THE BASIC ASSESSMENT FOR THE PROPOSED KOMAS WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR KLEINSEE IN THE NORTHERN CAPE PROVINCE.

APPENDIX C.8

Socio-Economic Assessment

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SOCIAL STATEMENT

KOMAS WEF BATTERY ENERGY STORAGE SYSTEM

FEBRUARY 2021

By

Tony Barbour

1. INTRODUCTION AND BACKGROUND TO REPORT

The CSIR was appointed by Genesis ENERTRAG Komas Wind (Pty) Ltd (the applicant) to manage the Basic Assessment (BA) process for the proposed 300 MW Komas Wind Energy Facility (WEF). The proposed Komas WEF site is located approximately 37 km south east of the coastal settlement of Kleinsee within the Springbok Renewable Energy Development Zone (REDZ) in the Northern Cape Province. The site and study area fall within the Nama Khoi Local Municipality (NKLM), one of the 7 LMs constituting the Namakwa District Municipality (NDM).

Tony Barbour was appointed by the CSIR to undertake a specialist Social Impact Assessment (SIA) as part of the BA process.

The applicant have updated the project and added a Lithium-ion Solid state Battery Energy Storage System (BESS) and an associated 33/132kV on-site Substation (SS) to the Komas WEF project. The BESS will be located within a 4ha to allow for micro-siting of the BESS components. Two site options have been identified for assessment as part of the BA process.

The Social Statement comments on the implications of the proposed BESS and associated on-site SS on the overall finding of the Komas WEF SIA (August 2020).

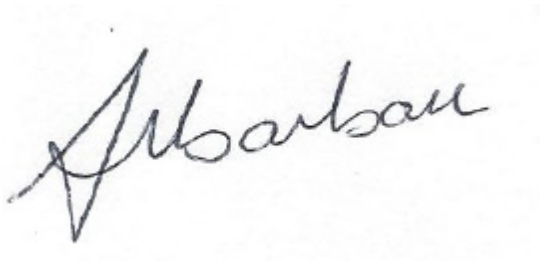
2. SOCIAL STATEMENT

As indicated above, a BESS and associated 33/132kV on-site Substation (SS) have been added to the Komas WEF project. The footprint of the BESS will be 4ha and two site alternatives have been identified.

Due to the relatively small footprint associated with the BESS (4ha) and on-site SS the social impacts associated with the establishment and operation of the BESS and SS will be limited. In this regard there are no changes to the significance ratings reflected in the Komas WEF SIA (August 2020). The establishment of the BESS and SS will create additional employment opportunities during the operational phase. The significance rating will remain Medium. The increase in capacity will also increase the contribution of renewable energy to South Africa's energy supply mix. This also represents an improvement in social benefits associated with the Komas WEF.

- The construction and operation of the proposed BESS and SS will not change the nature or significance of any of the social impacts previously assessed as part of the SIA for the Komas WEF (August 2020).
- The construction and operation of the proposed BESS and SS will not result in any material social impacts that were not previously assessed as part of the SIA for the Komas WEF (August 2020).
- The mitigation measures for the construction of the WEF listed in the Komas WEF (August 2020) are also appropriate for the establishment of the BESS and SS. No additional management outcomes or mitigation measures in terms of social impacts are therefore required.

The overall conclusion of the SIA supporting the establishment of the Komas WEF, including the BESS, and associated on-site substation, is therefore confirmed.



Tony Barbour
Tony Barbour Environmental Consulting and Research
3 February 2021

ANNEXURE A

Tony Barbour
ENVIRONMENTAL CONSULTING AND RESEARCH

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Tony Barbour's experience as an environmental consultant 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 renewable energy developments, infrastructure projects, dams, pipelines, and roads. 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, Nigeria, Senegal, Mozambique, Mauritius, Kenya, Ethiopia, Oman, South Sudan, Sudan and Armenia.

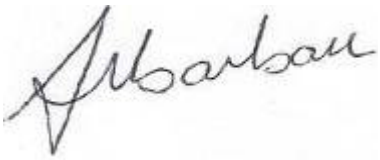
ANNEXURE B

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):

3 February 2021

Date:

SOCIO-ECONOMIC IMPACT ASSESSMENT

KOMAS WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NORTHERN CAPE PROVINCE

OCTOBER 2020

Prepared for

CSIR

By

Tony Barbour and Schalk van der Merwe

Tony Barbour
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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

The CSIR was appointed by Genesis ENERTRAG Komas (Pty) Ltd to manage the Basic Assessment (BA) process for the proposed 300 MW Komas Wind Energy Facility (WEF) and associated infrastructure. The proposed Komas WEF site is located approximately 37 km south east of the coastal settlement of Kleinsee within the Springbok Renewable Energy Development Zone (REDZ 8) in the Northern Cape Province. The site and study area fall within the Nama Khoi Local Municipality (NKLM), one of the 7 Local Municipalities (LMs) constituting the Namakwa District Municipality (NDM).

Tony Barbour was appointed by the CSIR to undertake a Socio-Economic Impact Assessment as part of the BA process. This report contains the findings of the assessment undertaken as part of the BA process.

APPROACH TO THE STUDY

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

- Collection and review of baseline socio-economic data;
- Review of relevant planning and policy frameworks for the area;
- Site specific information collected during the site visit to the area and interviews with key stakeholders;
- Review of information from similar projects; and
- Identification of social issues associated with the proposed project.

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; and
- No-Go Development Alternative.

FIT WITH POLICY AND PLANNING

The findings of the review indicate that renewable energy is strongly supported at a national, provincial and local level. At a national and provincial 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 make reference to renewable energy. The proposed WEF also supports a number of objectives contained in the Northern Cape Province (NCP) Provincial Growth and Development Strategy. At a district and local level, the NDM's Integrated Development Plan (IDP), NDM Climate Change Response Plan, NKLM's IDP and NKLM's Spatial Development Framework (SDF) all support the establishment of renewable energy facilities. The proposed Komas

WEF is also located within the Springbok REDZ 8, which was formally gazetted in 2018[1]. The area has therefore been identified as suitable for the establishment of renewable energy facilities, including WEFs.

CONSTRUCTION PHASE
The key social issues associated with the construction phase include:

Potential positive impacts
- Creation of employment and business opportunities and opportunity for skills development

The construction phase for a single 300 MW WEF is expected to extend over a period of 20-24 months and create approximately ~ 200-250 employment opportunities. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers, 30% (76) to semi-skilled workers and 15% (38) for skilled personnel. The majority of low and semi-skilled employment opportunities will be available to Historically Disadvantaged (HD) members from the NKLM community. Due the demise of the mining sector, the levels of unemployment in the NKLM are high. The towns that are likely to benefit are Komaggas, Buffelsrivier, Kleinsee, and Springbok. This would represent a significant positive social benefit in an area with limited employment opportunities. In order to maximise the potential benefits, the developer should commit to employing local community members to fill the low and medium skilled jobs.

The potential benefits for local communities are confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and the Development Bank of Southern Africa (DBSA) (March 2019). The review found that by the end of March 2019 the 64 renewable energy projects that had been successfully completed had created 31 633 job years[2] of employment, compared to the anticipated 20 689. This was 53% more than planned. The study also found that significantly more people from local communities were employed during construction than was initially planned.

The capital expenditure associated with the construction phase for a 300 MW WEF will be in the region of R 2.5 billion (2020 Rand value). The total wage bill will be in the region of R69 million (2020 Rand value). A percentage of the wage bill will be spent in the local economy which will create opportunities for local businesses in the town in the area, such as Komaggas, Buffelsrivier, Kleinsee, and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The benefits to the local economy will be confined to the construction period (20-24 months).

Potential negative impacts
- Impacts associated with the presence of construction workers on site and in the area;
- Influx of job seekers to the area;

[1] GN114 of 2018
[2] The equivalent of a full-time employment opportunity for one person for one year

- Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site;
- Increased risk of grass fires; and
- Impact of heavy vehicles, including damage to roads, safety and dust; and
- Impact on farming activities.

The findings of the Socio-Economic Assessment indicate that the significance of all the potential negative impacts with mitigation were **Low Negative**. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. Given that the majority of the low and semi-skilled construction workers can be sourced from the local area the potential risk posed by construction workers on local family structures and social networks is regarded as low for the community as a whole. Table 1 summarises the significance of the impacts associated with the construction phase.

Table 1: Summary of impacts associated with construction phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Moderate (+)	Moderate (+)
Presence of construction workers and potential impacts on family structures and social networks	Moderate (-)	Low (-)
Influx of job seekers	Low (-)	Low (-)
Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site	Moderate (-)	Low (-)
Increased fire risk	Moderate (-)	Low (-)
Impact of heavy vehicles and construction activities	Moderate (-)	Low (-)
Impact on farming activities	Moderate (-)	Low (-)

OPERATIONAL PHASE

The key social issues affecting the operational phase include:

Potential positive impacts
- The establishment of renewable energy infrastructure;
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Benefits associated with the establishment of a Community Trust; and
- Benefits for affected landowners.

Development of renewable energy infrastructure
The establishment of renewable energy infrastructure, such as the proposed WEF, should be viewed, firstly 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 Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

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 Greenpeace Report (Powering the future: Renewable Energy Roll-out in South Africa, 2013), notes that 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.

The Green Jobs study (2011) identifies a number of advantages associated with wind power as a source of renewable energy, including zero Carbon Dioxide (CO_2) emissions during generation and low lifecycle emissions. Greenhouse gases (GHG) associated with the construction phase are offset within a very short period of time compared with the project's lifespan. Wind 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, wind as 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.

The National Climate Change Response White Paper outlines the national response to the impacts of climate change, as well as the domestic contribution to international efforts to mitigate green-house gas emissions. As part of the global commitment, South Africa is targeting an emissions trajectory that peaks at 34% below a "business as usual" case in 2020, 42% below in 2025 and from 2035 declines in absolute terms. The emission reductions between March 2018 and 2019 are estimated to be 10.9 million tonnes of CO_2. This represents 53% of the total projected annual emission reductions achieved with only partial operation to date. Since operation, the Independent Power Producers (IPPs) have generated 35 699 GWh, resulting in 36.2 Mton of CO_2 emissions being offset and saving 42.8 million kilolitres of water related to fossil fuel power generation.

The REIPPPP had therefore contributed significantly towards meeting South Africa's GHG emission targets and, at the same time, supporting energy security, economic stability and environmental sustainability.

