategy of the Department of Economic Development and Tourism.

- Sectoral Strategy 11: Small Micro Medium Enterprises (SMME) Development Strategy of the Department of Economic Development and Tourism.
- Sectoral Strategy 12: Tourism Strategy of the Department of Economic Development and Tourism.
- Sectoral Strategy 19: Provincial renewable energy strategy (to be facilitated by the Department of Economic Development and Tourism).

Section C8.2.3, Energy Objectives, sets out the energy objectives for the Northern Cape Province. The section makes specific reference to renewable energy. Of relevance the objectives include:

- Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts.
- In order to reinforce the existing transmission network and to ensure a reliable electricity supply in the Northern Cape, construct a 400 kV transmission power line from Ferrum Substation (near Kathu/Sishen) to Garona Substation (near Groblershoop). There is a national electricity supply shortage, and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority.
- Develop and institute innovative new energy technologies to improve access to reliable, sustainable, and affordable energy services with the objective to realize sustainable economic growth and development. The goals of securing supply, providing energy services, tackling climate change, avoiding air pollution, and reaching sustainable development in the province offer both opportunities and synergies which require joint planning between local and provincial government as well as the private sector.
- Develop and institute energy supply schemes with the aim to contribute to the achievement of the targets set by the White Paper on Renewable Energy (2003). This target relates to the delivery of 10 000 GWh of energy from renewable energy sources (mainly biomass, wind, solar, and small-scale hydro) by 2013.

Section C8.3.3, Energy Policy, sets out the policy guidelines for the development of the energy sector, with specific reference to the renewable energy sector.

- The construction of telecommunication infrastructure must be strictly regulated in terms of the spatial plans and guidelines put forward in the PSDF. They must be carefully placed to avoid visual impacts on landscapes of significant symbolic, aesthetic, cultural or historic value and should blend in with the surrounding environment to the extent possible.
- EIAs undertaken for such construction must assess the impacts of such activities against the directives listed in (a) above.
- Renewable energy sources such as wind, solar**,** thermal, biomass and domestic hydroelectricity are to constitute 25% of the province's energy generation capacity by 2020.
  - The following key policy principles for renewable energy apply.
  - Full cost accounting: Pricing policies will be based on an assessment of the full economic, social and environmental costs and benefits of energy production and utilisation.
  - Equity: There should be equitable access to basic services to meet human needs and ensure human well-being. Each generation has a duty to avoid impairing the ability of future generations to ensure their own well-being.

- Global and international cooperation and responsibilities: Government recognises its shared responsibility for global and regional issues and act with due regard to the principles contained in relevant policies and applicable regional and international agreements.
- Allocation of functions: Government will allocate functions within the framework of the Constitution to competent institutions and spheres of government that can most effectively achieve the objectives of the energy policy.
- The implementation of sustainable renewable energy is to be promoted through appropriate financial and fiscal instruments.
- An effective legislative system to promote the implementation of renewable energy is to be developed, implemented, and continuously improved.
- Public awareness of the benefits and opportunities of renewable energy must be promoted.
- The development of renewable energy systems is to be harnessed as a mechanism for economic development throughout the province in accordance with the Sustainable Development Initiative (SDI) approach (refer to Toolkit D10) or any comparable approach.
- Renewable energy must, first, and foremost, be used to address the needs of the province before being exported.

2.2.3 Northern Cape Climate Change Response Strategy

The key aspects of the PCCRS Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key Sectors to ensure proactive long term responses to the frequency and intensity of extreme weather events such as flooding and wild fire, with heightened requirements for effective disaster management".

Key points from MEC's address include the NCPG's commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, is identified as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy. The MEC also indicated that the NCP was involved in the processing a number of WEF and Solar Energy Facility EIA applications.

2.2.4 Northern Cape Province Green Document

The NCP Green Document (2017-2018) was prepared by the Northern Cape Department of Economic Development and Tourism and provides an impact assessment of IPPs on the communities in the province located within a 50 km radius from existing facilities. The document notes that the NCP is nationally a leader in commercial-scale renewable energy projects. By 2018 a total of 23 IPP projects in the province had been integrated into the national grid. These projects include Solar PV, Concentrated Solar and WEFs. The document notes that through their economic development obligations these projects have already made a significant positive contribution to affected communities. Much of the effort has been directed at supporting local education. The document also notes that, as these

projects are committed to 20-year minimum lifespans, the collectively hold a tremendous potential for socio-economic upliftment.

Key issues identified with regard to improving the potential beneficial impact of IPPs in the NCP include:

- Local community members abusing project benefits for personal gain.
- Difficulty in outreach to local community beneficiaries due to high local illiteracy levels.
- A lack of business skills generally hampers the successful establishment of local small enterprises which could benefit from projects.
- Community benefit obligations are currently met in a piecemeal and uncoordinated fashion.
- Anticipated community benefits are often frustrated by inadequate engagement and insufficient ongoing consultation.
- The scarcity of people skilled in maths and sciences in local communities hampers meaningful higher-level local skills development and employment.
- Insufficient support from local municipalities for IPP development.

2.3.4 Pixley ka Seme District Municipality Integrated Development Plan

The vision for the PKSDM is "Developed and Sustainable District for Future Generations"

To mission statement that underpins the vision is:

- Supporting our local municipalities to create a home for all in our towns, settlements and rural areas to render dedicated services.
- Providing political and administrative leadership and direction in the development planning process.
- Promoting economic growth that is shared across and within communities.
- Promoting and enhancing integrated development planning in the operations of our municipalities.
- Aligning development initiatives in the district to the National Development Plan.

The Strategic Objectives to address the vision that are relevant to the project includes the promotion of economic growth in the district and enhance service delivery. Chapter 4, Development of Strategies, highlights the key strategies of the PKSDM. The promotion of economic development is the most relevant strategy for the project. The IDP also notes that the growth and development context in the district has also changed radically since 2013 (after it had been stagnant for decades) owing mainly to private and public investments in the area as a hub for renewable energy generation and astronomy.

The IDP notes that the economy in the Pixley ka Seme municipal area is characterized by:

- High levels of poverty and low levels of education.
- Low levels of development despite the strategic location in terms of the national transport corridors.
- High rate of unemployment, poverty and social grant dependence.
- Prone to significant environmental changes owing to long-term structural changes (such as climate change, energy crises and other shifts).

Of specific relevance the IDP highlights the potential for renewable energy to help address some of these challenges.

2.3.5 Pixley ka Seme District Municipality Spatial Development Framework

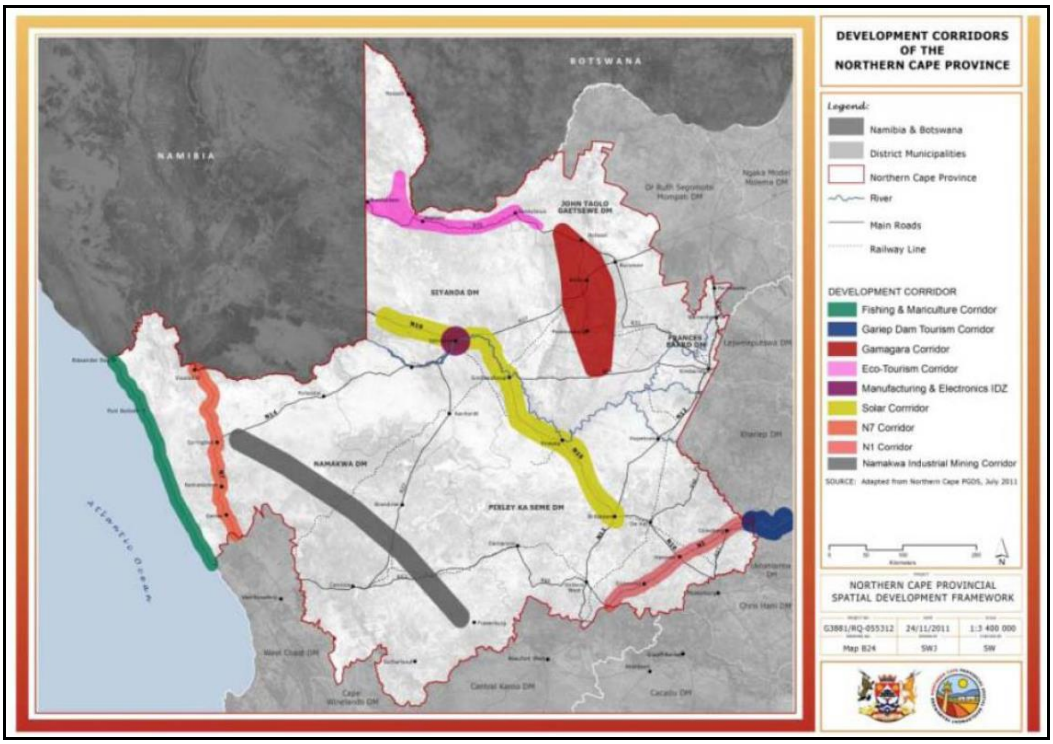
The SDF notes that the vision for the PKSDM is "Pixley Ka Seme DM, pioneers of development, a home and future for all". The Mission Statement that underpins the vision refers to:

- Effective and efficient service delivery.
- Optimal human and natural resource development.
- Local economic growth and development, job creation and poverty alleviation.
- A vibrant tourism industry.
- To participate in the fight to reduce the infection rate and lessen the impact of HIV/ Aids and other communicable diseases.
- A safe, secure and community friendly environment.

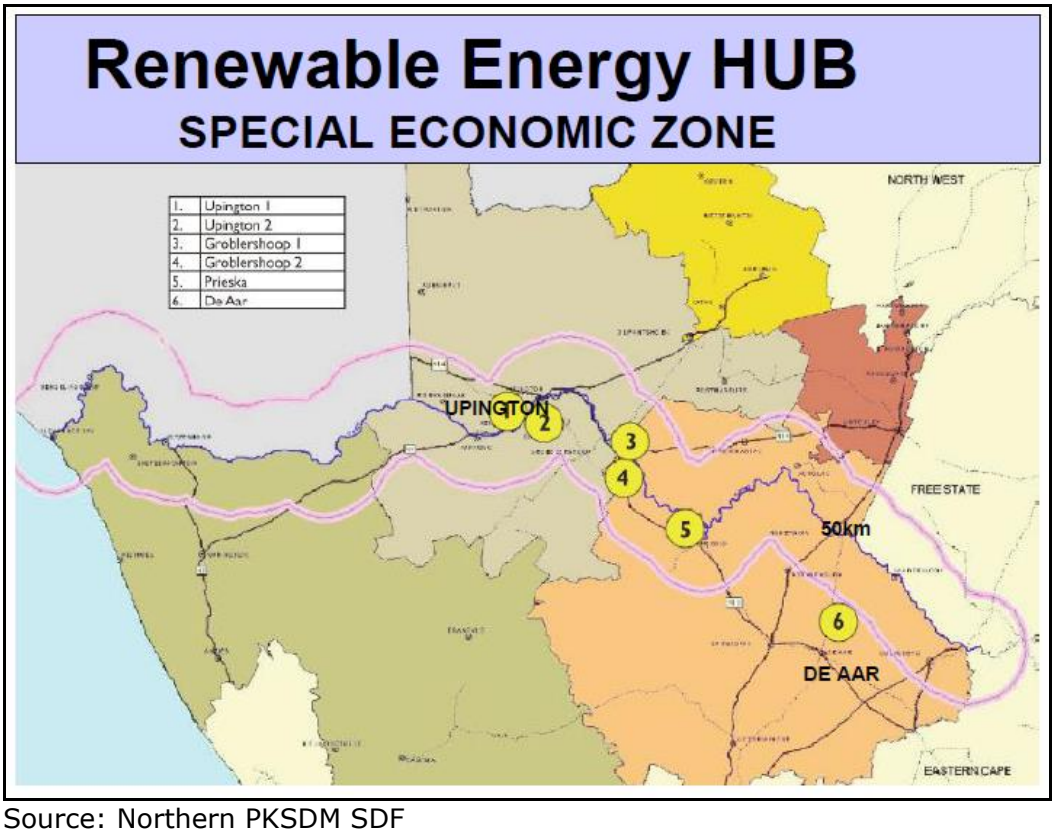
The SDF identifies the opportunities and constraints associated with the district. Of relevance to the project the opportunities include:

Renewable Energy and the identification of a renewable energy hub in the region. The natural environment and maintenance and conservation of the pristine natural environment to support sustainable farming into the future is also identified as an opportunity. The SDF notes that Pixley Ka Seme District area with its abundance of sunshine and vast tracts of available land has attracted considerable interest from solar energy investors. The high solar index of the area provides many opportunities in terms of the development of renewable energy. This has been acknowledged by the Northern Cape Government with the identification of the Renewable Energy Hub. The areas around the northern and eastern borders of the Pixley Ka Seme District Municipality form part of this hub with the potential to stimulate special economic development zoned within the area that have the potential to stimulate industrial development.

The PKSDM also falls within the Solar Development Corridor as identified in the Northern Cape Provincial Spatial Development Framework. The corridor extends from Kakamas to Upington and down to De Aar in the south-east (Figure 2.2). Section 5.6.1 of the SDF also refers to the establishment of a Renewable Energy Hub proposed for the Northern Cape stretching from the west coast right up to the De Aar region (Figure 2.3). The Hub can accommodate special economic development within the zone as earmarked and entails a 100km wide zone. The proposed project is located outside corridor and proposed hub. However, this does not imply that the area is not suitable for the establishment of solar energy facilities.



Source: Northern Cape SDF
Figure 2.2: Northern Cape Development Corridors-Solar Corridor (yellow)



Source: Northern PKSDM SDF
Figure 2.3: Northern Cape Renewable Energy Hub

The SDF does however also note that the area is known for its clean air and open skies with limited light pollution. Potential visual impacts are therefore an issue that needs to be considered.

In this regard the SDF notes that the topography of Pixley Ka Seme region is one of its main assets with vast open spaces and unspoilt panoramic visual vistas stretching over great distances. This asset makes for excellent scenic drives throughout the whole of the region from the flat plains to crossing the main rivers of South Africa. Visual vistas, ridges and "koppies" are assets within the region and they must be handled with sensitivity.

The relevant constraints include high levels of poverty and unemployment, backlog in basic services, including electricity and housing in rural areas, the limited supply of water and overall scarcity of water in the region to support economic development.

The development challenges that face the Pixley Ka Seme District Municipality include high unemployment and poverty rates and low income which are placing increasing demand on service delivery because very few people are able to pay for services. Declining population numbers, and alcohol and substance abuse are also key challenges.

In terms of services, inadequate schools in farming areas results in children having to travel long distances to areas where the go to school. There are also insufficient health centres and lack of amenities and recreational services. Where these services do exist, they are often poorly managed and maintained. The level of key services, such as refuse removal, are also low, while many rural and a number of urban households rely on boreholes for their water supply.