The establishment of renewable energy facilities, such as the proposed Komas WEF, therefore not only addresses the environmental issues associated with climate change and consumption of scarce water resources, but also creates significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

Creation of employment and business opportunities

The total number of permanent employment opportunities associated with a 300 MW WEF would be ~ 20. Of this total ~ 12 are low skilled workers, 6 semi-skilled and 2 skilled. The annual wage bill for the operational phase will be ~ R 3 million (2020 Rand value). The majority of low and semi-skilled beneficiaries are likely to be HD members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in the local towns in the area, such as Komaggas, Buffelsrivier, Kleinsee, and Springbok.

Procurement during the operational phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (March 2019) notes that the operational phase procurement spend over the 20-year period for BW1 to BW4, 1S2 and 2S2 will be in the region of R 73.1 billion. The Green Jobs study (2011) 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. The study notes that largest gains are likely to be associated with operations and maintenance (O&M) activities. In this regard, operations and maintenance employment linked to renewable energy generation plants will also be substantial in the longer term.

Community Trust

The establishment of a community benefit structure (typically, a Community Trust) also creates an opportunity to support local economic development in the area. The requirement for the project to allocate funds to socio-economic contributions (through structures such as Community Trusts) provides an opportunity to advance local community projects, which is guaranteed for a 20-year period (project lifespan). The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including but not limited to:

- Creation of jobs;
- Education;
- Support for and provision of basic services;
- School feeding schemes;
- Training and skills development; and
- Support for Small Medium and Micro Enterprises (SMMEs).

The 2019 IPPP Overview notes that the Socio-Economic Development (SED) contributions associated with the 64 IPPs has to date has amounted to R 860.1 million. The province with the highest SED contribution has been the Northern Cape Province, followed by the Eastern Cape and Western Cape.

Enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R7.2 billion. 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 March 2019 a total of R 254.3 million had already been made to the local communities located in the vicinity of the 64 operating IPPs.

The Green Jobs study (2011), found that the case for wind power is enhanced by the positive effect on rural or regional development. Wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. In this regard the towns of as Komaggas, Buffelsrivier, Kleinsee, and Springbok are small rural towns.

The long-term duration of the contributions from the WEF also enables local municipalities and communities to undertake long term planning for the area. Experience has, however, shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust or other community benefit structure (entity). The REIPPP programme does however have stringent audit requirements in place to try and prevent the mismanagement of trusts.

Benefits to landowners

The income from the WEF reduces the risks to the livelihoods of the affected landowners posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. The additional income from the WEF would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy.

Potential negative impacts
- The visual impacts and associated impact on sense of place;
- Impact on property values; and
- Potential impact on tourism.

Visual impacts and impact on sense of place
The potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The site is also located within the Springbok REDZ 8. The area has therefore been identified as suitable for the establishment of renewable energy facilities, including WEFs. Based on the findings of the Socio-Economic Assessment the significance was rated as **Low Negative**.

The findings of the Visual Impact Assessment (VIA) rate the significance of the impact as **Moderate Negative.**

Table 2 summarises the significance of the impacts associated with the operational phase.

Table 2: Summary of impacts associated with operational phase

Impact	**Significance No Mitigation/ Enhancement**	**Significance With Mitigation/ Enhancement**
Promotion of renewable energy projects	High (+)	High (+)
Creation of employment and business opportunities	Moderate (+)	Moderate (+)
Establishment of Community Trust	Moderate (+)	High (+)
Benefits for local affected landowners	Low (+)	Moderate (+)
Visual impact and impact on sense of place[3]	Moderate (-) Low (-)	Moderate (-) Low (-)
Impact on property values	Low (-)	Low (-)
Impact on tourism	Low (-)	Low (-)

CUMULATIVE IMPACTS

Cumulative impact on sense of place
Several Renewable Energy Facilities (REFs) are currently being proposed within 50 km from the proposed Komas WEF. These projects were considered in assessing the potential cumulative impacts. There are currently nine approved WEFs and one approved solar Photovoltaic (PV) facility. In addition to these, the applications for one solar PV facility is currently in process. The proposed Komas WEF comprises a separate BA process and is currently being undertaken in parallel to this BA process. The projects are listed in Table 3.4 and Figure 3.5.

Based on the findings of the Socio-Economic Assessment the potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The site is also located within the Springbok REDZ 8. The area has therefore been identified as suitable for the establishment of REFs, including WEFs. The significance of the potential cumulative impact on the areas character and sense of place is therefore regarded as **Low Negative**.

[3] Ratings reflect findings of VIA (Moderate) and findings of stakeholders interviewed (Low Negative).

The findings of the VIA rate the significance of the cumulative impact on the areas sense of place as **Moderate Negative**. The VIA notes however that that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

However, the potential impact of WEFs on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications and the potential implications for other land uses, specifically game farming and associated tourist activities.

Cumulative impact on services
The establishment of the proposed Komas WEF and the other REFs in the NKLM and NDM may place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the potential influx of workers to the area associated with the construction and operational phases of renewable energy projects proposed in the area, including the proposed Komas WEF. The potential impact on local services can be mitigated by employing local community members. With effective mitigation the significance of the impact is rated as **Low Negative.**

In addition, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of renewable energy as an economic driver in the area.

Cumulative impact on local economies
In addition to the potential negative impacts, the establishment of the proposed Komas WEF and other REFs in the area also has the potential to create a number of socio-economic opportunities for the NKLM and NDM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years. This significance of this benefit is rated as **High Positive** with enhancement.

NO-GO DEVELOPMENT ALTERNATIVE

The No-Go Development alternative would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The No-Go Development alternative also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed WEF and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost. However, at a provincial and national level, it should be noted that the proposed Komas WEF development is not unique. In this regard, a significant number of other REFs are currently proposed in the Northern Cape and other parts of South Africa. Foregoing the proposed establishment of WEFs would therefore not necessarily compromise the development of REFs in the Northern Cape Province and or South Africa. However, the socio-economic benefits for local communities

in the NKLM would be forfeited. Given the decline in the role played by mining and the limited economic opportunities in the NKLM, the No-Go Development Alternative would represent a significant lost opportunity for the area and is not supported by the findings of the Socio-Economic Assessment. The significance of the No-Go Development Alternative is rated as **High Negative**.

COMPARATIVE ASSESSMENT OF ALTERNATIVES

Two on-site Substation assessment site alternatives (i.e. Option 1 and Option 2) have been identified for assessment as part of the BA process. Substation Option 1 and Option 2 have been assessed and both are found to be acceptable from a socio-economic perspective and may proceed as none are fatally flawed.

DECOMMISSIONING PHASE

In the case of decommissioning ~ 20 permanent jobs associated with the operational phase would be lost. The potential impacts associated with the decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the significance of the impacts is assessed to be **Low Negative.** The proponent should also investigate the option of establishing an Environmental Rehabilitation Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility[4]. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The findings of the Socio-Economic Assessment indicate that the development of the proposed Komas WEF will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the Socio-Economic Assessment also indicate that the REIPPPP has resulted in significant socio-economic benefits, both at a national level and a local, community level. These benefits are linked to Foreign Direct Investment (FDI), local employment and procurement and investment in local community initiatives. The establishment of Community Trusts associated with renewable energy projects also have the potential to create significant benefits for local rural communities. These benefits should be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector on the local economy. The Komas WEF site is also located within the REDZ 8. The area has therefore been identified as suitable for the establishment of REFs.

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

Recommendation

The establishment of the proposed Komas WEF and associated infrastructure is strongly supported by the findings of the Socio-Economic Assessment.

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 2020 (Annexure C)
(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 D
(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;	Refer to VIA
(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 C, 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 C, 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 apply.	Comply with the Assessment Protocols that were published on 20 March 2020, in Government Gazette

	43110, GN 320. This specifically includes Part A, which provides the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed. As at 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

BA	Basic Assessment
DBSA	Development Bank of Southern Africa
DM	District Municipality
DEA&DP	Department of Environmental Affairs and Development Planning
EIA	Environmental Impact Assessment
EME	Exempted Micro Enterprises
EMP	Environmental Management Programme
EPHC	Environment Protection and Heritage Council
FDI	Foreign Direct Investment
HD	Historically Disadvantaged
HDI	Human Development Index
I&APs	Interested and Affected Parties
IDC	Industrial Development Corporation
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kV	Kilovolts
LCOE	Levelised Cost of Electricity
LED	Local Economic Development
LM	Local Municipality
MF	Monitoring Forum
MW	Megawatt
NCP	Northern Cape Province
NCPGDP	Northern Cape Provincial Growth and Development Plan
NDM	Namakwa District Municipality
NDP	National Development Plan
NERSA	National Energy Regulator of South Africa
NKLM	Nama Khoi Local Municipality
OCGT	Open Cycle Gas Turbine
O&M	Operations and Maintenance
QSE	Qualifying Small Enterprises
PPA	Power Purchase Agreement
RE	Renewable Energy
REDZ	Renewable Energy Development Zone
REF	Renewable Energy Facility
REIPPPP	Renewable Energy Independent Power Producers Procurement Programme
SAWEA	South African Wind Energy Association
SDF	Spatial Development Framework
SDI	Sustainable Development Initiative
SEA	Strategic Environmental Assessment
SED	Socio-Economic Development
SIA	Social Impact Assessment
SMME	Small, Medium, Micro Enterprise
STD	Sexually Transmitted Disease
VIA	Visual Impact Assessment
WEF	Wind Energy Facility
WWF	World Wildlife Fund

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SECTION 1: INTRODUCTION

1.1 INTRODUCTION

The CSIR was appointed by Genesis ENERTRAG Komas (Pty) Ltd to manage the Basic Assessment (BA) process for the proposed 300 MW Komas Wind Energy Facility (WEF). The proposed Komas WEF site is located approximately 37 km south east of the coastal settlement of Kleinsee within the Springbok Renewable Energy Development Zone (REDZ 8) in the Northern Cape Province (Figure 1.1). The site and study area fall within the Nama Khoi Local Municipality (NKLM), one of the seven Local Municipalities (LMs) constituting the Namakwa District Municipality (NDM).

Tony Barbour was appointed by the CSIR to undertake a specialist Socio-Economic Impact Assessment as part of the BA process. This report contains the findings of the Socio-Economic Assessment undertaken as part of the BA process.