Climate change is also identified as a key risk. The SDF notes that the Karoo is predicted to experience more drought periods, coupled with increased evaporation and temperatures and this will negatively impact already restricted water supply. It is likely that the greatest impacts will be on water supply.

2.3.6 Ubuntu Local Municipality Integrated Development Plan

The vision of ULM is "By 2030, Ubuntu Municipality shall be the best rural municipality through relentless pursuit of excellence through focused governance, efficient administration, and effective service delivery for inclusive targeted social and economic development against all odds".

The mission is to:

- Maximize the utility of the municipal resources in a sustainable, developmental, and economic manner to better the life of all.
- Improve institutional effectiveness and efficiency.
- Optimally develop our human, financial and natural resources.
- Create an enabling environment for local economic growth in order to create employment opportunities and alleviate poverty.
- Work with all our existing and prospective partners to establish a vibrant tourism industry.
- Participate in the fight to reduce the HIV/AIDS infection rate and lessen the impact thereof.
- Focus on youth development, women empowerment and enabling the disabled to play a meaningful role in unlocking human potential.
- Ensure a safe, secure and community friendly environment.

- Maintain sound and sustainable management of financial and fiscal affairs.

Based on the 2011 Census data the largest town in the ULM was Victoria West with a population of 7 611, followed by Richmond (2 841) and Loxton (921). Key issues facing the municipality include:

- High level of illiteracy.
- Poverty and unemployment.
- Limited educational facilities

The IDP identifies a number of challenges facing the area in terms of economic development and growth. Of relevance to the project these include:

- Unemployment and poverty.
- Shortage of critical skills
- Needs of vulnerable groups, including women, disabled and youth.
- Access to basic services such as water, sanitation, electricity and housing.
- Improved access to services in education, health and social services.
- Reduction in the rate of crime.

The key sectors in the local economy agriculture is the key economic sector. Livestock and game form the nucleus of farming activities, with limited crop farming. Livestock farming mainly comprises of sheep, goat and cattle. The main agricultural products are wool for the export market and meat for the local market. Biltong and hunting are the major products of game farming. Game biltong is produced at and exported from a factory in Victoria West.

Chapter 3 of the IDP outlines the development strategies for the ULM. The IDP strategies are aligned with the National Key Performance Areas (KPAs). The KPAs that are relevant to the project include:

- KPA 1: Basic Service Delivery and Infrastructure Development

The strategic objectives under KPA 1 include the provision of sustainable basic services.

- KPA 2: Local Economic Development

The strategic objectives under KPA 1 include investment acceleration and attraction, including a focus on private sector investment, promotion of SMMEs, agriculture, tourism and the development of an industrial and commercial economic zone.

In terms of Ward 3, the following challenges and needs were identified as part of the IDP process.

- High unemployment and poverty rates.
- Need for a youth centre.
- Need to upgrade firefighting services.
- Illegal dumping.

These issues can be addressed by SED and ED spend linked to the project.

2.4 OVERVIEW RENEWABLE ENERGY SECTOR IN SOUTH AFRICA

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

The following documents were reviewed:

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

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

The 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 June 2020. 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.

Energy supply
By the end of June 2020, the REIPPPP had made the following significant impacts.

- 6 422MW of electricity had been procured from 112 RE Independent Power Producers (IPPs) in seven bid rounds.
- 4 276 MW of electricity generation capacity from 68 IPP projects has been connected to the national grid.
- 49 461GWh 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 68 projects that have reached COD, 64 projects have been operational for longer than a year. The energy generated over the past 12-month period for these 64 projects is 11 079GWh, which is 93% of their annual energy contribution projections (P50) of 11 882GWh over a 12-month

delivery period. Twenty-eight (24) of the 64 projects (38%) have individually exceeded their P50 projections.

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

Through the competitive bidding process, the IPPPP effectively leveraged rapid, global technology developments and price trends, buying clean energy at lower and lower rates with every bid cycle, resulting in SA getting the benefit of renewable energy at some of the lowest tariffs in the world. The price for wind power has dropped by 50% to R0.91/kWh, with the BW4 price directly comparable with the per kWh price of new coal generation. Solar PV has dropped most significantly with a price decrease of 75% to R1.10/kWh between BW1 and BW4.

This compares with the industry estimates in April 2020 of R1.45/kWh for Medupi. Considering the on-going delays incompletion, indications are that these costs may even be significantly higher.

Investment
The document notes that the REIPPPP has attracted significant investment in the development of the REIPPs into the country. The total investment (total project costs[3]), including interest during construction, of projects under construction and projects in the process of closure is R209.7 billion (this includes total debt and equity of R209.2 billion, as well as early revenue and VAT facility of R0.5 billion).

The REIPPPP has attracted R41.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and 2S2). 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.

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. In terms of local equity shareholding, 52% (R31.5 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 R29.5 billion and contributes 48% of total equity.

The REIPPPP also contributes to Broad Based Black Economic Empowerment and the creation of black industrialists. In this regard, Black South Africans own, on average, 33% of projects that have reached financial close (BW1-BW4), which is 3% higher than the 30% target. This includes black people in local communities that have ownership in the IPP

[3] 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)

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 24% (against the targeted 20%) for the 68 projects in operation (i.e. in BW1–4).

The target for shareholding by black people in top management has been set at 40%, with an average 67% 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, 1S2 and 2S2, qualifying communities will receive R26.9 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, 1S2 and 2S2) was structured as equal payments overtime, it would represent an annual net income of R1.34 billion per year.

Income to all shareholders only commences with operation of the facility. Revenue generated to date by the 68 operational IPPs amounts to R105 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, 1S2 and 2S2 during the construction phase was R73.1 billion, while the projected operations procurement spend over the 20 years operational life is estimated at 76.8 billion. The combined (construction and operations) procurement value is projected as R149.9 billion of which R81 billion has been spent to date. For construction, of the R70.2 billion already spent to date, R57.7 billion is from the 68 projects which have already been completed. These 68 projects had planned to spend R52.9 billion. The actual procurement construction costs have therefore exceeded the planned costs by 9% 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%. However, these figures have not been verified and the report notes that they are reported with caution.

The majority of the procurement spend to date has been for construction purposes. Of the R70.2 billion spent on procurement during construction, R59 billion has reportedly been procured from BBBEE suppliers, achieving 87% 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 R59 billion spent on BBBEE during construction is 15% more than the R51.1 billion that had originally been anticipated by all IPPs procured.

Total procurement spend by IPPs from QSE and EMEs has amounted to R24.7 billion (construction and operations) to date, which exceeds commitments by 96% and is 30% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction was R 22 billion, which is 4.4 times the targeted spend for construction of R4.9 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 3.2 billion was undertaken by women-owned vendors, which is almost double the R 1.9 billion estimated for the construction of projects that have reached financial close.

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

Local Content[4]

The report notes that the REIPPP programme represents the country's most comprehensive strategy to date in achieving the transition to a greener economy. Local content minimum thresholds and targets were set higher for each subsequent bid window. The report notes that for a programme of this magnitude, with construction procurement spend alone estimated at R73.1 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 R67.6 billion or 45% of total project value (R151.1billion for all bid windows).

Actual local content spend reported for IPPs that have started construction amounts to R57.6 billion against a corresponding project value (as realised to date) of R114 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%).

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

To date, the R57.6 billion local content spend reported by active IPPs is already 87% of the R66billion local content expected. This is with23 projects still in construction, and 68 of the 91active projects having reached COD (i.e. 75% of the active portfolio complete). For the 68 projects that have reached COD, local content spend has been R 46.96 billion of a committed R46.55 billion, which is 0.9 more than the planned local spend.

Leveraging employment opportunities

To date, a total of 52 603 job years[5] have been created for South African citizens, of which 42 355 job years were in construction and 10 248 in operations. These job years should rise further past the planned target as more projects enter the construction phase. Employment opportunities across all five active bid windows are 126% of the planned number during the construction phase (i.e. 33 707 job years), with 23 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 June 2020, 68 projects had successfully completed construction and moved into operation. These projects created 33 449 job years of employment, compared to the anticipated 23 619. This was 42% 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 91% 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, 42 355 job years for SA citizens were achieved during construction, which is 26% above the planned 33 707 job years for active projects. These job years are expected to rise further since 23BW4 projects are still in or entering, 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 22 935 job years have been realised (i.e. 73% 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 53%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 81%, 43% and 49% 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 (84%) has significantly exceeded the 50% target and the 30% minimum threshold. Likewise, the share of skilled black citizens (as a percentage of skilled

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

employees) for both construction (69%) and operations (80%) 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 49% and 68% for construction and operations respectively – exceeding the minimum threshold of 12% and the target of 20%.

Socio-economic development (SED) contributions

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

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

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–BW41), 68 are operational. The SED contributions associated with these 68 projects has amounted to R 1.2 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 1 123 education institutions with a total of R312 million in contributions, from 2015 to the end of June 2020. A total of 1 142 bursaries, amounting to R183.8 million, have been awarded by 55 IPPs from 2015 until the end of June 2020. The largest portion of the bursaries were awarded to African and Coloured students (97%), with women and girls receiving 56% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 61%, followed by the Eastern Cape (18%) and Western Cape (14%). 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 to BW4, 1S2 and 2S2 amount to R7.2 billion. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R360 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. Up until the end of June 2020 a total of R 384.2 million had already been made to the local communities located in the

vicinity of the 68 operating IPPs. This represents 93% of the total R384.2 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. These commitments are incorporated into the National Development Plan in Outcome 10 and sub-utcome3. 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 11.5 million tonnes CO2 (MtonCO2) based on the 1 1313 GWh energy that has been generated and supplied to the grid over this period. This represents 56% of the total projected annual emission reductions (20.5MtonCO2) achieved with only partial operations. A total of 50.2 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 2.3). The study also found that energy generation is expected to become an increasingly important contributor to green job creation over time, as projects are constructed or commissioned.

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

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

(Source: Green Jobs Study, 2011)

Notes:

- VH = very high (total employment potential > 20 000 direct jobs; manufacturing employment potential > 3 000 direct jobs);
- H = high (total employment potential > 8 000 but < 20 000; manufacturing employment potential > 1 000 but < 3 000);
- M = medium (total employment potential > 3 000 but < 8 000; manufacturing employment potential > 500 but < 1 000);
- L = low (total employment potential > 1 000 but < 3 000; manufacturing employment potential > 150 but < 500);
- VL = very low (total employment potential > 0 but < 1 000; manufacturing employment potential > 0 but < 150);
- N = negligible/none (total employment potential = 0; manufacturing employment potential = 0).

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

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

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

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

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

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

Within a broader context of climate change, coal energy does not only have environmental impacts, it also has socio-economic impacts. Acid mine drainage from abandoned mines in South Africa impacts on water quality and poses the biggest threat to the country's limited water resources. Huge volumes of water are also required to wash coal and cool operating power stations. Eskom uses an estimated 10 000 litres of water per second due to its dependency on coal (Greenpeace, 2012).

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

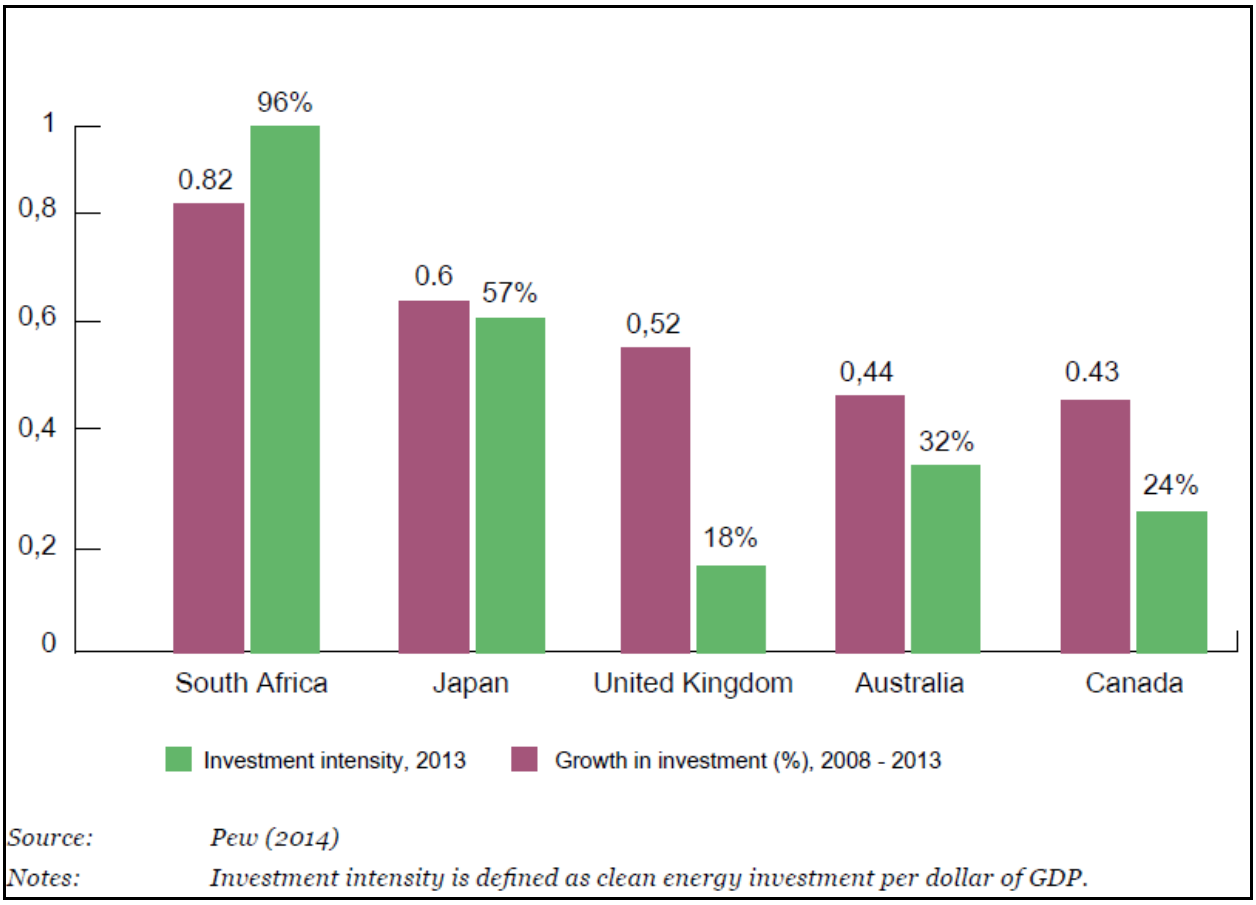
2.4.4 WWF SA Renewable Energy Vision 2030

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

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

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

The report also notes that the REIPPPP has several contracting rounds for new renewables supply. A robust procurement process, extension of a 20-year sovereign guarantee on the power purchase agreement (PPA) and, especially, ideal solar power conditions, have driven the investment case for RE in South Africa. In this regard, South Africa has been identified as one of the worlds' leading clean energy investment destinations (Figure 2.1).



Source: *Pew (2014)*

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

Figure 2.1: South Africa leads as a clean energy investment destination

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

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

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

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

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

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

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

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

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

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

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

In terms of employment, the paper refers to the IDC *Green Jobs R*eport (2011). In summary, the short-term (next 2 years) estimate of total net employment potential is 98 000 jobs, and the long-term (next 8 years) employment potential is 462 567 jobs. Natural resource management is predicted to lead to the greatest number of these at 232 926 long-

term jobs. Green energy generation is estimated to produce 130 023 long-term jobs, with energy and resource efficiency measures adding another 67 977 long-term jobs.

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

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

2.4.6 The potential for local community benefits from wind farms in South Africa[6]

In her thesis, Tait[7] 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.

[6] Similar benefits are also likely to be associated with solar energy projects.
[7] 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.

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.

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).

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, namely[8]:

- 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.

[8] 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 overseas[9]. 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.

[9] 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 study area is located within the Ubuntu Local Municipality (ULM), which forms part of the Pixley Ka Seme District Municipality (PKSDM) (Figure 3.1). The PKSDM is made up of eight category B local municipalities which include Emthanjeni, Kareeberg, Thembelihle, Siyathemba, Renosterberg, Ubuntu, Siyancuma and Umsobomvu municipalities (Figure 3.2). The town of Victoria West is the administrative seat of the ULM. The project area is located in Ward 3 of the ULM.

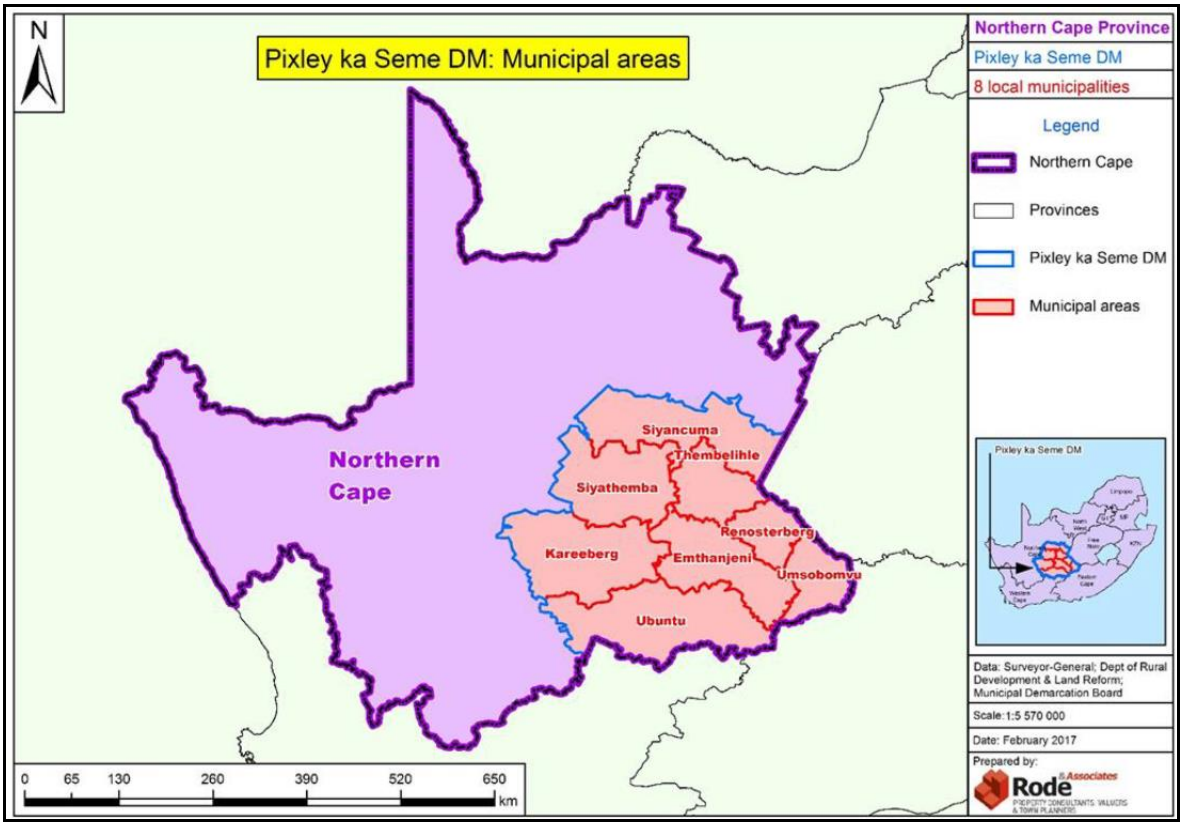


Figure 3.1: Location of Pixley Ka Seme District Municipality within the Northern Cape Province

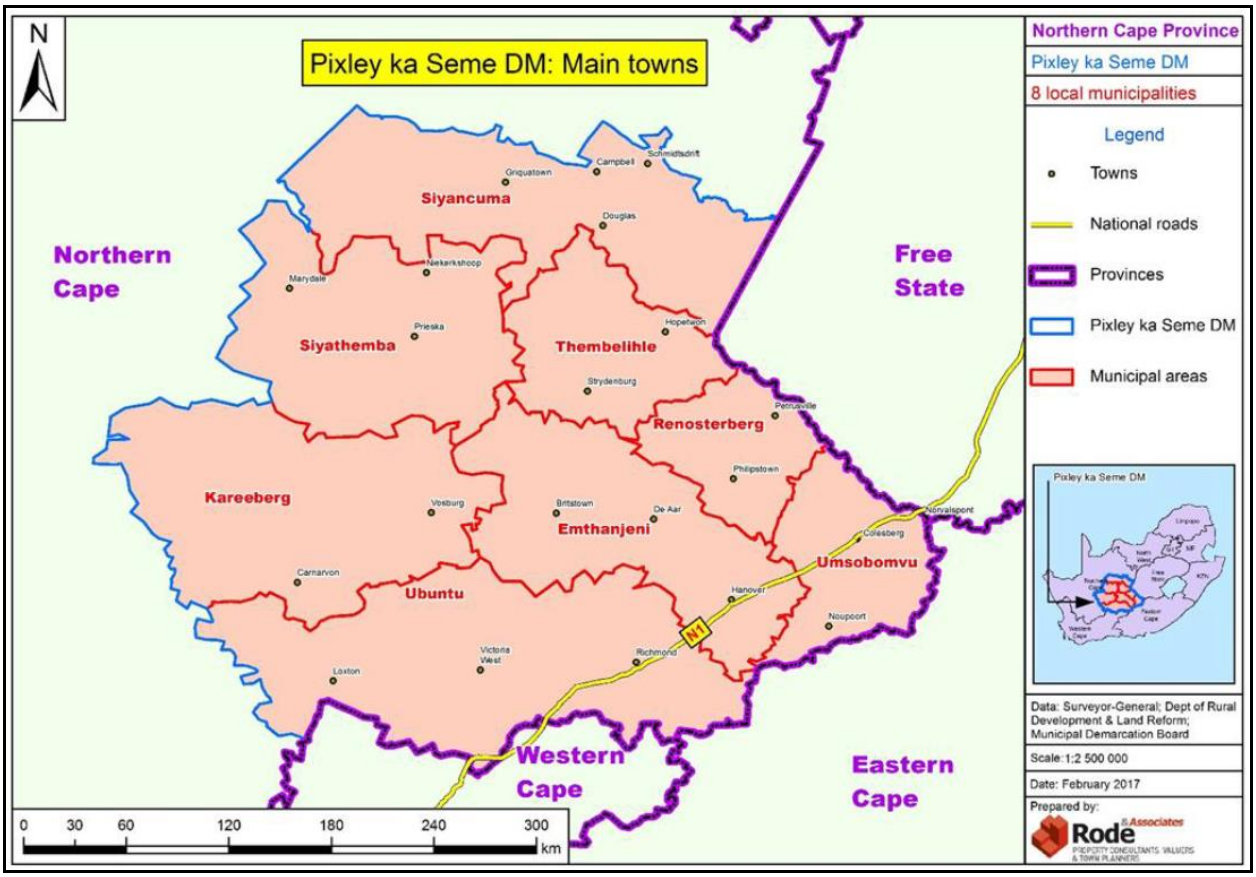


Figure 3.2: Location of Ubuntu Local Municipality within the Pixley Ka Seme District Municipality

3.3 PROVINCIAL CONTEXT[10]

The proposed site located in the Northern Cape Province, which is the largest province in South Africa and covers an area of 361 830 km^2 and, constitutes approximately 30% of South Africa. The province is divided into five district municipalities (DM), namely, Frances Baard, Karoo, Namakwa, Pixley Ka Seme and ZF Mgcawu District Municipality (known before 1 July 2013 as Siyanda DM). The site itself is located in the Pixley Ka Seme DM.

Population

Despite having the largest surface area, the Northern Cape has the smallest population of 1 193 780 (Community Household Survey, 2016) or 2.2% of the population of South Africa. Of the five districts, Frances Baard has the largest population (32.5%), followed by ZF Mgcawu District Municipality (21.2%), John Taola Gaetsewe (20.3%), Pixley ka Seme (16.4%) and Namakwa (9.7%). The majority of the population in the Northern Cape Province are Black African (48.1%), followed by Coloureds (43.7%) and Whites (7.7%).

[10] The information in this section is based on the Northern Cape Provincial Growth and Development Strategy 2004-2014. This document does not include 2011 Census Data. Where possible data from the 2011 Census and 2016 Community Household Survey has been used to update the information.

In terms of age, 36.5% of the Northern Cape population is between 15 and 34 years old, which is the highest age distribution, followed by 29.2% of those aged 35–64 years, while only 6.6% comprised those aged 65 years and older. Similarly, this pattern is also seen across all districts in the province. The district profile shows that the highest proportions of persons aged 15–34 years were recorded in Pixley Ka Seme, ZF Mgcawu and John Taolo Gaetsewe districts. The figures for these three districts were also above the provincial average of 36.5%. The proportion of persons aged 65 years and older was higher in Namakwa (9.5%) and Frances Baard (8.2%).

Education

Based on the information contained in the NCPSDF the average adult education attainment levels in the Northern Cape are lower than the adult education attainment levels of South Africa as a whole. Approximately 19.7% of the Northern Cape adults have no schooling in comparison to South Africa's 18.1%. The Northern Cape has the second lowest percentage of adult individuals (5.5%) that obtained a tertiary education in South Africa. The LED Strategy for the Northern Cape indicates that Pixley ka Seme has the lowest adult education attainment levels in the Northern Cape with 27.3% of the adult population having no form of schooling, whilst John Taolo Gaetsewe is second with 25.4% having no schooling. The highest number of the adult population with tertiary education (6.4%) is located in Frances Baard.

The Northern Cape also has the smallest portion (11.1%) of highly skilled formal employees in South Africa, while Gauteng has the highest (14.3%). Linked to this the Northern Cape has the second largest portion of semi and unskilled formal employees in the country. A lack of skilled people often results in both the public and the private sector being unable to implement planned growth strategies and achieve the desired productivity, service delivery and service quality (NCSDF, 2012).

Economic development

Over the past 8 years there has been little to no variance in the Human Development Index (HDI) figures for the Northern Cape, indicating no increase or decrease in the overall standard of living[11]. This trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better-off areas. It is important to note that the HDI for the Northern Cape (0.55) is substantially below the South African figure of 0.72. The HDI of 0.55 displays a pattern of semi-development, and there is a definite inequality between the different population groups, with the Whites having a higher development lifestyle than the African or Coloured groups.

The percentage of Northern Cape people living below the poverty line has decreased from 40% in 1995 to 27% in 2011, while the poverty gap has decreased from 11% in 1995 to 8% in 2011 (Figure 3.3). The goal set by the province is to decrease the percentage of

[11] The Human Development Index (HDI) was developed by the United Nations Development Programme (UNDP) based on the philosophy that the goal of development was to ensure that individuals live long, informed and comfortable lives. The HDI consists of three components: Longevity, which is measured by life expectancy at birth; Educational attainment, which is measured by two education variables, namely adult literacy and combined gross primary, secondary and tertiary enrolment ratio, and; Income, which is measured by gross domestic product (GDP) per capita. Performance in each dimension is expressed as a value between 0 and 1, and the HDI index gives an internationally accepted measure of the wellness (quality of life) of the population of the area under consideration. The closer the HDI is to 1.0, the higher the level of "living condition". For example, Sweden has an index of 0.91 defined as high, South Africa at 0.72 is defined as middle and Lesotho at 0.47 is defined as low.

people living below the poverty line to 20% by 2015 (NCSDF, 2012). The alleviation of poverty is one of the key challenges for economic development. Higher levels of economic growth are a key challenge for poverty eradication. Investment in people is pivotal to the eradication of poverty and inequality. Investment in people is also, to a large extent, about delivering social and economic infrastructure for education, welfare, health, housing, as well as transport and bulk infrastructure.