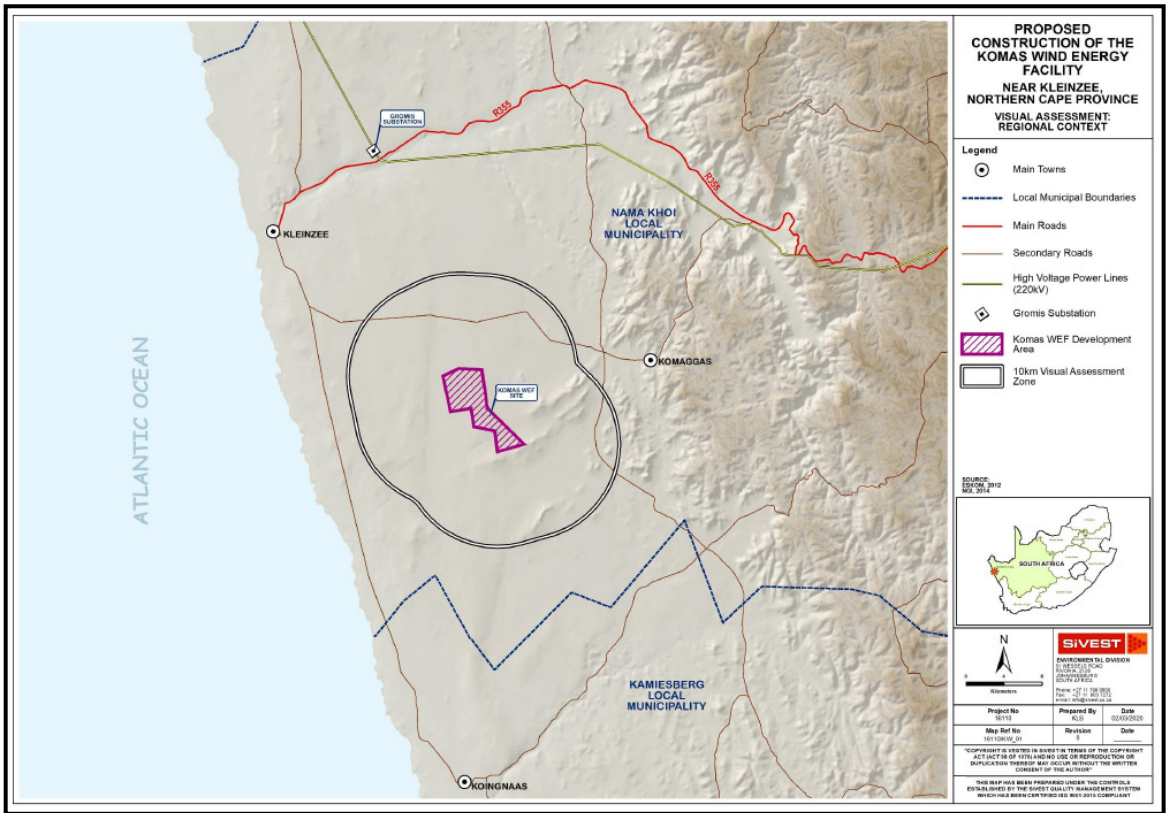


Figure 1.1: Regional location of proposed Komas WEF
(Source: SiVEST VIA, March 2020)

1.2 TERMS OF REFERENCE AND APPROACH TO STUDY

The terms of reference for the Socio-Economic Assessment require:

- Compile a Socio-Economic Assessment in compliance with Appendix 6 of the of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended (NEMA) and the Environmental Impact Assessment (EIA) Regulations 2014, as amended. The Specialist Assessment must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- Describe the socio-economic context of the study area, focusing on aspects that are potentially affected by a WEF, and taking into consideration the current situation as well as the trends, the local planning (IDPs and SDFs), other developments in the area. The study should look more broadly than the individual land parcel on which the proposed project will developed, as most, if not all, of the anticipated social impacts may be experienced in the urban areas nearest to the proposed project.
- Apply a variety of appropriate options for sourcing information, such as review of analogous studies, available databases and social indicators, and use of interviews with key affected parties such as local communities, local landowners and government officials (local and regional) etc. This should also include a site visit. The REDZ Phase 1 SEA (CSIR, 2015) should also be considered.
- The socio-economic study does not lend itself to providing a spatially based sensitivity map. Therefore, instead, the study could provide a simplified schematic mapping of the links between the project actions (i.e. interventions) and the receiving social environment (i.e. the socio-ecological system), which may occur at a local, provincial or national scale, and showing how these links can be optimized to enhance benefits and minimize negative impacts.
- Consider social issues such as potential in-migration of job seekers, opportunities offered by training and skills development, phasing of employment over the duration of the REIPPPP, cumulative effects with other REIPPPP projects in the local area, implications for local planning and resource use.
- Evaluate the implications of the social investment programme associated with REIPPPP projects on the local socio-economic context.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on the receiving environment from a socio-economic perspective. For example, identify and assess potential social benefits and costs as a result of the proposed development, and including the estimated direct employment opportunities. Impact significance must be rated both without and with mitigation, and must cover the construction, operational and decommissioning phases of the project.
- Identify any protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also identify best practice management actions, monitoring requirements, and rehabilitation

guidelines for all identified impacts. This must be included in the Environmental Management Programme (EMPr).
- Incorporate and address all review comments made by the Project Team (CSIR and Project Applicant) during the various revisions of the specialist report.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, Interested and Affected Parties (I&APs) and the public during the Public Participation Process (where relevant and applicable).

The approach to the Socio-Economic Assessment study is based on the DEA&DP's Guidelines for Social Impact Assessment (DEA&DP, 2007). The key activities undertaken as part of the Socio-Economic Assessment process as embodied in the guidelines included:

- 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;
- Site visit and semi-structured interviews with key stakeholders and affected individuals and communities;
- Assessing and documenting the significance of social impacts associated with the proposed intervention;
- Consideration of other renewable energy projects that may pose cumulative impacts; and
- Identification of enhancement and mitigation measures aimed at maximizing opportunities and avoiding and or reducing negative impacts.

The identification of potential social issues associated with the proposed Komas WEF is based on observations during the project site visit, review of relevant documentation, experience with similar projects and the general area. Annexure A contains a list of the secondary information reviewed and interviews conducted. Annexure D summarises the assessment methodology used to assign significance ratings to the assessment process.

1.3 PROJECT DESCRIPTION

A 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; and
- 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.

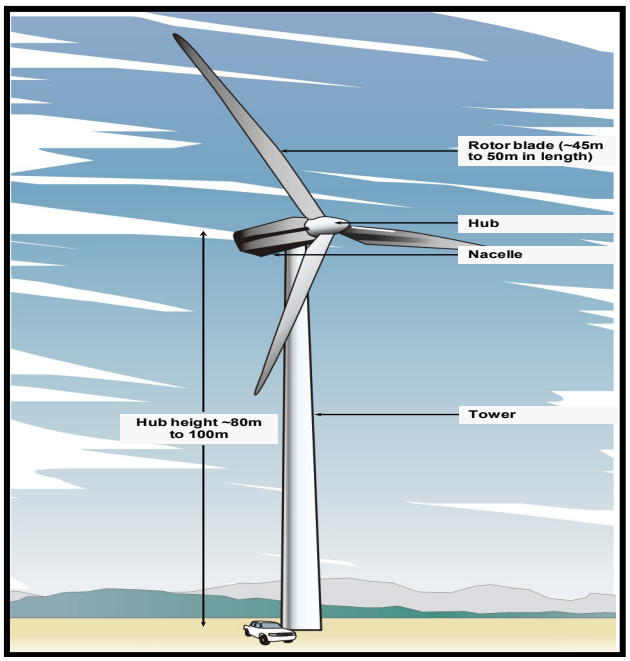


Figure 1.2: Typical example of wind turbine structure and components

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

- Up to 50 wind turbine generators (WTGs) with a maximum generation capacity of up to 300 MW.
- Turbines with a hub height of up to 200 m and a rotor diameter of up to 200 m.
- Hardstand areas of approximately 1 500 m^2 per turbine.
- Temporary construction laydown and storage area of approximately 4 500 m^2 per turbine.
- Medium voltage cabling connecting the turbines will be laid underground.
- Internal road of approximately 10 m, including turning circle/bypass areas of up to 20 m at some sections during the construction phase, providing access to each turbine and accommodating cable trenches and stormwater channels,

as required. Existing roads will be upgraded wherever possible, although new roads will be constructed where necessary.
- A temporary construction laydown/staging area of approximately 22 500m^2 which will also accommodate the O&M buildings.
- A 33/132kV on-site substation (SS) of approximately 4 hectare (ha) to feed electricity generated by the proposed Komas WEF into the national grid.

The proposed grid infrastructure including an Eskom Switching SS, 132 kV power line and Collector SS (if required) are subject to a separate BA process. Two on-site SS assessment site Alternatives (Option 1 and Option 2) have been identified for assessment as part of the BA process. Each on-site SS assessment site is approximately 4 ha and includes the O&M building and the construction laydown/staging area.

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 a WEF. The site is also located in the Springbok REDZ 8.

Strategic importance of the project
The strategic importance of promoting renewable energy is supported by the national and provincial energy policies. However, this does not mean that site related issues can be ignored or overlooked.

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 Socio-Economic Assessment 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. However, the study recognises the strategic importance of wind energy and the technical, spatial and land use constraints required for WEFs.

1.4.2 Limitations

Demographic data
Some of the information contained in some key policy and land use planning documents, such as IDPs etc., is based on the 2011 Census. These limitations do not have a material bearing on the findings of the Socio-Economic Assessment. In addition, information from the 2016 Community Survey has been added where it is available.

1.5 SPECIALIST DETAILS

Tony Barbour, the lead author of this report is an independent specialist with 26 years' experience in the field of environmental management. In terms of Socio-Economic Assessment experience Tony Barbour has undertaken in the region of 260 SIA's and is the author of the Guidelines for Social Impact Assessments for

EIA's adopted by the DEA&DP in the Western Cape in 2007. Annexure A contains a copy of the Curriculum Vitae (CV) for Tony Barbour.

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 on a number of SIAs over the last twelve 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 Socio-Economic Assessment Report, are independent and do not have vested or financial interests in the proposed development being either approved or rejected. Annexure B contains a copy of signed declaration of independence.

1.7 REPORT STUCTURE

The report is divided into five sections, namely:

- Section 1: Introduction;
- Section 2: Policy and planning context;
- Section 3: Overview of study area;
- Section 4: Identification and assessment of key issues; and
- Section 5: Key Findings and recommendations.

SECTION 2: DESCRIPTION OF POLICY AND PLANNNIG CONTEXT

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[5]" of the proposed development therefore constitutes a key aspect of the Socio-Economic Assessment. In this regard, assessment of "planning fit" conforms to international best practice for conducting SIAs. Furthermore, it also constitutes a key reporting requirement in terms of the applicable Western Cape DEA&DP's *Guidelines for Social Impact Assessment* (2007).

For the purposes of the meeting the objectives of the SIA the following national, provincial and local level policy and planning documents were reviewed, namely:

- National Energy Act (2008);
- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- White Paper on Renewable Energy (November 2003);
- Integrated Energy Plan for South Africa (2016);
- Integrated Resource Plan (2019);
- The National Development Plan (2011);
- New Growth Path Framework (2010);
- National Infrastructure Plan (2012);
- Strategic Environmental Assessment for wind and solar energy in South Africa (CSIR, 2015);
- Nama Khoi Local Municipality (2019). Nama Khoi Local Municipality Integrated Development Framework 2019/2020 Revision;
- Nama Khoi Local Municipality (2017). Nama Khoi Local Municipality Disaster Management Plan 2017-2022;
- Nama Khoi Local Municipality (2014). Nama Khoi Local Municipality Spatial Development Framework;
- Namakwa District Municipality (2019). Namakwa District Municipality Integrated Development Framework 2019/2020 Revision;
- Namakwa District Municipality (2017). Namakwa District Climate Change Response Plan 2017-2022;
- Namakwa District Municipality (2017). Namakwa District Tourism Sector Plan 2017-2022; and
- Northern Cape Department of Economic Development and Tourism (2017). Northern Cape Province Green Document 2017/2018.

[5] 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.

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

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

2.1.2 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 (December1998). 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; and
- 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[6];
- Lower energy densities; and
- Lower levels of availability, depending on specific conditions, especially with sun and wind based systems.

The Integrated Resource Plan (IRP 2010) (DoE, 2010) aims to allocate 43% of new energy generation facilities in South Africa to renewables.

2.1.3 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[7], 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.

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).

[6] Recent studies have however shown that capital costs for wind and solar projects are more cost effective than coal and nuclear options.

[7] 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)

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. The medium-term (10-year) target set in the White Paper is:

2.1.4 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;
- 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; and
- 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; and
- 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 Photovoltaic (PV) and Concentrated Solar Power (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 term 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 IRP 2010 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 REIPPPP, the IEP notes:

- The REIPPPP 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; and
- The implementation of REIPPPP 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 REIPPPP 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 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; and
- Where proactive and socialised investment can be made to provide time-efficient infrastructure access.

2.1.5 National Development Plan

The NDP contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies nine key challenges and associated remedial plans.

Managing the transition towards a low carbon national economy is identified as one of the nine key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

2.1.6 The New Growth Path Framework

Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: ***energy***, transport, communication, water and housing.

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

2.1.7 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 strengthen 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; and
- 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 IRP 2010; and
- 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; and
- 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; and
- 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.

2.1.8 Integrated Resource Plan 2019

The IRP 2010 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 IRP 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 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 6 422 MW under the government led REIPPPP has been procured, with 3 876 MW currently operational and made available to the grid. In addition, IPPs have commissioned 1 005 MW 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, 1 588 MW of Medupi, 800 MW of Kusile and 100 MW of Sere Wind Farm. In total, 18 000 MW of new generation capacity has been committed to.

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

- 1 500 MW of coal;
- 2 500 MW of hydro;
- 6 000 MW of solar PV;
- 14 400 MW of wind;

- 1 860 MW of nuclear;
- 2 088 MW for storage;
- 3 000 MW of gas/diesel; and
- 4 000 MW 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 IRP 2019 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 1 600 MW for wind technology commencing in the year 2022 up to 2030. The solar PV allocation of 1 000 MW 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 2 000 MW 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.

2.1.9 Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa

The SEA for wind and solar PV energy in South Africa (CSIR, 2015) identified eight (8) REDZs. The REDZs identified areas where large scale WEFs can be developed in a manner that limits significant negative impacts on the environment. The proposed Komas WEF falls within the Springbok REDZ 8 (Figure 2.2). The REDZs were gazetted in terms of section 24(3) of NEMA in Notice 114 of 16 February 2018. The REDZs are located in Overberg (Western Cape), Komsberg (Western Cape), Cookhouse (Eastern Cape), Stormberg (Eastern Cape), Kimberley (Free State/Northern Cape), Vryburg (North West), Upington (Northern Cape) and Springbok (Northern Cape). The outcome of the gazetting process means that wind and solar PV activities within the eight REDZs and electricity grid expansion within the five Power Corridors (with a capacity of 275 kV or more) will be subjected to a BA and not a full EIA process. This reduces not only the process timeframe, but also the review and decision-making timeframe from 107 to 57 days.

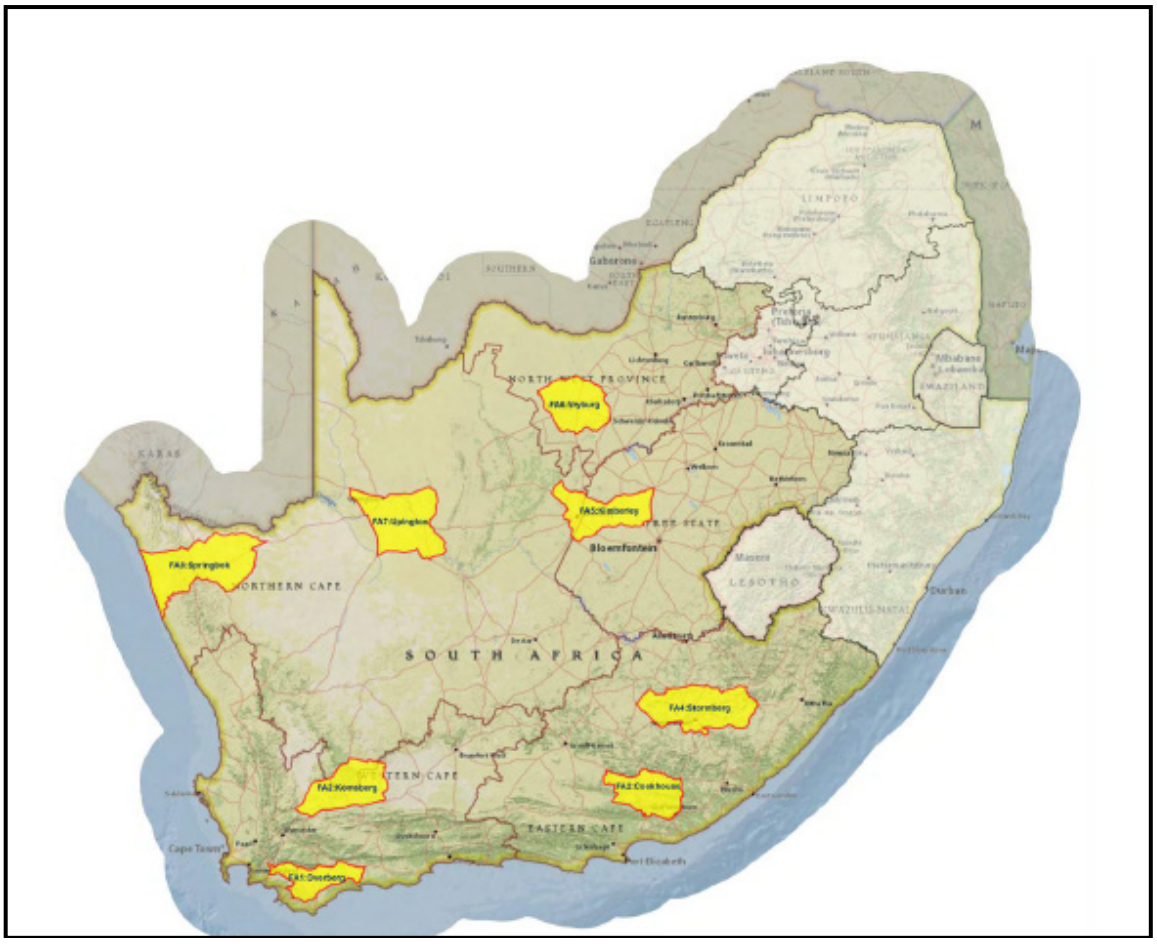


Figure 2.2: Location of Renewable Development Zones in South Africa *(Source CSIR).* The proposed Komas WEF is located within the Springbok REDZ 8.

2.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

2.3.1 Northern Cape Province Provincial Growth and Development Strategy

The 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; and
- 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; and
- 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; and
- Enhancing infrastructure for economic growth and social development.

Of specific relevance to the Socio-Economic Assessment the NCPGDS make 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 levels 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 WEF 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 WEF and other REFs 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. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed solar energy facility, do not affect the tourism potential of the province.

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 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; and
- Sectoral Strategy 19: Provincial renewable energy strategy (to be facilitated by the Department of Economic Development and Tourism).

Under Section B 14.4, Energy Sector, the NCSDF (2012), notes the total area of high radiation in South Africa amounts to approximately 194 000 km^2 of which the majority falls within the Northern Cape. It is estimated that, if the electricity production per km2 of mirror surface in a solar thermal power station were 30.2 MW and only 1% of the area of high radiation were available for solar power generation, then generation potential would equate to approximately 64 GW. A mere 1.25% of the area of high radiation could thus meet projected South African electricity demand in 2025 (80 GW) (NCPSDF, 2012). However, the SDF does indicate that this would require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres. The SDF also notes that the implementation of large concentrating solar power (CSP) plants has been proposed as one of the main contributors to greenhouse gas emission reductions in South Africa. In this regard various solar parks and CSP plants have been proposed in the province with Upington being the hub of such developments (NCPSDF, 2012).

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

- 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;

- Enhance the efficiency of Eskom's power station at the Vanderkloof power station;
- 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; and
- 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; and
- Renewable energy must, first, and foremost, be used to address the needs of the province before being exported.

2.3.3 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 three key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the three key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as three 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 the 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.

2.3.4 Northern Cape Province Green Document 2017/2018

The NCP Green Document 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. Nine facilities were investigated, none of them falling within the Namakwa DM. Only two of the relevant projects were WEFs, namely the Loeriesfontein and Noupoort WEFs.

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; and
- Insufficient support from local municipalities for IPP development.