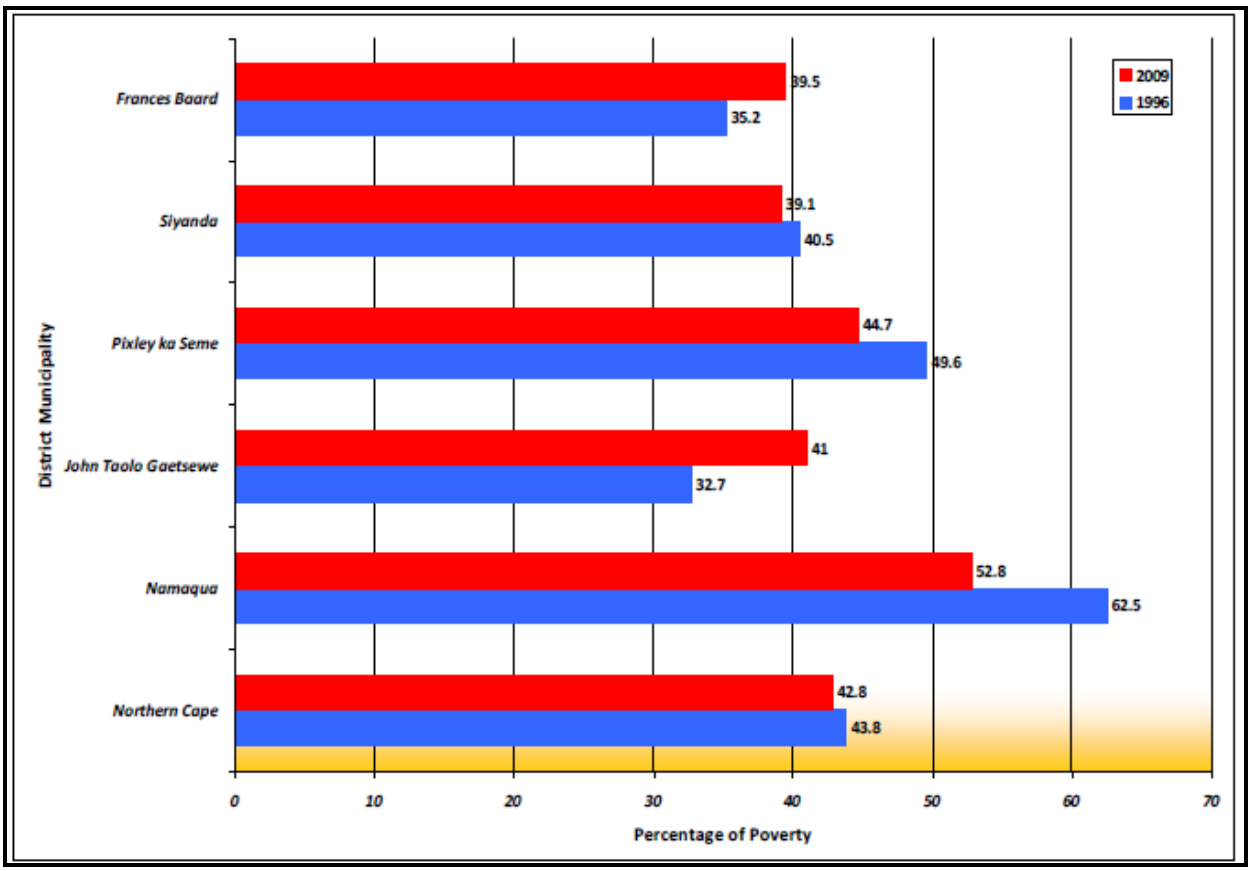


Figure 3.3: Percentage of people living in poverty in the Northern Cape (Source: Global Insight, 2009 as cited in the PGDS, July 2011)[12].

In terms of per capita income, the Northern Cape Province has the third highest per capita income of all nine provinces, however, income distribution is extremely skewed, with a high percentage of the population living in extreme poverty. The measure used in the PGDS document to measure poverty is the percentage of people living below the poverty line or breadline is used[13].

Economic sectors

The Northern Cape economy has shown significant recovery since 2000/2001 when it had a negative economic growth rate of -1.5% (LED Strategy). The provincial economy reached a peak of 3.7% in 2003/2004 and remained the lowest of all provinces. The Northern Cape is

[12] Siyanda DM is now called the ZF Mgcawu DM.

[13] In terms of the poverty line, a person is considered poor if his or her consumption or income level falls below some minimum level necessary to meet basic needs. The minimum level is usually called the poverty line. In South Africa the poverty income level is set at R800/month for an individual or R 3 200 per month for a household of four.

the smallest contributing province to South Africa's economy (only 2% to South Africa GDP per region in 2007).

The mining sector is the largest contributor to the provincial GDP, contributing 28.9% to the GDP in 2002 and 27.6% in 2008. The mining sector is also important at a national level. In this regard, the Northern Cape produces approximately 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% if its manganese.

Agriculture and agri-processing sector is also a key economic sector. Approximately 2% of the province is used for crop farming, mainly under irrigation in the Orange River Valley and Vaalharts Irrigation Scheme. Approximately 96% of the land is used for stock farming, including beef cattle and sheep or goats, as well as game farming. The agricultural sector contributed 5.8% to the Northern Cape GDP per region in 2007 which was approximately R1.3 billion, and it employs approximately 19.5% of the total formally employed individuals (NCSDF, 2012). The sector is experiencing significant growth in value-added activities, including game-farming. Food production and processing for the local and export market is also growing significantly.

The main agricultural produce of the Northern Cape include:

- High-value horticultural products such as table grapes, sultanas and wine grapes, dates, nuts, cotton, fodder, and cereal crops are grown along the Orange River.
- Wheat, fruit, groudnuts, maize and cotton in the Vaalharts irrigation scheme in the vicinity of Hartswater and Jan Kempdorp.
- Vegetables and cereal crops at the confluence of the Vaal River and the Orange Rivers in the vicinity of Douglas.
- Wool, mohair, karakul, Karoo lamb, ostrich meat and leather, and venison throughout most of the province.

Economic development in the Northern Cape is hampered by the vastness of the area and the remoteness of its communities in rural areas. Development is also hampered by the low education and skills levels in the province. As a result unemployment in the Northern Cape presents a major challenge.

Employment

According to Statistics South Africa Labour (2012) the community and social services sector is the largest employer in the province at 29%, followed by the agricultural sector (16%), wholesale and retail trade (14%), finance (8%) manufacturing (6%) and mining (6%), etc. (Figure 3.4).

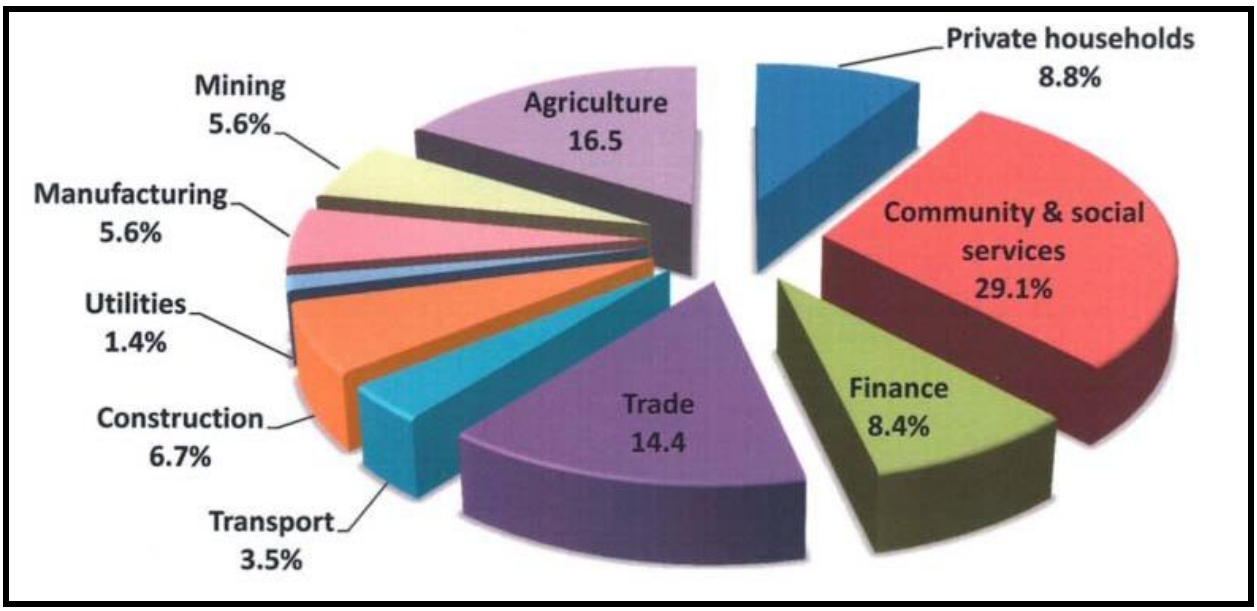


Figure 3.4: Employment by Economic Sector and Industry (Source: Statistics South Africa 2012).

3.4 DEMOGRAPHIC OVERVIEW

Population

The population of the ULM in 2016 was 19 471 (Community Household Survey 2016). Of this total, 38.6% were under the age of 18, 55.9% were between 18 and 64, and the remaining 5.5% were 65 and older. The population of Ward 3 in 2011 was 4 715. Of this total, 37% were under the age of 18, 58% were between 18 and 64, and the remaining 5% were 65 and older. The ULM and Ward 3 therefore have a high percentage of the population that fall within the economically active group of 18-65. The figures are similar to the figures for the PKSDM and Northern Cape (58.5% and 57.7% respectively).

The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates reduced revenue for local authorities to meet the growing demand for services. The national dependency ratio in 2011 was 52.7%, while the Northern Cape Province was 55.7%. The high provincial dependency ratio is also reflected at a local municipal and ward level. The traditional approach is based people younger than 15 or older than 64. The information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e. they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratios for the ULM (2016) and Ward 3 (2011) were 79% and 72% respectively. Based on this approach the figures are similar to the figure for the Northern Cape (73.3%). The high dependency ratios reflect the limited employment and economic opportunities in the area.

In terms of race groups, Coloureds made up 73% of the population on the ULM, followed by Black Africans, 22.5% and Whites, 4.5%. In Ward 3, Coloureds made up 77.3% of the population, followed by Whites, 14.8% and Black Africans, 6.7The main first language spoken in both the ULM and Ward 3 was Afrikaans, 82.5% and 92.5% respectively.

Households and house types

There were a total number of 6 034 (2016) and 1 609 (2011) households in the ULM respectively. Of these 90.4% (ULM) and 92.4% (Ward 7) were formal houses. 6.6% of the structures in the ULM and 1.2% in Ward 3 were shacks. The majority of dwellings in the ULM and Ward 3 are therefore formal structures. The majority of the properties in the ULM (59.2%) were owned and fully paid off. In Ward 3 the majority of properties were occupied rent free. This figure reflects the rural nature of Ward 3 and the rent-free status of farm workers. Approximately 33.6% of the households in the ULM and 18.8% of the households in Ward 3 were headed by women. These figures are lower than the rate for the PKSDM (37%) and Northern Cape (39%). Despite the figures for the ULM being lower than the district and provincial averages, women headed households tend to be more vulnerable.

Household income

Based on the data from the 2011 Census, 11.7% of the population of the ULM had no formal income, 3.6% earned less than R 4 800, 6.2% earned between R 5 000 and R 10 000 per annum, 24.1% between R 10 000 and R 20 000 per annum and 24% between R 20 000 and 40 000 per annum (2016). For Ward 3, 5.9% of the population had no formal income, 2.5% earned less than R 4 800, 5.1% earned between R 5 000 and R 10 000 per annum, 30.9% between R 10 000 and 20 000 per annum and 29% between R 20 000 and 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 (~ 40 000 per annum). Based on this measure, in the region of 69.6% of the households in the ULM and 73.4% in Ward 3 live close to or below the poverty line. The low-income levels reflect the rural nature of the local economy and the limited formal employment opportunities outside in the area. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the ULM. This in turn impacts on the ability of the ULM to maintain and provide services.

Household income levels are likely to have been impacted by the COVID-19 pandemic. The number of households in the ULM and Ward 3 that live close to or below the poverty line is likely to have increased over the last 18 months. This, coupled with the high dependency ratio, is a major cause of concern for the area.

Employment

The official unemployment rate in the ULM in 2011 was 18.1%, while 44.2% were employed, and 33.2% were regarded as not economically active. The figures for Ward 3 in 2011 were 6.8% unemployed, 62.5% employed and 28.4% not economically active. The unemployment rates for the ULM and Ward 3 are lower than the Provincial rate of 14.5% and the District rate of 14.8%. However, the COVID-19 pandemic is likely to have resulted in an increase in unemployment rates in both the ULM and Ward 3. Recent figures released

by Stats South Africa also indicate that South Africa's unemployment rate is in the region of 36%, the highest formal unemployment rate in the world.

Education
In terms of education levels, the percentage of the population over 20 years of age in the ULM and Ward 3 with no schooling was 11.8% (2016) and 20.7% (2011) respectively, compared to 7.9% and 11.1% for the Northern Cape Province in 2016 and 2011 respectively. The percentage of the population over the age of 20 with matric was 23.2% and 15.6% respectively, compared to 29.1% (2016) and 25.2% (2011) for the Northern Cape. The lower education levels are linked to rural, isolated nature of the area.

3.5 MUNICIPAL SERVICES

Electricity
Based on 2016 survey, 84.7% of households in the ULM had in-house prepaid meters, while 6.6% had no access to electricity. No data was on electricity access was available for Ward 3.

Access to water
Based on the 2016 survey information, 89% of households in the ULM were supplied by a service provider, while 9.8% relied on their own sources. For Ward 3, 56% of households relied on boreholes, while 31.1% were provided with water by a local service provider and 6% from tankers (2011). This high reliance on boreholes reflects the rural nature on Ward 3.

Sanitation
87.6% of the households in the ULM had access to flush toilets (2016), while 4.1% relied on bucket toilets and 5.8% did not have access to formal sanitation. In Ward 3, only 55.7% of the households had access to flush toilets, while 15.4% relied on pit latrines and 21.7% had no form of formal sanitation (2011). The high percentage of households with no formal form of sanitation reflects the rural nature of Ward 3.

Refuse collection
82.6% of the households in the ULM had access to regular refuse removal service, while 7.5% disposed of their waste at their own dump and 5.1% used communal dumps (2016). In Ward 3, 20.4% of households had access to regular refuse removal service, 56.2% disposed of their waste at their own dump and 17.6% had not access to refuse removal services (2011). The lower figures for Ward 3 reflect the rural nature of the area and the difficulty of providing municipal services to areas located at a distance from the main towns in the area.

3.6 HEALTH, COMMUNITY AND SAFETY FACILITIES

In terms of health care facilities, there is a hospital and clinic in Victoria West and Richmond, and also a clinic in Loxton (Table 3.1). The key issues facing the health services in the area include:

- Inadequate health facilities.
- Limited medical staff (Doctors & Nurses).
- Limited equipment.
- Shortage of ambulances

Table 3.1: Health Facilities in ULM

Health Facilities	Clinic	Hospital	Ambulance Facilities
Victoria West	1	1	Yes
Richmond	1	1	Yes
Loxton	1	0	0
Hutchinson	0	0	0
Merriman	0	0	0
Total	**3**	**2**	**2**

The public facilities include libraries in all of the towns, except Merriman. There are also community halls in the larger towns (Table 3.2).

Table 3.2: Community Facilities in ULM

Towns	Cemeteries	Libraries	MPCC	Community Halls	Recreational Facilities	Museums
Victoria West	4 private & 1 public	2	-	3	1 caravan park	1
Richmond	2 public & 1 private	1 private & 1 public	-	3	1 park & 1 caravan park	1
Loxton	1 public & 1 private	1	-	1	1 park & 1 caravan park	-
Merriman	1 private	-	-	--	-	-
Huchinson	1 public	1	-	-	-	-
Farms	-	2	-	-	-	-
Ubuntu LM	12	8	0	7	5	2

The key issues identified in the IDP include:

- Inadequate recreational facilities in all the towns.
- Poor maintenance

In terms of safety and security all three of the main towns have police stations (Table 3.3). There are also magistrate and district courts in Victoria West and Richmond.