2.3.5 Namakwa District Municipality Integrated Development Plan 2019/2020

The Vision of the Namakwa DM is: 'Namakwa District, the centre of excellence'. The Mission statement for the MD includes:

- Stimulating radical economic and social transformation;
- Fostering partnerships with relevant role-players;
- Supporting and capacitating local municipalities;
- Maintaining transparent and accountable processes; and
- Providing local leadership.

Key developmental issues facing the DM include:

- The DM has a large cohort of people in the economically active age category (15-64). This highlights the need for local employment creation;
- The youthful population group (15-34) has increased by 2.4%, further emphasizing the need for local employment creation;
- Between 2004 and 2014, the urbanization rate in the DM has increased from 77.3% to 91.2% and that in the NKLM from 88.4% to 95.3%. These increases in urbanization have increased pressure on local authorities to provide municipal and social services; and
- The DM's economic outlook is depressed. This is linked to limited new mining activity and the ongoing drought.

Key developmental priorities identified for the DM include:

- Economic diversification, specifically the development of local agricultural and mining manufacturing sectors; and
- New mining and renewable energy projects should be supported.

The IDP notes support for the commitments made in terms of the Paris Accord on Climate Change. The IDP notes that the DM is located in an arid region, prone to droughts, and therefore very vulnerable to global warming.

2.3.6 Namakwa District Climate Change Response Plan 2017-2022

The Namakwa District Climate Change Response Plan was developed through the Local Government Climate Change Support program. It includes a climate change vulnerability assessment and associated climate change responses which address these vulnerabilities.

The vulnerability assessment identified 17 of the DM's socio-economic indicators which are both very exposed and highly sensitive to climate change, but have very low capacity to adapt. These included the agricultural sector, tourism, water-dependent municipal services and the coastal and marine environment.

Priority responses are identified for the key sectors, including agriculture, biodiversity and habitat conservation, human health, and human settlements. These include mainstreaming climate change preparedness into all future IDPs, and implementation of a Namakwa Renewable Energy Strategy which supports the development and use of non-fossil sources of energy.

2.3.7 Namakwa District Tourism Sector Plan 2017-2022

The Namakwa District Tourism Sector Plan 2017-2022 is a high-level sector plan. It forms part of the Northern Cape Tourism Master Plan. It identifies the key gateways, staging posts, routes, distribution points and destinations in the Namakwa DMs tourism portfolio.

Of relevance to the project area, the Sector Plan notes that the NCP Department of Development and Tourism has developed a Northern Cape Coastal and Marine Tourism Development Strategy, which focuses on the coastal towns of Port Nolloth, Hondeklip Bay and Kleinsee in the Namaqua District Municipality. The strategy identifies present and potential future catalytic development opportunities which could unlock the tourism potential of these settlements. Development in proximity to the DM's coastline should therefore be sensitive to this fact.

2.3.8 Nama Khoi Local Municipality Integrated Development Plan 2019/2020

The Nama Khoi IDP Strategic Objectives are aligned with the 2010 National Outcomes and 2012 National Development Plan, and include:

- Fostering the growth if an effective and efficient skilled workforce;
- Maintaining a healthy and safe environment;
- Expanding and strengthening relationships with LED stakeholders;
- Sustainable delivery of basic services;
- Effective land use management; and
- Mainstreaming sustainability and optimizing resource efficiency.

The IDP notes that the closure of mines in the LM and DM has hit communities very hard, contributing to high poverty rates. At the same time, the LM has seen a mushrooming of small-scale farmers, as former labour sending communities try to find an alternative source of livelihoods. The NCP Expanded Public Works Programme is noted a s a key mechanism to provide poverty and income relief in the LM.

The IDP includes a settlement-based needs analysis. Key needs identified for Komaggas include:

- Construction of 300 low cost houses;
- Upgrades to potable water and electricity infrastructure;
- Tarring of gravel road to the Kleinzee-Koingnaas road;
- Participation in local renewable energy projects, including WEFs proposed in the area; and
- Supporting infrastructure development for local small-scale farmers.

2.3.9 Nama Khoi Local Municipality Spatial Development Framework (2014)

The Nama Khoi SDF is aligned with the National Spatial Planning Perspective and the Northern Cape PSDF. It notes that the Northern Cape PSDF identified the N7 as an activity corridor, and proposes an industrial mining corridor in the south-eastern inland quadrant of the NKLM.

Spatial Objectives for the NKLM include:

- Improving accessibility through the strengthening and development of road links. Road links identified for improvement are those between Springbok and Kleinsee, and Port Nolloth and Kleinsee.
- Developing sustainable human settlements in functional growth areas with a clear hierarchy of nodes. Springbok and Steinkopf are identified as key existing nodes.
- Developing a sustainable and diverse local economy. The development of alternative and/ or supplementary land uses to support local agriculture is identified as a strategic intervention. The development of renewable energy facilities should be supported. These include WEF development in the areas around Springbok and Koingnaas, and SEFs inland of Buffelsrivier. The LM also supports the potential development of a nuclear power station near Kleinsee. Local tourism is identified as a key potential growth sector, but it is noted that tourism development is much hampered by the lack of existing infrastructure, including of tarred road links.
- Protecting the unique natural environment. The local environment is strongly linked to local tourism. The western portion of the LM, from the coast to the N7 has been identified by SANBI as a priority conservation area. This is linked to the rich botanical diversity of its Succulent Karoo vegetation. The rehabilitation of coastal lands disturbed by historic mining activities around Kleinsee is identified as an intervention which would potentially also benefit tourism development.
- Addressing urban social decay by providing adequate infrastructure and fostering appropriate education and skills development. Interventions include the eradication of substance abuse and the provision of rehabilitation centres. Other interventions include the development of after-school and youth centres, and the expansion of medical facilities and services. The proposed development of a private hospital in Kleinsee is supported. The strengthening and expansion of existing educational facilities in the main settlements of Springbok and Steinkopf is proposed.

The SDF also includes a broad development framework for the individual areas within the LM. Key principles and objectives for Kleinsee include:

- Retaining the 'small town character' of the settlement should be supported. The settlement should be promoted as a holiday destination and investment opportunity. The wilderness tourism market is the key target group;
- A strategy should be formulated and implemented to rehabilitate land around Kleinsee damaged by historical mining activities. Areas for conservation should be identified and set aside; and
- The development of WEFs in the Kleinsee area should be supported.

Key principles and objectives for Komaggas include:

- The community is spatially too dispersed. Densification and infill development should be promoted, and services between Komaggas and Buffelsrivier should be better integrated;
- Due to the relative isolation, remoteness and low population threshold of Komaggas, development strategies should primarily be focussed on developing mobile services and not additional infrastructure such as hospitals and schools;
- The community is exposed to year-round levels of high insolation, and therefore has the potential to go 'off grid' via the development of solar PV projects;
- Small-scale farming activities should be supported and where possible, expanded to assist in providing local income and food security;
- The gravel road from Komaggas to Kleinsee is in a very bad state. The road urgently needs to be upgraded and maintained to improve accessibility between the two communities; and
- Local conservation should focus on the inland area to the north of the settlement.

2.3.10 Nama Khoi Local Municipality Disaster Management Plan 2017-2022

The NKLM Disaster Management Plan is closely linked to the LM's long term local economic development goals. Climate change is identified as a key long-term threat to the LM. This threat would affect the basis of the local economy as well as the viability of human settlements. This is linked to the aridity and drought-proneness of the region. The support and development of renewable energy projects is identified as both a key response and economic opportunity for the LM. Commercial-scale WEF development in the LM is specifically identified for support. The document also notes the potential of renewable energy tourism in the area, especially once more WEFs are constructed.

2.4 OVERVIEW OF 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 (March 2019), 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;* and
- 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.

- Market Intelligence Report: Renewable Energy (2014). Mike Mulcahy, Greencape.

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

The document presents an overview of the REIPPPP undertaken by the Department of Energy, National Treasury and the DBSA in March 2019. By the end of March 2019, the REIPPPP had made the following significant impacts:

Energy supply
- 6 422MW of electricity had been procured from 112 RE Independent Power Producers (IPPs) in seven bid rounds;
- 3 976 MW of electricity generation capacity from 64 IPP projects has been connected to the national grid; and
- 35669GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational.

In terms of renewable energy 6 422 MW of electricity had been procured from 112 RE IPPs in seven bid rounds to date. Of this 3 976 MW of electricity generation capacity from 64 IPP projects has been connected to the national grid. To date 35 669 GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational. Renewable energy IPPs have proved to be very reliable. Of the 64 projects that have reached COD, 62 projects have been operational for longer than a year. The energy generated over the past 12-month period for these 62 projects is 10648GWh, which is 96% of their annual energy contribution projections (P50) of 11146GWh over a 12-month delivery period. Twenty-eight (28) of the 62 projects (45%) have individually exceeded their P50 projections.

Energy costs
Through the competitive bidding process, the REIPPPP 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 estimated, average portfolio cost for all technologies under the REIPPPP has dropped consistently in every bid period to a combined average of R0.92/kWh in BW4. Indications are that prices will continue to decrease in future rounds. This compares with the industry estimates in April 2018 of R1.05/kWh for Medupi and R1.16/kWh for Kusile, i.e. R1.41/kWh and R1.60/kWh.

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[8]), 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

[8] 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)

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 a 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 B-BBEE 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 slightly above the 30% target. This includes black people in local communities that have ownership in the IPP projects that operate in or near their communities.

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 19% shareholding by black people in engineering, procurement and construction (EPC) contractors has been attained for the 64 projects in operation (BW1, BW2 and BW3). This is slightly below the 20% target. The target for shareholding by black people in top management has been set at 40%, with an average 65% 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.

Income to all shareholders only commences with operation of the facility. Revenue generated to date by the 64 operational IPPs amounts to R74.4 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 R63.1 billion has been spent to date. For construction, of

the R55.7 billion already spent to date, R51.1 billion is from the 64 projects which have already been completed. These 64 projects had planned to spend R50.4 billion. The actual procurement construction costs have therefore exceeded the planned costs by 1% for completed projects.

Preferential procurement

The share of procurement that is sourced from B-BBEE 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 B-BBEE 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 86%, which is significantly higher than the target of 60%, but also the 71% that had been committed by IPPs. B-BBEE, as a share of procurement spend for projects in construction, is also reported as 87% with operations slightly lower at 73%. 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 R55.7 billion spent on procurement during construction, R48.5 billion has reportedly been procured from B-BBEE suppliers, achieving 87% of total procured. Actual B-BBEE spend during construction for BW1 and BW2 alone was R25.5 billion, 81% more than the 14.1 billion planned by the IPPs.

Total procurement spend by IPPs from QSE and EMEs has amounted to R19.8 billion (construction and operations) to date, which exceeds commitments by 58% and is 31% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction is achieving 32% of total procurement to date and operations is less at 23%, however this is still well above the 10% target. QSE and EME share of construction procurement spend totals R18.1 billion, which is 3.7 times the targeted spend for construction of R4.9 billion during this procurement phase. However, procurement from women owned vendors is lagging, with only 3% of construction and 6% for operations achieved to date against a target of 5%.

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.

Local Content[9]

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.

Actual local content spend reported for IPPs that have started construction amounts to R46.5 billion against a corresponding project value (as realised to

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

date) of R90.3 billion. This means 52% of the project value has been locally procured, exceeding the 45% commitment from IPPs and the thresholds for BW1 – BW4 (255-45%).

For the 64 projects that have reached COD, local content spend has been R 43.1 billion of a committed R43.3 billion, which is 0.4% below the planned local spend.

Leveraging employment opportunities

To date, a total of 40 134 job years[10] have been created for South African citizens, of which 33 019 job years were in construction and 7 115 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 101% of the planned number during the construction phase (i.e. 32 602 job years), with 26 projects still in construction and employing people as of March 2019. The number of employment opportunities is therefore likely to continue to grow beyond the original expectations. By the end of March 2019, 64 projects had successfully completed construction and moved into operation. These projects created 31 633 job years of employment, compared to the anticipated 20 689. This was 53% 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 89% during construction (against a target of 80%), while it was 95% during operations for BW1 – BW3 (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.

In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. The expectation for local community participation was 13 058 job years. To date 18 253 job years have been realised (i.e. 140% more than initially planned), with 26 projects still in construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 22%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 79%, 41% 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 8% and 0.5% 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 (79%) and the early stages of operations (83%) has significantly exceeded the 50% target and the 30% minimum threshold. Likewise, the share of skilled black citizens (as a percentage of skilled employees) for both construction (67%) and operations (79%) has also exceeded the 30% target and is at least 3.5 times more than the minimum threshold of 18%. The share of local community members as a share

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

of SA-based employees was 49% and 67% for construction and operations respectively – exceeding the minimum threshold of 12% and the target of 20%.

Socio-Economic Development 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 R1.153 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.

To date, with the limited number of operational IPPs (64), the SED contribution amounts to R 860.1 million. The majority of the spend has been on education and skills development (40.9%), followed by enterprise development (24.2%), social welfare (21.3%), general administration (9%) and health care (4.5%). In terms of education, the IPPs have supported 1 044 education institutions, with a total spend of R 236.7 million between 2015 and March 2018. It is estimated that these contributions have benefitted in the region of 375 737 learners.

The province with the highest SED contribution has been the Northern Cape Province, followed by the Eastern Cape and Western Cape. However, the report does note that SED contributions are concentrated in the communities in the immediate vicinity of the IPPs. As such there is a lack of equity considerations across geographical areas, i.e. some communities benefit more than others.

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 March 2019 a total of R 254.3 million had already been made to the local communities located in the vicinity of the 64 operating IPPs.

Contribution to cleaner energy and water savings

The National Climate Change Response White Paper outlines the national response to the impacts of climate change, as well as the domestic contribution to international efforts to mitigate green-house gas emissions. As part of the global commitment, South Africa is targeting an emissions trajectory that peaks at 34% below a "business as usual" case in 2020, 42% below in 2025 and from 2035 declines in absolute terms. The emission reductions between March 2018 and

2019 are estimated to be 10.9 million tonnes of CO_2. This represents 53% of the total projected annual emission reductions achieved with only partial operation to date. Since operation, the IPPs have generated 35 699 GWh, resulting in 36.2 Mton of CO2 emissions being offset and saving 42.8 million kilolitres of water related to fossil fuel power generation.

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 (2011)

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 (2011) 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 2.1).

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. The international wind power industry employed

almost half a million workers worldwide in 2009 – a figure that is expected to grow to over a million in five years from now, according to forecasts by the Global Wind Energy Council.

Table 2.1: 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**		

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 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 farms. The study does note that a shortage of skills in certain professional fields pertinent to wind power generation presents a challenge that must be overcome.

The study also found that South Africa is in a position to leverage upon some of its existing manufacturing capacities in order to produce components and parts for various sections of wind turbines, especially those industries involved in the production of steel and metal products, as well as the boat building and electrical industries. Local manufacturing capacity can be promoted through engagement with established global manufacturers. The study does however note that critical mass would have to be developed in order to obtain economies of scale.

The study found that there was also significant potential for local involvement in the wind sector (Table 2.2). Local companies can also exploit market opportunities in other African countries with higher wind power potential. This would create additional opportunities for improving economies of scale and enhancing the local industry's chances to succeed.

Table 2.2: Potential contribution capacity of local industries

Industry	Product/services	Share in turbine cost[30]	Local capacity
Manufacturing:	**Production of:**		
Structural steel, cast iron, metal and cement products	Towers, frames, hubs	34%	High
Boat-, airplane-, glass fibre composites	Rotor blades, nacelle, other plastic and fibre glass products	26%	High
High-technology parts and machinery	Gearbox parts, shafts, bearings	18%	Low
Electrical and electronic equipment	Generators, transformers and other electrical components	15%	Medium
Metal products	Pitch, yaw and break systems, and other parts	7%	Medium
Construction and civil engineering	**Foundation laying, tower erection, housing**	-	High
Electricity distribution	**Grid connection**	-	High
Electricity generation	**Operations and maintenance**	-	High
Logistics	**Transportation of very large components**	-	Medium

The study also identifies a number of advantages associated with wind power as a source of renewable energy with a large 'technical' generation potential. In this regard wind energy does not emit CO_2 in generating electricity and is associated with exceptionally low lifecycle emissions. The construction period for a wind farm is much shorter than that 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 GHG associated with the construction phase are offset within a very short period of time compared with the project's lifespan. Wind 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, wind as an 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 the case for wind power is enhanced by the positive effect on rural or regional development. Wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. In Denmark, one of the world's most advanced countries with respect to wind power generation, a significant portion of wind turbines is owned by local communities. A major drawback for wind energy is that, due to the natural variation in wind power on a daily and/or seasonal basis, back-up base-load generation capacity is imperative to provide stability to the energy supply. Furthermore, as with other renewable energy sources, wind power has relied on incentive measures throughout the world for its development, although its relative competitiveness has been improving continuously.

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. 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 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.

In terms of costs, onshore wind energy costs are expected to drop by 12% since 2011 due to lower cost equipment and gains in output efficiency. The report refers to Bloomberg New Energy Finance, which noted that the average wind farm could reach grid parity by 2016. In Australia, unsubsidised renewable energy is now cheaper than electricity from new-build coal- and gas-fired power stations. A BNEF study indicated that electricity can be supplied from a new wind farm at a cost of R747.32/MWh (AUS$80), compared to R1 335.82/MWh (AUS$143) from a new coal plant or R1 083.06 /MWh (AUS$116) from a new base-load gas plant, including the cost of emissions under the Australian government's carbon pricing scheme. Based on this the chief executive of Bloomberg New Energy Finance, Michael Liebreich, noted that "The fact that wind power is now cheaper than coal and gas in a country with some of the world's best fossil fuel resources showing that clean energy is a game changer which promises to turn the economics of power systems on its head," (Paton, 2013).

Within the South African context, a presentation by the South African Wind Energy Association (SAWEA) at the National Energy Regulator of South Africa (NERSA) hearings in February 2013 indicated that in the second round of (REIPPPP) the bidding price for wind was 89c/kWh. The estimates for nominal new Eskom coal power range from NERSA's 97c/kWh to Standard Bank's estimate that Kusile will cost R1.38/kWh in 2019. In addition to being more expensive, coal-fired power stations have fewer job creation possibilities than RE, carry future expenses due to climate change impacts, and have health expense issues due to pollution.

The Greenpeace study notes that it is not only local manufacturers and rural farmers that benefit from RE, but large scale renewable utilities as well. The report notes that the Lake Turkana Wind Power Project (LTWP), which has a capacity of 310MW and consists of 365 turbines of 850kW, is the largest wind farm in Sub-Saharan Africa. The project is equivalent to 20% of the current installed capacity in Kenya and is the largest single private investment in Kenya's history (LTWP, 2012). At the proposed 9.9 US cents per kWh it will be the cheapest electricity in Kenya (Kernan, 2012). Wind energy therefore creates significant opportunities for investment and the production of affordable energy

without the significant environmental and socio-economic impacts associated with coal and nuclear energy options.

2.4.4 World Wildlife Fund SA, Renewable Energy Vision 2030

In its vision the World Wildlife Fund (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 REIPPPP introduced in 2011, has by all accounts been very 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). In 2013, the average levelised cost of electricity supplied to the grid was R0.82/kWh (Donnelly 2014), so wind-generated power has already achieved pricing parity with the grid.

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 2.9).