Table 3.3: Safety and security facilities in ULM

Towns	Police stations	Magistrate court	District court
Victoria west	1	1	1
Richmond	1	1	1
Loxton	1	-	-
Total	3	2	2

The key issues identified in the IDP include:

- Need for satellite police stations in townships.
- Shortage of police staff and vehicles.

- Shortage of magistrates

3.7 ECONOMIC OVERVIEW

Agriculture
Agriculture is the key economic sector in the PKSDM and ULM. Many of the towns within the district municipal area function mainly as agricultural service centres, with the level of services provided at the centres to a large extent reliable on the intensity of the farming practices in the surrounding area.

Despite the largely semi-arid and arid environment in the district, the fertile land that lies alongside the Orange, Vaal and Riet Rivers supports the production of some of the country's finest quality agricultural products, including grapes and vegetables. The main livestock farming in the region include cattle, sheep and goat farming. Game breeding has also been identified as one of the opportunities which could be linked with the tourism sector for Game reserves and hunting activities.

However, despite the key role played by agriculture there is limited value adding to the farming products within the district and the area is prone to droughts and climate change.

Mining
The main deposits in Pixley ka Seme include alluvial diamond mining along the Orange River and various semi-precious stones, such as tiger-eye and zinc deposits. The region also has various saltpans for the potential of salt production. Uranium deposits also occur in the district.

Tourism
The tourism sector in the district contributes 15.6% to the provincial gross value added (GVA). The municipalities Emthanjeni, Kareeberg, Umsobomvu and Siyancuma municipalities are the biggest contributors to the provincial gross value added (GVA). The PKSDM IDP notes that the tourism opportunities in the district will increase due to the Karoo Array Telescope (KAT), a project being driven at a national level. Of relevance, the PKSDM notes that care needs to be taken with developments that have the potential to negatively impact on the Karoo landscapes.

Renewable energy
Of key relevance the PKSDM IDP identifies renewable energy as key economic sector and refers to the substantial socio-economic development (SED) and enterprise development (ED) contributions leveraged by the IPPPP commitments. The IDP notes that the towns of Prieska and Carnarvon have in recent years changed character from small rural towns to potentially regional hubs as a result of investments in renewable energy generation and the Square Kilometre Array (SKA) radio telescope project, respectively.

3.8 OVERVIEW OF STUDY AREA

3.8.1 Introduction

The Great Karoo Renewable Energy Cluster is located to the north of the N1, between Three Sisters and Richmond. The closest towns to the site are Richmond, which is located approximately 22 km from the eastern boundary of the site, and Victoria West, which is located approximately 30 km (as the crow flies) north west of western boundary of the site. The bulk of the site is located to the north of the N1 with a small portion located to the south (Figure 3.5).

The landscape associated with the site is a typical Karoo landscape consisting of dolerite koppies and ridges separated by valley bottoms. The land uses are linked to livestock farming. The character of the area can be described as a rural, Karoo landscape. There are a number of farm dwellings located in the vicinity of the site, including three farm dwellings within the boundary of the site. As indicated in Figure 3.6, most of the farm dwellings are located in the area to the west and north of the site. The Rondavel Guest Farm is located adjacent to the N1, within the boundary of the site.

Figure 3.5: Location of Great Karoo Renewable Energy Cluster (Red Arrow)

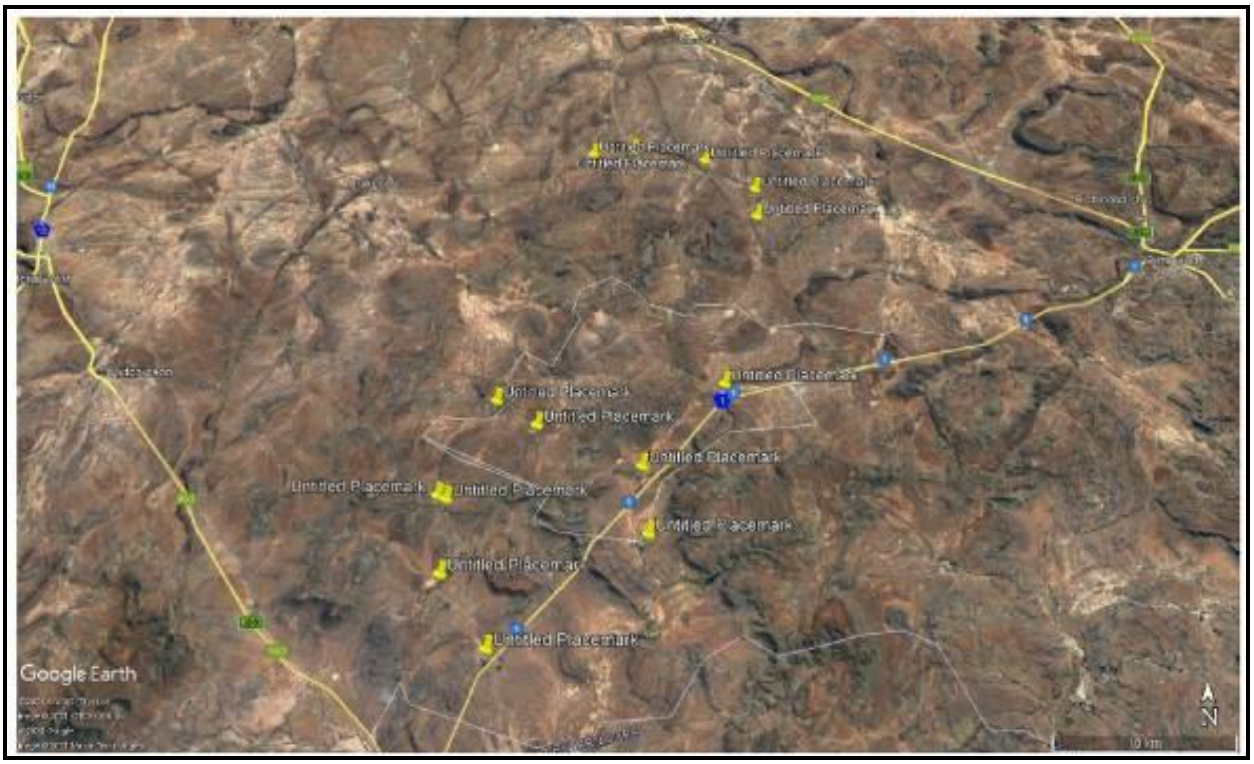


Figure 3.6: Location of farm dwellings (place marks) in relation to the Great Karoo Renewable Energy Cluster area (grey outline).

The Merino WEF site is located to the north of the N1 between Richmond and Three Sisters, roughly halfway between Johannesburg and Cape Town (Figure 3.7). Richmond, the nearest settlement, is located ~~26 km east-north-east, the larger settlement of Victoria West ~44 km north-west, and the fuel station complex at Three Sisters ~67 km south-west. The site and adjacent properties are located in the Northern Cape Province. Richmond forms part of the Ubuntu Local Municipality seated in Victoria West.

The town of Richmond was established in 1843 when a new congregation was formed for the area. The town was names after the Duke of Richmond from Kent, who was the father-in-law of the Governor of the Cape at that time, Sir Peregrine Maitland. Historically the town served as resort town for European aristocratic tuberculosis patients in the 1800s due to its clean air and mineral rich waters. The PKSSD SDF identifies Richmond as an Urban Satellite Town. These are towns that already have some services and infrastructure and have the potential to grow. The economy of the town is linked to providing services to the surrounding farming areas and through traffic associated with the N1. The town of Victoria West was named after Queen Victoria of England and established in 1843. Victoria West forms the starting point of the Diamond Way and lies on the main route from Cape Town to Kimberley. Diamond fever was sparked in 1866 with the discovery at Hopetown and then at Kimberley. The PKSSD SDF identifies Victoria West as an Urban Centre. These towns are administrative centres within the respective eight municipalities in the district. These centres' administrative functions should be further enhanced, and it is recommended that programs for urban rehabilitation of these centres should focus on the stimulation of economic growth in these areas. The economy of the town is linked to providing services to the surrounding farming areas and through traffic associated with the N12 and R63.

Beaufort West and Graaff-Reinet (both well over 100 km away) are the nearest large settlements for accessing higher order retail and services. The nearest operational REF in the broader area is Nobelsfontein WEF located north of Three Sisters to the south west.

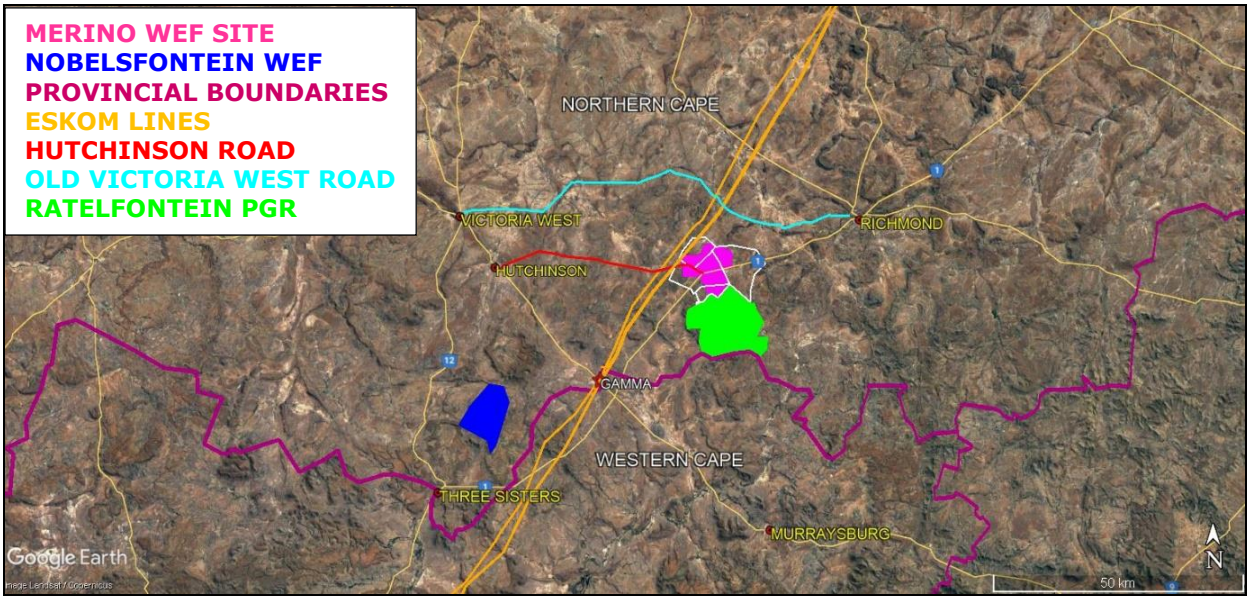


Figure 3.7: Merino WEF site and affected properties (white outlines) in relation to local context

The study area properties are accessed directly off the N1, or via the Hutchinson- and Old Victoria West public gravel roads. The Hutchinson gravel road provides a link between the N1 and the small railway settlement of Hutchinson located along the R63 south-east of Victoria West (Photographs 3.1 and 3.2). Both public gravel roads are said to be relatively well-maintained at present and provide access for local farmers. The Old Victoria West Road would not be affected by the Angora WEF project. Properties located south/ east of the N1 are accessed via private and servitude farm roads off the N1. Gates are typically kept locked.

Photograph 3.1: Intersection of the N1 and Hutchinson Rd north of Rondawel Farm viewed from the south

Photograph 3.2: Hutchinson public gravel road, looking west from just north of the Rondawel Farm yard

Eskom's Gamma substation is located just to the north of the R63, approximately 24 km south-west of the Merino WEF site (Photograph 3.3). A broad Eskom transmission line (Tx) corridor traverses the study area SW-NE. The corridor is 1-2 km broad, contains 5 (400 and 765 kV) lines, and is located >2 km (nearest point) to the north (west) of the N1. The lines traverse the Hutchinson Road just to the west of the Merino WEF site (Photograph 3.4). Cell phone signal relay towers are located on a number of study area properties. The towers are located just to the north (west) of the N1 near the relevant farmsteads (Vogelstruisfontein, Rondawel, Bultfontein, Kleinfontein) (Photograph 3.5).

The study area is located in the arid Central Karoo region and the terrain is characterized by successions of broad plains enclosed or criss-crossed by kopjes. The vegetation consists of Karroid scrub ('Karoo bossiesveld') (Photograph 3.6). The landscape is essentially treeless, with large trees confined to water courses and at farmsteads. Due to a limited grass component and low biomass, the veld is not highly fire prone. The region is prone to droughts.

Photograph 3.3: Portion of Gamma substation located just to the north of the R63

Photograph 3.4: Four (2 X 400 kV and 2 X 765 kV) Tx lines traversing the Hutchinson Road within a 350 m corridor on Annexe Rondawel

Photograph 3.5: Cell phone relay tower along the N1 on Vogelstruisfontein Farm

Photograph 3.6: Karoo scrub veld and kopjes on Rondawel Farm

Land use is almost exclusively agricultural and focused on livestock, specifically wool and mohair (Photograph 3.7). With the exception of Ratelfontein/ Bloemhof, all the study area properties are primarily used for stock farming, largely merino sheep, and angora goats. The veld carrying capacity is around 1 sheep/ goat per 3 ha. Economically viable farming units are around 5 000 – 8 000 ha. Properties are stocked year-round, with stock moved between internal camps on a rotational grazing basis. Many of the landowner's farm on multiple, often adjacent, properties. The study area is too arid to support dryland cropping, but fodder crops are grown under irrigation, typically for own use. However, a few farms have sufficient water to grow fodder commercially. Cropping areas are typically located near farm yards. Game occurs on many properties, but commercial hunting currently takes place only on Ratelfontein PGR south of the N1.

Photograph 3.7: Merino sheep on Westdene Merino Stud Farm

The settlement pattern is sparse and concentrated along public roads. Many of the farmsteads are also located at fountains near kopjes. Workers' dwellings are typically located near farmsteads (Photograph 3.8). The majority of study area farms are inhabited, or form part of nearby farms. Absent land owners typically lease out their properties to local farmers. Supervising staff reside on many properties not inhabited by their owners.

Photograph 3.8: Labourer's houses and farmstead on Gegundefontein Farm

Local area tourism is currently confined to Rondawel-, Skiektkuil- and Bloemhof Guest Farms, and Ratelfontein Private Game Reserve. The facilities on Rondawel (Angora WEF site property) and Skietkuil (near Gamma, part of historically proposed Betelgeuse PV site) are located along the N1 and cater to motorists (Photograph 3.9). Both are primarily stock farming operations. Bloemhof Guest Farm and Ratelfontein Private Game Reserve are dedicated upmarket destinations and are not primarily used for farming (see below).