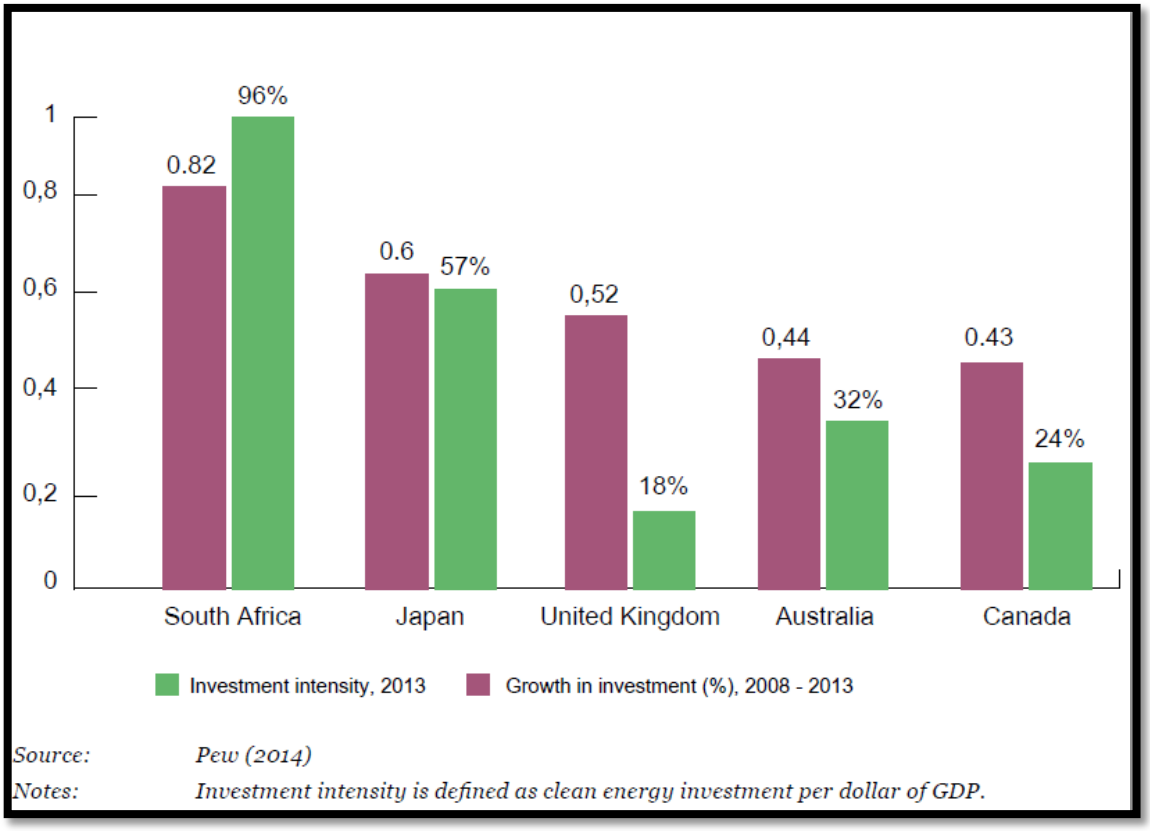


Figure 2.9: South Africa leads as a clean energy investment destination

The study also found that there were a number of opportunities to further reduce the cost of wind energy, specifically cost reductions for turbines. Towers, constructed mostly from steel, comprise 25% of the cost of wind turbines. The increasing distribution of manufacturers, greater competition and the use of more lightweight materials support cost reductions. In addition, since towers can, and are manufactured locally, they will be less sensitive to the weakening Rand. The study estimates a potential cost reduction of 15-20% by 2030. Rotor blades comprise 20% of the cost of wind turbines. On-going improvements in reducing weight through the use of carbon fibre and other lightweight materials will support a reduction of 10-20% by 2020. Gearbox costs and the costs of other components may be reduced by 10-15% by 2020, owing to manufacturing efficiencies.

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; and
- 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 very 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. 16 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 17 primary researchers from three prominent organisations, namely the IDC, the DBSA, and Trade and Industrial Policy Strategies. Many role players from other organisations were also consulted, including the World Wide Fund for Nature, the Green Building Council, the Economic Development Department and private companies involved in green industries.

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

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

In her thesis, Tait[11] 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. 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 wind 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

[11] 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.

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.

2.4.7 Market Intelligence Report: Renewable Energy

A study undertaken by Greencape in 2014 found that the bidding programme is placing increasing pressure on developers to include locally manufactured 'key components'. In the wind sector the key components that are being focussed on are wind turbine blades and towers. The increasing local content requirements are leading to increasing interest in setting up manufacturing in the country, specifically in the Western Cape.

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; and
- 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 WEFs 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 Socio-Economic Assessment. Three articles were reviewed, namely[12]:

- 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; and

[12] Annexure E contains a more detailed review of the documents

- 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.

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 Socio-Economic Assessment 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[13]. The literature reviewed was based on an attempt by the authors of the Socio-Economic Assessment 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;

[13] Annexure F contains a more detailed review of the documents

- 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; and
- 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 Komas WEF 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.

SECTION 3: OVERVIEW OF THE STUDY AREA

3.1 INTRODUCTION

Section 3 provides an overview of the study area with regard to:

- The relevant administrative context;
- The provincial level socio-economic context; and
- The municipal level socio-economic context.

3.1 ADMINISTRATIVE CONTEXT

The project site is located within the NKLM (NC061), one of six LMs which constitute the Namakwa District Municipality (DC6) (Figure 3.1). The town of Springbok is the administrative seat of both the NKLM as well as the NDM. The NDM occupies the arid north-western corner of South Africa. Main land uses are mining and extensive livestock farming. A number of WEFs have been proposed in the NKLM. To date the only development has taken place in the eastern portion of the LM, east of Springbok and the N7.

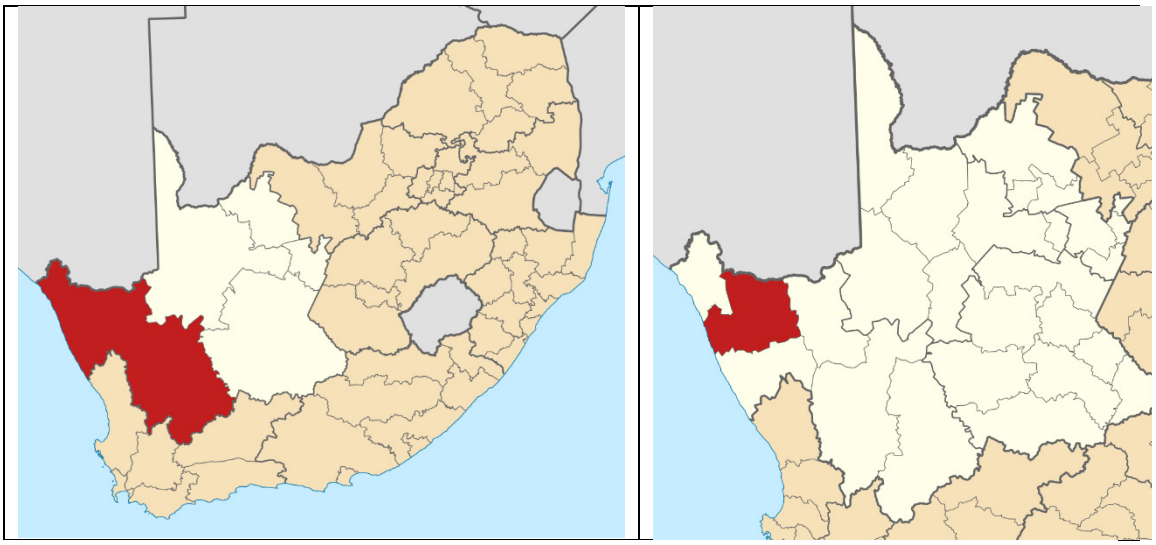


Figure 3.1: Location of Namakwa District Municipality (left) and Nama Khoi Local Municipality (right) within the Northern Cape Province (Source: Wikipedia)

3.2 PROVINCIAL CONTEXT[14]

The project site is 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, namely the Frances Baard, John Taolo Gaetswe, Namakwa, Pixley ka Seme, and ZF Mgcawu District Municipalities.

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%).

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
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 Northern Cape also has the smallest portion (11.1%) of highly skilled formal employees in South Africa and 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 eight 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[15]. This trend is unlikely to change in the

[14] 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.
[15] 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

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 people in the Northern Cape 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 3.2). The goal set by the province is to decrease the percentage of 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.

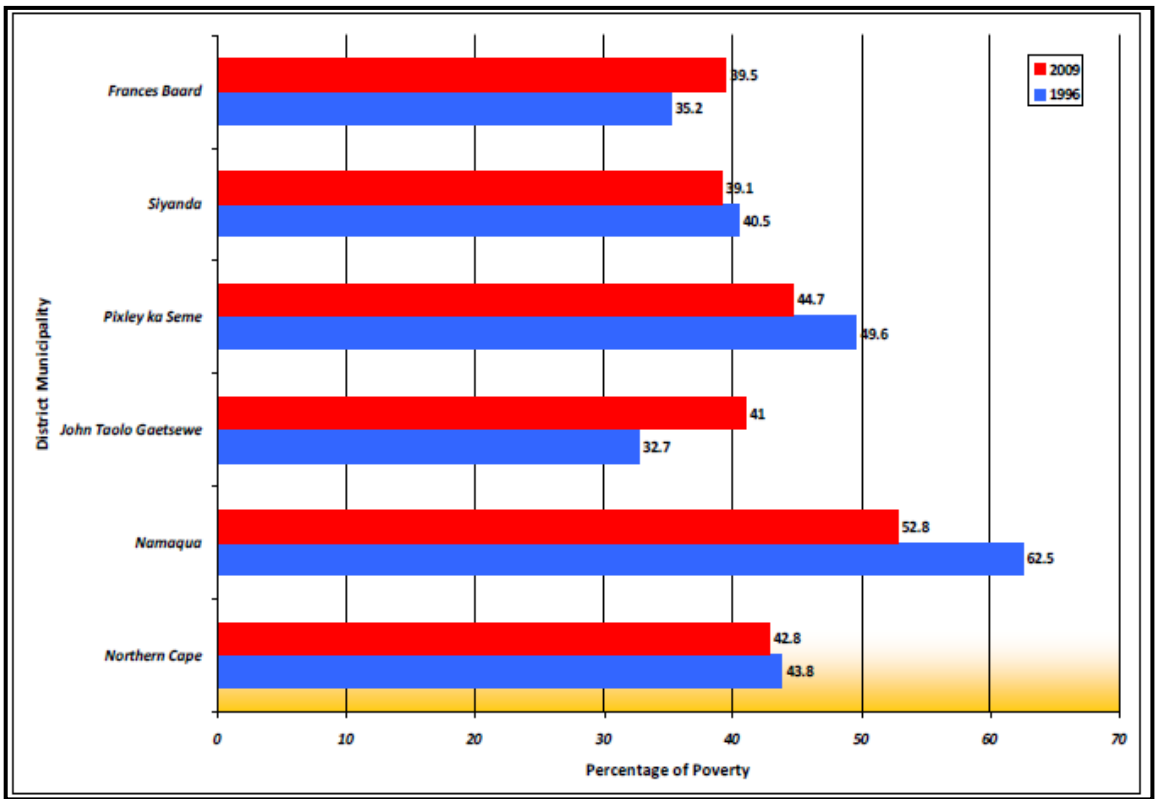
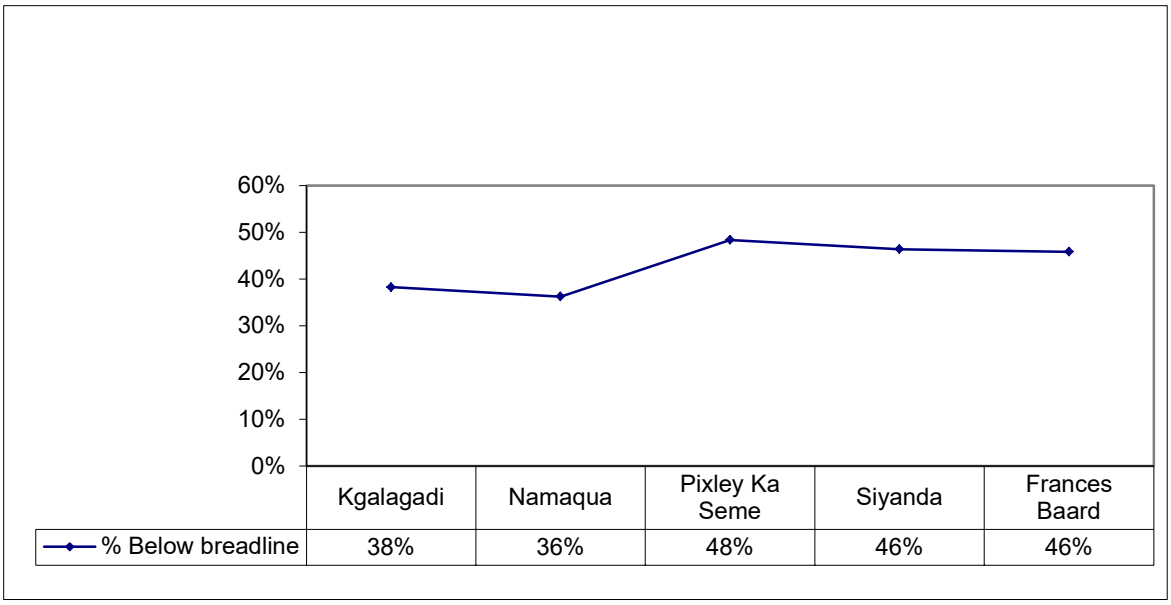