Photograph 3.9: Entrance to Skietkuil Guest Farm off the N1 near the R63 intersection

3.1.1 Site properties

The Merino WEF site straddles four (4) properties, namely Vogelstruisfontein 84/RE, Rondavel 85/RE, Bult en Rietfontein 96/ 9 and Rondawel 85/1 (Figure 3.8). Vogelstruisfontein 84/RE and Rondavel 85/RE straddle the N1. The Merino WEF assessment area also straddles the N1, affecting portions of Rondavel 85/RE and Bult en Rietfontein 96/9 (both Rondawel farm). All turbines are however proposed to the north of the N1.

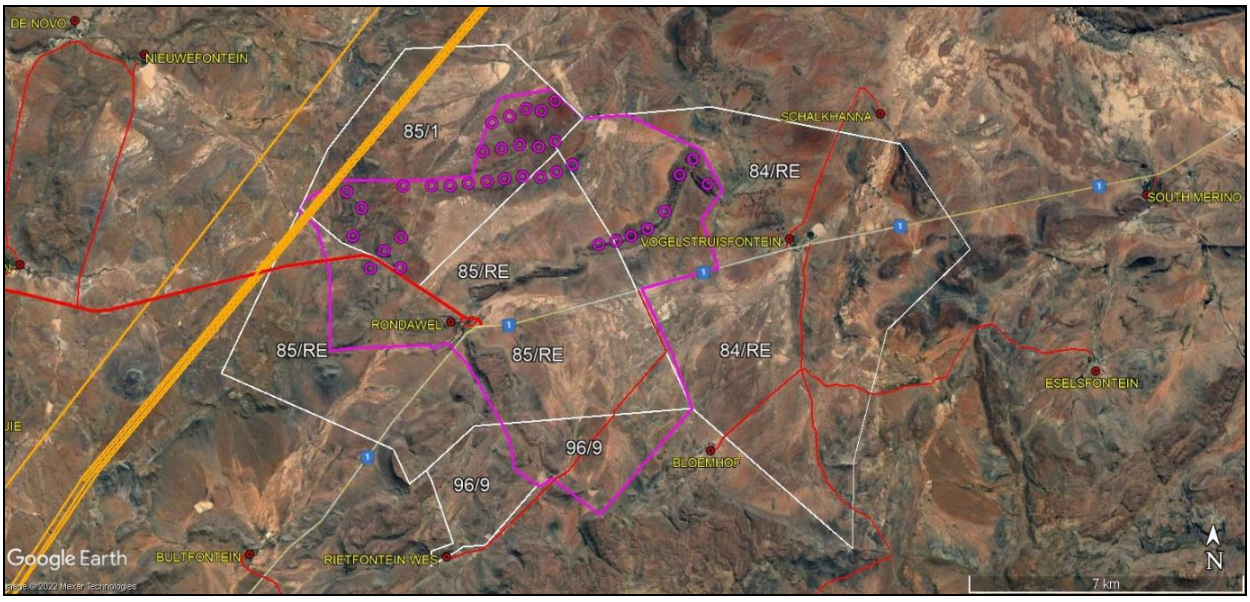


Figure 3.8: Overview of properties directly affected by the proposed Merino WEF (white outlines); orange lines indicate Eskom lines and red lines gravel roads

The four site properties belong to three land owners (Table 3.4). All site properties are primarily used for small stock farming, mainly wool merinos. All form part of significantly larger multi-farm operations.

Table 3.4: Overview of Merino WEF site properties

PROPERTY	OWNER	DWELLINGS	LAND USE
Vogelstruisfontein 84/RE	Mr Jan Victor	Vogelstruisfontein	Owner and workers live on farm Stock farming Multiple Great Karoo REFs proposed
Rondawel 85/RE	Mr Pieter van der Merwe	Rondawel	Owner and workers live on farm Stock farming Overnight accommodation Multiple Great Karoo REFs proposed
Bult en Rietfontein 96/9	Mr Pieter van der Merwe	Rietfontein Wes	Part of Rondawel operation Stok farming Dwelling currently unused
Rondawel 85/1	Mr Stephanus van den Heever	N.a.	Part of adjacent Excelsior farm Stock farming Multiple Great Karoo REFs proposed

Dwellings are located on three properties, namely Rondawel, Vogelstruisfontein and Rietfontein Wes. The Rondawel and Vogelstruisfontein farmstead complexes are located directly along the N1 (Photographs 3.10 and 3.11). Rondawel provides overnight accommodation in chalets near the farmstead (Photograph 3.12). The operation is entirely focused on passing or traffic or essential travel. The farm house on Bult en Rietfontein 96/9 (Rondawel) shares a yard with that on Bult en Rietfontein 96/5 (Ratelfontein PGR). Both are called Rietfontein West. The dwellings on the Rondawel portion are not occupied. The Ratelfontein portion is used to accommodate guest hunting parties. The two properties are dependent on one another for access over different stretches of the access road from the N1. Rondawel 85/1 is used purely for grazing. No structures are located on the property. It forms part of Grootaar Boerdery based on Excelsior (150/RE) adjacent to its north (van den Heever, van der Merwe, Victor – pers. comm).

Photograph 3.10: Farmstead and outbuildings on Vogelstruisfontein viewed from N1

Photograph 3.11: Rondawel farmstead, located near the N1- Hutchinson Road intersection

Photograph 3.12: Self-catering tourist accommodation on Rondawel

3.8.2 Adjacent properties

The Merino WEF site properties border onto fourteen (14) properties (Figure 3.9). Five of the relevant properties, including Bloemhof/ Ratelfontein, are located to the south/ east of the N1. The 14 properties are owned by 7-9 different landowners, three of whom are also the owners of the Merino WEF site properties (Table 3.5). Three portions of Ratelfontein PGR border onto the site properties, two of which border onto the Merino WEF development area. With the exception of Bloemhof/ Ratelfontein, all the properties are primarily used for small stock farming. Farmsteads are located on 8 of the properties, but not all of them are inhabited. Six of the properties serve as base farms for larger operations.

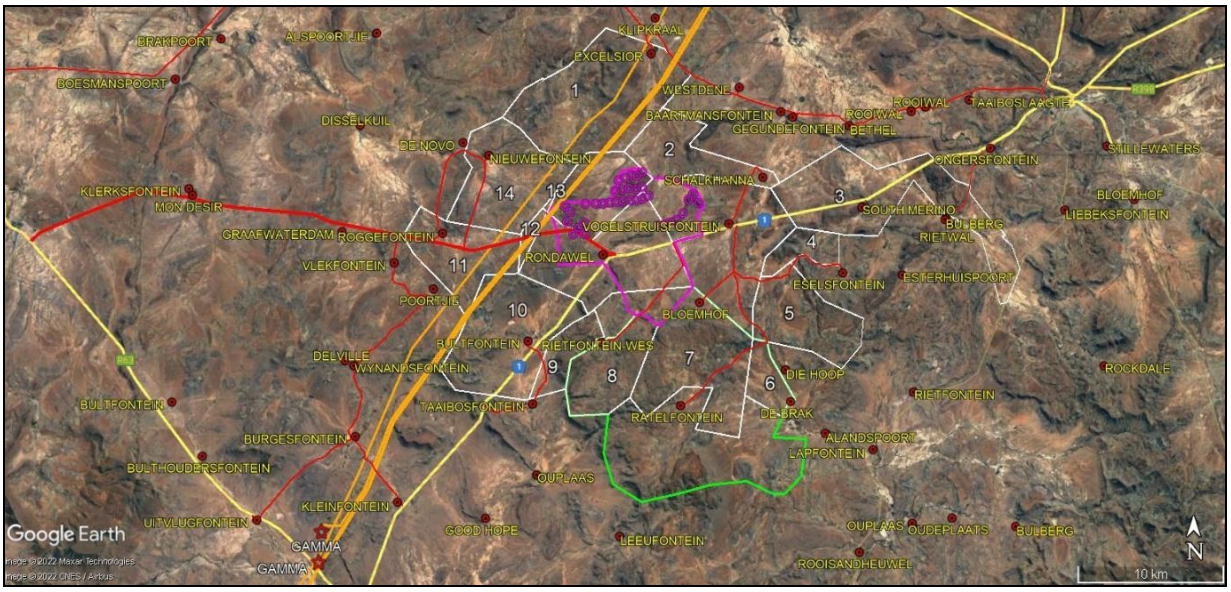


Figure 3.9: Merino WEF site in relation to adjacent properties; orange lines indicate Eskom lines, red lines access roads, and the green outline Ratelfontein Private Game Reserve/ Bloemhof Guest Farm

Table 3.5: Overview of properties adjacent to the Merino WEF site properties

	PROPERTY	OWNER	DWELLINGS	LAND USE
1	Farm 150/RE	Mr Stephanus van den Heever	Excelsior	Base farm of Grootaar Boerdery Owner and workers live on farm Stock farming
2	Gegundefontein 53/11	Mr Jan Victor	Schalkhanna	Part of Vogelstruisfontein operation Stock farming Farmstead currently uninhabited
3	South Merino 147/RE	Mr Henri Ackermann	South Merino	Owner and workers live on farm Stock farming
4	Farm 83/3	Unknown	N.a.	Assumed grazing
5	Farm 83/1	Unknown	N.a.	Assumed grazing
6	Elandspoort 101/11[14]	Mr Jan& Ms Jenny Pickard	N.a.	Bloemhof Guest Farm Ratelfontein Private Nature Reserve
7	Ratelfontein 98/1	Mr Jan& Ms Jenny Pickard	Bloemhof	Bloemhof Guest Farm Ratelfontein Private Nature Reserve Bloemhof farmstead used as upmarket guest accommodation
8	Bult en Rietfontein 96/5	Mr Jan& Ms Jenny Pickard	Rietfontein-Wes	Ratelfontein Private Nature Reserve Rietfontein-Wes farmstead used as trophy hunting guest accommodation
9	Bult en Rietfontein 96/8	Mr André de Vries	N.a.	Part of Bultfontein farm Leased out for grazing
10	Bult en Rietfontein 96/1	Mr André de Vries	Bultfontein	Owner lives in Kroonstad Leased out for grazing
11	Nieuwe Fontein 89/1	Mr. Leon Wasserfall	Roggefontein	Owner lives in Cape Town Stock farming Resident supervisor
12	Annexe Rondawel	Mr Stephanus	N.a.	Part of Grootaar Boerdery

[14] Shading indicates sensitive receptors.

	86/RE	van den Heever		Stock farming
13	Annexe Rondawel 86/1	Mr Stephanus van den Heever	N.a.	Part of Grootaar Boerdery Stock farming
14	Nieuwe Fontein 89/RE	Mr Kobus Reynolds	Nieuwefontein	Owner and workers live on farm Stock farming

Bloemhof Guest Farm and Ratelfontein Private Game Reserve (PGR) are the only sensitive receptors in any significant proximity to the proposed Merino WEF (Photograph 3.13). Bloemhof (Ratelfontein 98/1) effectively forms part of the larger Ratelfontein Private Game Reserve (PGR)[15] which consists of around 8 contiguous properties occupying around 16 000 ha. The properties are owned by Mr Jan Pickard. Ms. Jenny Pickard, his wife, operates Bloemhof Guest Farm, while Mr Pickard operates Ratelfontein. The Pickards are based in Cape Town, but typically visit the property 1-2 times a month. The properties are primarily used for tourism/ trophy hunting purposes, but also accommodate limited livestock farming. Resident staff manage the properties and tourism/ hunting operations in the absence of the owners. Turbines are proposed in significant proximity to both the Ratelfontein PGR property boundary and guest facilities on Rietfontein-Wes, and especially Bloemhof.

Photograph 3.13: Farmstead on Bloemhof Guest Farm. Dr Chris Barnard was the previous owner of Bloemhof

Bloemhof offers high-end catered accommodation and associated activities in a Karoo farm setting. The farm house (4 large suites) and a small chapel cater to visitors. Activities include guided and unguided walks, rides and game drives. Visitor flows are estimated to be half dedicated and half travellers stopping over along the N1 route. The operation permanently employs 5 staff members who reside on Bloemhof with their families (Photograph 3.14). Over peak periods (Easter, December holidays, functions) Bloemhof employs 5-7 additional people from the Richmond community.

Ratelfontein PGR caters for high-end trophy hunters, mainly overseas clients. Ratelfontein offers a large variety of indigenous, exotic, and rare plains game. Clients are accommodated in 6 lodges spread across the larger property. These include the farm houses at Ratelfontein and Rietfontein-Wes. A private landing strip is located on the property. Ratelfontein employs 5 resident workers (professional hunters, trackers, skinners, etc), with downstream work for taxidermists, chartered aviation, etc. Activities between Bloemhof and Ratelfontein overlap to some extent – e.g., Bloemhof offers game drives on the larger property, and the wives of

[15] A private designation, i.e., not a proclaimed Private Nature Reserve (PNR).

Ratelfontein guests often stay over on Bloemhof during excursions (Pickard, Mr Jan and Ms Jenny – pers. comm). The anchoring attraction of both operations is the unspoilt 'expansive Karoo' sense of place currently enjoyed on the relevant properties. None of the properties are currently affected by major service industrial infrastructure, and all are shielded from the N1 by intervening properties (Photograph 3.15).

Photograph 3.14: Ratelfontein and Bloemhof staff on Bloemhof

Photograph 3.15: Bloemhof farm yard (circled) and intervening veld on the portion of Vogelstruisfontein located to the south of the N1, seen from the N1

The Bloemhof farm yard is located 4.4 km south (east) of the N1. Traffic is only slightly visible, and mainly distantly at night. Traffic noise is not distinctly/ intrusively audible. The farm houses on Ratelfontein and Rietfontein-Wes are screened from the road by intervening topography. WEF applications have been approved on properties adjacent to the west (Mainstream's Victoria West WEF) and south (Iswathi Emoyeni WEF) of Ratelfontein PGR. Another Great Karoo REF, the Angora WEF, is currently proposed adjacent to the north (north/ west of the N1).

3.8.3 Potentially sensitive social receptors

A number of directly affected and adjacent properties currently accommodate major infrastructure. This includes the Eskom corridor, the N1, and cell phone signal relay towers

on a number of properties along the N1 (Table 3.5). All the existing infrastructure is currently located to the north west of the N1.

Table 3.5: Overview of affected properties in relation to proposed Merino WEF turbines

PROPERTY	ACCESS	EXISTING	HOUSES	COMMENT
Vogelstruisfontein 84/RE	N1	N1 Cell tower	2.5 km[16]	Merino WEF site (8 turbines) Proposed Angora WEF (28 turbines)
Rondawel 85/RE	Hutchinson Rd	N1 2 x 400 kV 2 x 765 kV Cell tower	800 m	Merino WEF site (4 turbines) Proposed Angora WEF (3 turbines) Proposed Moriri (Ptn) and Kwana SEFs
Bult en Rietfontein 96/9	N1	None	7.4 km	Merino WEF site (no turbines) Rietfontein Wes farm house uninhabited
Rondawel 85/1	Internal roads Excelsior	2 x 400 kV 2 x 765 kV	N.a.	Merino WEF site (23 turbines) Proposed Angora WEF (12 turbines) Proposed Moriri (Ptn) and Nku SEFs
Farm 150/RE (Excelsior)	Old Victoria West Rd	3 x 400 kV 2 x 765 kV	8.1 km	4 Great Karoo REFs proposed on greater Excelsior
Gegundefontein 53/11	N1 via Vogel-struisfontein	None	4.7 km	Angora WEF site (23 turbines) Dwelling on Schalkhanna currently unoccupied
South Merino 147/RE	N1	N1 None	11.1 km	Farmsteads on South Merino, Bulberg and Rietwal located E of N1
Farm 83/3	N1, via Vogelstruis-fontein Ptn	None	N.a.	Located E of N1
Farm 83/1	N1, via Vogelstruis-fontein Ptn	None	N.a.	Located E of N1
Elandspoort 101/11[17] (Ratelfontein PGR)	N1, via Vogelstruis-fontein Ptn	None	N.a.	Located E of N1 Turbines proposed 9.6 km from boundary Ratelfontein PGR/ Bloemhof Guest Farm
Ratelfontein 98/1 (Bloemhof Guest Farm)	N1, via Vogelstruis-fontein Ptn	None	5.6 km	Located E of N1 Turbines proposed 4.6 km of boundary Ratelfontein PGR/ Bloemhof Guest Farm
Bult en Rietfontein 96/5 (Ratelfontein PGR)	N1, via Rondawel Ptn	None	7.4 km	Located E of N1 Turbines proposed 6.5 km of boundary Ratelfontein PGR/ Bloemhof Guest Farm
Bult en Rietfontein 96/8	N1	None	N.a.	Located E of N1
Bult en Rietfontein 96/1	N1	N1 2 x 400 kV	7.8	Part of approved Mainstream Victoria West WEF (2011)

[16] Shading indicates dwelling within 5 km of the nearest turbine.
[17] Shading indicates sensitive receptors.

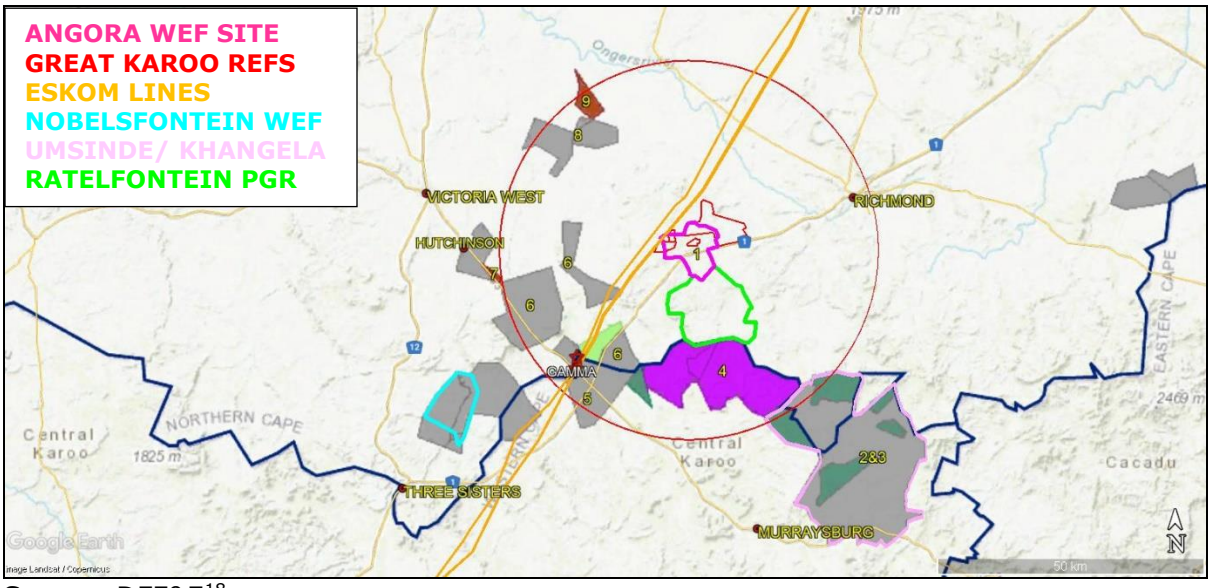
		2 x 765 kV Cell tower		Farmstead currently unoccupied
Nieuwe Fontein 89/1	Hutchinson Rd	3 x 400 kV 2 x 765 kV	8.5	Originally part of Great Karoo WEFs proposals (excluded due to presence of eagle nests)
Annexe Rondawel 86/RE	Internal roads Excelsior	2 x 400 kV 2 x 765 kV	N.a.	Part of Grootaar Boerdery (Excelsior)
Annexe Rondawel 86/1	Internal roads Excelsior	None	N.a.	Part of Grootaar Boerdery (Excelsior)
Nieuwe Fontein 89/RE	Hutchinson Rd	1 x 400 kV	6.2 km	Originally part of Great Karoo WEFs proposals (excluded due to presence of eagle nests)

Multiple Great Karoo REF projects are proposed on three of the four site properties. Rondawel 85/RE would accommodate (portions of) four REFs, Rondawel 85/1 three, and Vogelstruisfontein 84/RE two. Roggefontein and Nieuwefontein originally formed part of the Great Karoo REFs development area but were subsequently scoped out due to biophysical constraints. Mainstream's proposed Victoria West WEF was approved on Bultfontein in 2011.

Most (but not all) farm yards on the study area properties are situated near kopjes. This, coupled with the broken terrain, shields views in most directions and therefore limits the potential visual exposure to wind turbines. Turbines are proposed within a 5 km range of dwellings on Rondawel, Vogelstruisfontein, and Gegundefontein 53/11 (Schalkhanna). Vogelstruisfontein and Rondawel form part of the Merino site. Schalkhanna effectively forms part of the larger Vogelstruisfontein farm and Angora WEF site. Most of the affected land owners who are based west/ north of the N1, are already affected by existing or proposed infrastructure. None raised any issues or concerns with regard to the proposed Merino layout. No turbines are proposed to the south of the N1. Access roads to Bloemhof/ Ratelfontein PGR would therefore not be affected. The nearest turbines would be located 4.6 km from the Bloemhof/ Ratelfontein PGR boundary. The nearest turbines are proposed 5.6 km (Bloemhof) and 7.4 km (96/5) from the nearest residential/ accommodation structures. The owners have indicated that confining the Merino development area to the north of the N1 would be acceptable (Pickard, Mr Jan and Ms. Jenny – pers. comm).

3.8.4 Other renewable energy facilities

The study area does not fall within a REDZ. The Nobelsfontein WEF (Elawan Energy), located 42 km south-west of the Merino WEF site, is the only operational REF located in the vicinity of the study area. The Nobelsfontein WEF was completed in 2011 and consists of 41 x 1.8 MW turbines (80 m hub height) with an installed capacity of 74 MW. The turbines are visible from the N1 in the area near the R63 intersection during the day time, but not from the immediate study area. According to the owner of Ratelfontein, aviation lights are visible at a distance on peripheral portions of Ratelfontein PGR at night (Pickard, Jan – pers. comm). A total of 12 other REFs (8 broad sites) are/ have been proposed on properties located within a 35 km range of the Merino site. The sites are located in a semi-circle to the south and west of the Merino site (Figure 3.10).



Source: DFF&E[18]

Figure 3.10: Location of proposed REFs within 35 km range (red circle) of Merino WEF site

Most of the active proposals appear to be located to the south, north of Murraysburg, and entail WEFs. Four of the 12 REFs (9 broad sites) also form part of the Great Karoo REF cluster, namely the adjacent Angora WEF, and Kwana-, Moriri- and Nku PV SEFs (Table 3.7). The specifications for the Angora and Merino WEFs are identical (namely 140 MW, turbines of up to 170 m hub height). Each of the three SEFs would have a capacity of 100 MW. The five Great Karoo REFs would evacuate power via an on-site collector substation (to be located on portion of Rondawel north of the N1) and common Tx line to Gamma. It is understood that a number of properties in the study area (De Novo, Vlekfontein, Roggefontein, Wynandsfontein) are currently being investigated for potential future expansion of the Groot Karoo cluster. The relevant properties are located to the north of the N1 and the Merino development area.

Table 3.7: Overview of proposed REFs within 35 km range of Merino WEF site

	NAME	TYPE	MW	DEVELOPER	COMMENT
1	Great Karoo (REF cluster)	Mixed	140 x 2 100 x 3	Great Karoo Renewable Energy	6 parallel applications; Merino and Angora WEFs + Kwana, Moriri and Nku PV SEFs + shared Tx line to Gamma
2	Umsinde Emoyeni (2 phases)	WEF	147	Windlab	Submitted Bid Round 5 35 turbines (hub 135 m) To evacuate into Gamma
3	Khangela Emoyeni (2 Phases)	WEF	147	Windlab	Submitted Bid Round 5 Same site as Umsinde WEF 33 turbines (160 m hub) To evacuate into Gamma
4	Iswathi Emoyeni	WEF	140	Windlab	Submitted Bid Round 5 66 turbines approved (130 m hub) 2020 application for 33 turbines (160 m hub)

[18] https://egis.environment.gov.za/renewable_energy (November 2021 update).

					To evacuate into Gamma
5	Betelgeuse 2-4	PV SEF	3 x 75	Aurora Power Solutions	Project appears to be inactive
6	Victoria West	Mixed	???	SA Mainstream Renewable Power Developments	37 turbines approved 2011 Application to add 33 turbines 2016
7	Biesjesfontein	PV SEF	19	Bellatrix Solar	Project appears to be inactive
8	Brakpoort Karoo	PV SEF	12	Blue Sky Solar	Project appears to be inactive
9	Wildebeest Karoo	PV SEF	12	Green Sky Solar	Project appears to be inactive

Three WEF projects located within 35 km of the Merino site submitted bids in REIPPP Bid Round 5 (closed April 2021). All three are Mainstream/ Emoyeni projects, namely Iswathi, Umsinde and Khangela. The projects are located on contiguous properties. Iswathi Emoyeni borders onto Ratelfontein PGR to the north. The most recent amendment applications reflected on the SAHRIS archival website[19] indicate proposals for 140-147 MW capacity facilities consisting of 33-35 turbines with hub heights of 130 to 160 m. All three projects are proposed to feed into Gamma. None of the projects achieved preferred bidder status in 2021. None of the remaining projects within a 35 km radius of the Merino site submitted bids in 2021. These include the approved Mainstream Victoria West WEF (2011, applied for amendment 2016), and the Betelgeuse 2-4, Brakpoort Karoo and Wildebeest Karoo PV facilities. It is not clear whether these projects are still active. At any rate, none of the projects/ applications appear to have an internet presence dating to after 2016 (and in one instance, 2012).

[19] https://sahris.sahra.org.za/

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 PKSDM SDF and IDP and ULM IDP also support the development of renewable energy. The development of the proposed WEF is therefore supported by key policy and planning documents.

4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

Potential positive impacts

- Creation of employment and business opportunities, 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 of the Merino WEF will extend over a period of approximately 18-24 months and create in the region of 350 employment opportunities. Based on information provided by the proponent, approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. Members from the local communities in the area, specifically Victoria West and Richmond, 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. Based on information from similar projects, the total wage bill will be in the region of R 31 million (2021 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 ULM. 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 2 billion (2021 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 ULM. 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.

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	
Enhancement: See below		
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.

Recommended enhancement measures
In order to enhance local employment and business opportunities associated with the construction phase, the following measures should be implemented:

Employment
- 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 ULM 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 ULM 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 contractors. These companies should be notified of the tender process and invited to bid for project-related work.
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.
- The ULM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

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.

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.

The proponent has indicated that workers will be accommodated in nearby towns such as Richmond and Victoria West.

As indicated above, the objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. 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 Victoria West and Richmond.

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	
Mitigation: See below		
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.

Recommended mitigation measures
The potential risks associated with construction workers can be mitigated. The detailed mitigation measures should be outlined in the Environmental Management Plan (EMP) for the Construction Phase. Aspects that should be covered include:

- 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 Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from ULM, farmers, and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers.
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify

which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation.
- The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
- The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area.
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.
- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days of their contract coming to an end.
- It is recommended that no construction workers, except for security personnel, should be permitted to stay over-night on the site. However, as indicated above, due to the location of the site, on-site accommodation for workers may need to be provided.

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 4.4.2. 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 nearby towns of Victoria West and Richmond. 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	Permanent (5) (For job seekers that stay on in the area)	Permanent (5) (For job seekers that stay on in the area)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
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	
Mitigation: See below		
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.

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:

- The proponent, in consultation with the ULM, should investigate the option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area. The MF should also include the other proponents of solar energy projects in 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.

4.3.4 Risk to safety, livestock, and farm infrastructure

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In

addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may 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. 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.

Based on feedback from interviews with local landowners, stock theft is currently not a major concern; however, properties vulnerable due to year-round stocking. Potential risk of poaching is largely linked to Ratelfontein which stocks valuable game species.

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

Nature: Potential risk to safety of scholars, 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
Mitigation: See below		
Residual impacts: No**,** provided losses are compensated for.		

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

Recommended mitigation measures
Key mitigation measures include:

- The proponent should enter into an agreement with 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.
- Traffic movement and construction related activities should be contained within clearly designated areas.
- Strict traffic speed limits must be enforced.
- All farm gates must be closed after passing through.

- Contractors appointed by the proponent should provide daily transport for construction workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties.
- 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 the contractors move onto site.
- The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction related activities and or workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).
- The Environmental Management Plan (EMP) 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 on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the proponent must ensure that construction workers 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.
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

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. In terms of potential mitigation measures, the option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated. In addition, fire-fighting equipment must be provided on site.

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	
Mitigation: See below		
Residual impacts: No, provided losses are compensated for.		

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

Recommended mitigation measures
The mitigation measures include:

- 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.

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.

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	
Mitigation: See below		
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.

Recommended mitigation measures
The potential impacts associated with heavy vehicles can be effectively mitigated. The mitigation measures include:

- The movement of construction vehicles on the site should be confined to agreed access road/s.
- The movement of heavy vehicles associated with the construction phase should be timed to avoid days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher.
- Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- All vehicles must be road worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

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 rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: See below		
Residual impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		

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

Recommended mitigation measures
The potential impacts associated with damage to and loss of farmland can be effectively mitigated. The aspects that should be covered include:

- An Environmental Control Officer (ECO) should be appointed to monitor the construction phase.
- Existing internal roads should be used where possible. In the event that new roads are required, these roads should be rehabilitated on completion of the construction phase.
- The footprint associated with the construction related activities (access roads, construction camps, workshop etc.) should be minimised.
- All areas disturbed by construction related activities, such as access roads on the site, construction camps etc., should be rehabilitated at the end of the construction phase.
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be included in the EMP.
- The implementation of the Rehabilitation Programme should be monitored by the ECO.

4.4 OPERATIONAL PHASE SOCIAL IMPACTS

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

Potential positive impacts
- The establishment of infrastructure to improve energy security and support 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.

4.4.1 Improve energy security and support the renewable energy sector

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

Improved energy security
South Africa's energy crisis, which started in 2007 and is ongoing, has resulted in widespread rolling blackouts (referred to as load shedding) due to supply shortfalls. The load shedding has had a significant impact on all sectors of the economy and on investor confidence. The mining and manufacturing sector have been severely impacted and will continue to be impacted until such time as there is a reliable supply to energy. Load shedding in the first six months of 2015 was estimated to have cost South African businesses R13.72 billion in lost revenue with an additional R716 million was spent by businesses on backup generators[20]. A survey of 3 984 small business owners found that 44% said that they had been severely affected by load shedding with 85% stating that it had reduced their revenue, with 40% of small businesses losing 20% or more or revenue during due to load shedding period[21].

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.

[20] 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
[21] "How does load shedding affect small business in SA?". *The Yoco Small Business Pulse (3: Q1 2019): 3*

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

The overview of the IPPPP (June 2020) indicates that the REIPPPP has attracted R41.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and IS2). This is almost double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 52% (R31.5 billion) of the total equity shareholding (R61 billion) was held by South African's across BW1 to BW4, 1S2 and 1S2. This equates to substantially more than the 40% requirement. Foreign equity amounts to R 29.5 billion and contributes 49% to total equity. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 33% of projects that have reached financial close, which is slightly above the 30% target.

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 24% (against the targeted 20%) for the 68 projects in operation (i.e. in BW1–4). The target for shareholding by black people in top management has been set at 40%, with an average 67% achieved to date. The target has therefore been significantly exceeded.

The total projected procurement spend for during the construction phase was R73.1 billion, while the proposed operations procurement spend over 20 years operational life is estimated at 76.8 billion. The combined (construction and operations) procurement value is projected as R149.9 billion, of which R81 billion has been spent to date. For construction, of the R70.2 billion already spent to date, R57.7 billion is from the 68 projects which have already been completed. These 68 projects had planned to spend R52.9 billion. The actual procurement construction costs have therefore exceeded the planned costs by 9% for completed projects. Of the R70.2 billion spent on procurement during construction, R59 billion has reportedly been procured from BBBEE suppliers, achieving 87% of total procured. Actual BBBEE spend during construction for BW1 and BW2 alone was R25.5 billion. The R59 billion spent on BBBEE during construction is 15% more than the R 51.1 billion that had originally been anticipated by all IPPs.

Total procurement spend by IPPs from Qualifying Small Enterprises (QSE) and Exempted Micro Enterprises (EME) has amounted to R24.7 billion (construction and operations) to date, which exceeds commitments by 96% and is 30% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction was R 22 billion, which is 4.4 times the targeted spend for construction of R4.9 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 3.2 billion was undertaken by women-owned vendors, which is almost double the R 1.9 billion estimated 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.

In terms of employment, to date, a total of 52 603 job years[22] have been created for South African citizens, of which 42 355 job years were in construction and 10 248 in operations. 81%, 43% and 49% 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. These job years should rise further past the planned target as more projects enter the construction phase. The REIPPPP has also ensured that black people in local communities have ownership in the IPP projects that operate in or nearby their vicinities. The establishment of renewable energy facilities therefore not only address environmental issues associated with climate change and consumption of scarce water resources, but also create significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

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	
Enhancement: See below		
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

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

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

Recommended mitigation measures
Should the project be approved the proponent should:

- Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members.
- Maximise opportunities for local content, procurement, and community shareholding.

4.4.2 Creation of employment opportunities

The proposed development will create in the region of 20 full time employment opportunities during the operational phase, of which 70% will be unskilled, 25% semi-skilled, and 5% skilled. Based on similar projects the annual operating budget will be in the region of R 24 million (2021 Rand values), including wages.

Table 4.9: Assessment of employment and business creation opportunities

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Enhancement	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Low (28)**	**Medium (40)**
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: See below		
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.

Recommended enhancement measures
The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase.

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.

The benefits are also not only limited to the affected landowners. In this regard, the landowners interviewed indicated that farm owners that were scoped out during the EIA phase will still receive some financial compensation.

Table 4.10: Assessment of benefits associated with income generated for the affected farmer(s)

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	
Enhancement: See below		
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.

Recommended enhancement measures
Implement agreements with affected landowners.

4.4.4 Benefits associated with the socio-economic development contributions

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue

can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

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

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

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–BW41), 68 are operational. The SED contributions associated with these 68 projects has amounted to R 1.2 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 1 123 education institutions with a total of R312 million in contributions, from 2015 to the end of June 2020. A total of 1 142 bursaries, amounting to R183.8 million, have been awarded by 55 IPPs from 2015 until the end of June 2020. The largest portion of the bursaries were awarded to African and Coloured students (97%), with women and girls receiving 56% of total bursaries. The Northern Cape province benefitted most from the bursaries awarded, with 61%, followed by the Eastern Cape (18%) and Western Cape (14%). 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 Enhancement[23]**
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	
Enhancement: See below		
Residual impacts: Promotion of social and economic development and improvement in the overall well-being of the community		

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

Recommended enhancement measures
To maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented:

- The proponents should liaise with the ULM 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.

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. Concerns were raised regarding the potential impact on the sense of place associated with some of the turbines associated with the proposed Merino WEF and the impact on the sense of place on Bloemhof and Ratelfontein. As indicated above, Ratelfontein caters for high-end trophy hunters, mainly overseas clients, who are accommodated in six lodges. Bloemhof offers game drives and wives of Ratelfontein guests often stay over on Bloemhof during excursions. The anchoring attraction of both operations is the unspoilt 'expansive Karoo' sense of place currently enjoyed on the relevant properties. None of the properties are currently affected by major service industrial infrastructure, and all are shielded from the N1

[23] Enhancement assumes effective management of the community trust

by intervening properties. The wind turbines associated with the Merino WEF are all located to the north of the N1. The owners of the Ratelfontein and the Bloemhof Guest Farm, the Pickards, indicated that they are not opposed to turbines located to the north of the N1.

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 (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (21)**
Status	Negative	Negative
Reversibility	Yes, WEF components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: See below		
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.

Recommended mitigation measures
The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.

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 farms on property values based on the findings of studies undertaken overseas. The assessment rating is based on the findings of the review.

In total, five articles were identified and reviewed namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159.
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia.
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics /

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

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 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%).

Martin D. Heintzelman and Carrie M. Tuttle (March 2011)
The findings of the study indicate that nearby wind 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 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. In conclusion, the authors of the Urbis study found:

- 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.

Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low. As indicated above the owners of the operations on Bloemhof and Ratelfontein have indicated that they are not opposed to wind turbines located to the north of the N1.

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 (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	

Enhancement: See below
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.

Recommended mitigation measures
The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.

4.4.7 Potential impact on tourism

A review of international literature on the impact of wind farms 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.

Based on the findings of the literature review, there is limited evidence to suggest that the proposed WEF would impact on the tourism in the PKSDM and ULM at a local and regional level. The findings also indicate that wind farms do not impact on tourist routes. This was confirmed by the feedback from the local landowners interviewed. The majority of whom raised no concerns about the potential impact on tourism facilities in the area. As indicated above the owners of the operations on Bloemhof and Ratelfontein have indicated that they are not opposed to wind turbines located to the north of the N1.

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 (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Enhancement: See below		
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.

Recommended mitigation measures
The recommendations contained in the VIA should be implemented. In addition, consideration should be given to confining wind turbines to the north of the N1.

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).

As indicated above, the potential impact of the proposed WEF and associated infrastructure on the areas sense of place is likely to be limited. The cumulative impacts are also likely to be low with mitigation.

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

Nature: Visual impacts associated with the establishment of more than one REF 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. REF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: See below		

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

Recommended mitigation measures
The recommendations of the VIA should be implemented.

4.6 CUMULATIVE IMPACT ON LOCAL SERVICES AND ACCOMMODATION

The objective will be to source as many low and semi-skilled workers for the construction phase from the ULM. This will reduce the pressure on local services and accommodation and the nearby towns of Victoria West and Richmond. The capacity of accommodate workers will be addressed during the assessment phase.

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 ULM. These benefits will create opportunities for investment in the ULM, including the opportunity to up-grade and expand existing services and the construction of new houses. Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed WEF is also required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the ULM to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning process undertaken by the ULM.

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 ULM 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)[24]**
Status (positive/negative)	Negative	Negative
Reversibility	Yes. REF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: See below		

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

Recommended mitigation measures
The proponent should liaise with the ULM to address potential impacts on local services.

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

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

The review of the REIPPPP (June 2020) indicates that the SED contributions associated with 68 operational projects has amounted to R 1.2 billion to date. In terms of Enterprise Development (ED), R 7.2 billion has been committed for BW1 to BW4, 1S2 and 2S2. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R360 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. Up until the end of June 2020 a total of R 384.2 million had already been made to the local communities located in the vicinity of the 68 operating IPPs. This represents 93% of the total R384.2 million enterprise development contributions made to date). The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes.

Table 4.17: Cumulative impacts on local economy

Nature: The establishment of renewable energy facilities and associated projects, such as the WEF, in the ULM 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)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Low (27)**	**Medium (52)** [25]
Status (positive/negative)	Positive	Positive
Reversibility	Yes. REF components and other infrastructure can be removed.	
Loss of resources?	No	No
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: See below		

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 ULM.

Recommended enhancement measures
The proposed establishment of suitably sited renewable energy facilities and associated projects, such as the proposed WEF, within the ULM and NCP should be supported.

[25] With effective enhancement and planning, the significance will be Medium Positive.

4.8 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 4.18: 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 [26]	**With Enhancement[27]**
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: See below		
Residual impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		

Recommended enhancement measures

The proposed WEF should be developed, and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented.

[26] Assumes project is not developed
[27] 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 PKSDM SDF and IDP and ULM IDP also support the development of renewable energy. The development of the proposed WEF is therefore supported by key policy and planning documents.

5.2.2 Construction phase impacts

The key social issues associated with the construction phase include:

Potential positive impacts

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

The construction phase will extend over a period of approximately 14 months and create in the region of 350 employment opportunities. Based on information provided by the proponent, approximately 75% of the jobs will benefit low-skilled workers, 25% semi-skilled and 5% high skilled. Members from the local communities in Victoria West and Richmond may potentially qualify for low skilled and semi-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 31 million (2021 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 ULM.

The capital expenditure associated with the construction phase will be approximately R 2 billion (2021 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 ULM. 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

- he 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.

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. 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)	Medium (Positive)
Visual impact and impact on sense of place	Medium (Negative)	Low (Negative)
Impact on property values	Medium (Negative)	Low (Negative)
Impact on tourism	Medium (Negative)	Low (Negative)

5.2.4 Assessment of cumulative impacts

Cumulative impact on sense of place

The potential visual impact of the proposed WEF and associated infrastructure on the areas sense of place is likely to be limited. The cumulative impacts on sense of place are also likely to be low with mitigation. This will be confirmed during the assessment phase.

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 **Medium Positive**.

5.2.5 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 Merino WEF 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 though 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 establishment of the proposed Merino WEF is therefore supported by the findings of the SIA.

ANNEXURE A

INTERVIEWS

- Ackermann, Mr Henri (telephonic 2021-12-09). Owner South Merino farm.
- De Jager, Mr Louis (telephonic, 2021-12-07). Owner Nuwefontein and Uitvlugfontein farms.
- De Vries, Mr Andre (telephonic, 2021-12-07). Owner Bultfontein farm.
- Esterhuizen, Mr Hannes (telephonic, 2021-12-10). Owner Poortjie farm.
- Esterhuizen, Mr Hennie (telephonic, 2021-12-06). Owner Wynandsfontein farm.
- Hugo, Mr Danny (telephonic, 2021-12-06). Owner Burgersfontein farm.
- Pickard, Ms. Jenny (2021-12-04). Owner Bloemhof Guest Farm.
- Pickard, Mr Jan (2021-12-04). Owner Ratelfontein Private Game Reserve.
- Reynolds, Mr Kobus (telephonic, 2021-12-07). Owner Nuwefontein farm.
- Van der Heever, Mr Stephanus (2021-12-06). Owner Excelsior farm.
- Van der Merwe, Mr Pieter (2021-12-06). Owner Rondawel farm.
- Victor, Mr Jan (2021-12-06). Owner Vogelstruisfontein farm.
- Wasserfall, Mr Leon (telephonic 2021-12-09). Owner Roggefontein farm.

REFERENCES

- The National Energy Act (2008).
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998).
- The White Paper on Renewable Energy (November 2003).
- Integrated Resource Plan (IRP) for South Africa (2010-2030).
- The National Development Plan (2011).
- Northern Cape Provincial Growth and Development Strategy (2004-2014).
- Northern Cape Climate Change Response Strategy.
- Northern Cape Spatial Development Framework (2012).
- Northern Cape Province Green Document (2017/2018).
- Pixley Ka Seme Integrated Development Plan (2019-2020).
- Pixley Ka Seme Spatial Development Framework (2017).
- Green Jobs Study (2011), IDC, DBSA Ltd and TIPS.
- Independent Power Producers Procurement Programme (IPPPP): An Overview (2017), Department of Energy, National Treasury and DBSA.
- Powering the Future: Renewable Energy Roll-out in South Africa (2013), Greenpeace South Africa.
- Ubuntu Integrated Development Plan (2019-2020).

ANNEXURE B

METHODOLOGY FOR THE ASSESSMENT OF POTENTIAL IMPACTS

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

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

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

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

S = Significance weighting
E = Extent
D = Duration

M = Magnitude
P = Probability

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

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

ANNEXURE C

Tony Barbour
ENVIRONMENTAL CONSULTING AND RESEARCH

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(E-Mail) tbarbour@telkomsa.net

Tony Barbour's has 26 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 260 SIA's, including SIA's 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 SIA's 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.

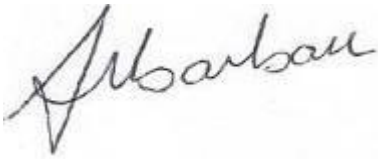
ANNEXURE D

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):

20 April 2022

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 CO_2 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 CO_2-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 km^2 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 that 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 measureable 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.