Figure 3.2: Percentage of people living in poverty in the Northern Cape (Source: Global Insight, 2009 as cited in the PGDS, July 2011)[16].

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.

[16] The Siyanda DM is now called the ZF Mgcawu DM.

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[17]. The poverty line indicates a lack of economic resources to meet basic food needs. Figure 3.3 indicates the percentage of household income below the poverty breadline of R800 in the Northern Cape Province, the highest being Karoo at 48% and the lowest being Namakwa at 36%.



	Kgalagadi	Namaqua	Pixley Ka Seme	Siyanda	Frances Baard
% Below breadline	38%	36%	48%	46%	46%

Figure 3.3: Percentage of household income below the poverty breadline by district (*Source: Northern Cape PGDS)*

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 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

[17] 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.

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 includes:

- 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).

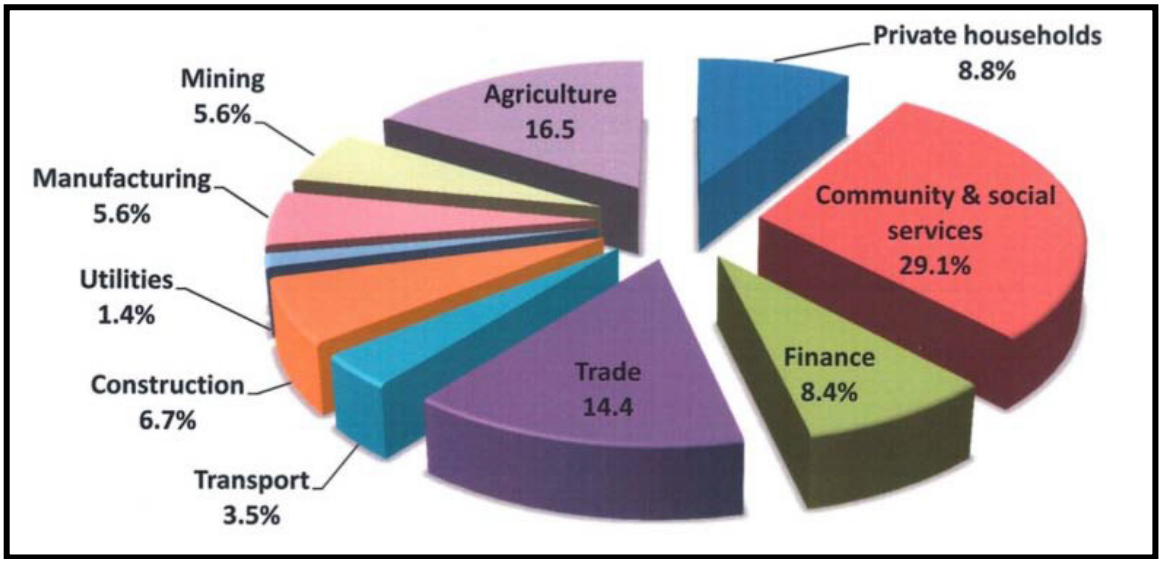


Figure 3.4: Employment by Economic Sector and Industry (Source: Statistics South Africa 2012).

3.3 NAMAKWA DISTRICT MUNICIPALITY

The NDM (DC6) is comprised of six LMs, namely Richersveld, Nama Khoi, Kamiesberg, Hantam, Karoo-Hoogland and Khâi-Ma. The Namakwa DM borders onto Namibia to the north, the ZF Mgcawu DM to the north-east, the Pixley ka Seme LM to the east, the Central Karoo DM (Western Cape Province (WCP)) to the south-east, the Cape Winelands DM (WCP) to the south, the West Coast DM

(WCP) to the south-west, and the Atlantic Ocean to the west. The Namakwa DM covers an area of 126 836 km^2, and is very sparsely populated (<1 person per km^2). The DM is the least populous of the NCP's DMs, and represents only about 10% of the provincial population. This is linked to the aridity of the entire DM. The NMLM is the most populous of the LMs. In 2016 it accounted for 40.2% of the DM's population, followed by the Hantam (18.7%) and Karoo-Hoogland (11.3%) LMs (Table 3.1).

Table 3.1: Namakwa DM population by constituent Local Municipality 2016

Local Municipality	Population	Percentage
Richtersveld	12 487	10.8
Nama Khoi	46 512	40.2
Kamiesberg	9 605	8.3
Hantam	21 540	18.7
Karoo-Hoogland	13 009	11.3
Khâi-Ma	12 333	10.7
TOTAL	115 488	100

Source: Household Community Survey 2016

Springbok (12 790, Census 2011), seat of the Namakwa DM, is also the largest town in the DM. All other settlements in the DM have a population of 10 000 or less. The larger settlements include Calvinia, Steinkopf, Sutherland, Okiep and Port Nolloth. The N7 (Cape Town-Namibia route) plays an important role in the economies of road-adjacent towns such as Springbok, Kamieskroon and Garies. The N14, which intersects with the N7 at Springbok in the west, provides a link to Upington via the northern-eastern portion of the DM (Aggenys, Pofadder).

The Orange (Gariep) River on the DMs northern boundary is the only perennial water course in the Namakwa DM. Mining and agriculture form the economic backbone of the DM. Mining activities historically included diamond mining along the coast and copper mining north of Springbok. Mining activities in the DM have greatly declined over the past two decades, leading to massive lay-offs and disinvestment in the DM. Extensive small stock farming constitutes the spatially most dominant form of land use.

Tourism has been identified as a key economic diversification strategy at provincial, district and local levels. The region is famed for its vast, desolate landscapes and botanical richness. The Succulent Karoo Biome is very well represented in the western DM. Two national parks (NPs) are located in the DM, namely the Richtersveld Transfrontier Park and Namakwa NP.

A portion of the Richtersveld Transfrontier Park is located in the Richtersveld LM adjacent to the south of the Orange River. The 141 000 ha Namakwa NP straddles the Nama Khoi and Kamiesberg LMs. The Namakwa NP is located to the north-west of Kamieskroon up to the Atlantic coast. It includes the coastal area between the Spoeg and Groen River mouths. The main gate to the Namakwa NP (Skilpad camp) is accessed from the east, via the N7.[18] The Namaqualand and Tanqua Karoo regions (all of which are included in the DM area) are world renowned for their annual wildflower displays. Wildflower tourism is the key tourism anchor in the Namaqualand region. Inland areas such as Garies are

[18] https://www.sanparks.org/parks/namaqua/tourism/history.php

renowned hotspots. Displays occur from late winter into late spring, but timing and occurrence are dependent on the relevant year's rainfall.

As indicated in Section 2, the DM supports the development of REFs in its municipal area. This is linked to the DM's identified vulnerability to climate change (and hence the need to support non-fossil energy sources), as well as perceived potential economic opportunities (employment, community development benefits).

3.4 NAMA KHOI LOCAL MUNICIPALITY

3.4.1 Introduction

The proposed Komas WEF project site is located in the western part of the Nama Khoi LM, west of Springbok and the N7. The NKLM is 17 898 km^2 in extent, and largely coincides with the Namaqualand region. The NKLM borders onto the Richtersveld LM to the north-east, Namibia to the north-west, the Khâi-Ma LM to the east, the Kamiesberg LM to the south, and the Atlantic coastline to the west. As indicated, the Nama Khoi is by far the most populous of the Namakwa DM's constituent LMs. This is also reflected by the fact that most of the DMs more sizeable settlements are located in the Nama Khoi LM. Based on Census 2011, the most populous settlements in the LM were Springbok (12 790), Steinkopf (7 842), Okiep (6 304), Nababeep (5 374), Concordia (4 988) and Komaggas (3 116). Smaller settlements include Carolusberg, Bulletrap. Goodhouse, Kleinsee and Vioolsdrif. The Municipal Area is divided into 9 wards. The proposed WEF is located in Ward 8 (Komaggas, Buffelsrivier, Koingnaas). Kleinsee is currently still administrated and serviced by De Beers. The infrastructure and responsibility would ultimately be transferred to the NKLM (date still not finalized).

Many of earliest permanent settlements in the broader region originated as mission stations on land historically belonging to the Nama Khoekhoen (and before them, the San). These mission stations, including Pella, Kamieskroon and Komaggas (to the east of the project site), were founded during the first decades of the 19th century. Communal land is associated with many of these settlements.

The establishment and/or growth of many settlements are linked to copper and diamond mining activities. Commercial copper mining dates to the later decades of the 19th century, and supported many Namaqualand communities throughout the 20th century. Mines at Nababeep and Okiep all closed down over the past two decades. Diamonds were discovered in the Kleinsee area during the late 1920s. Settlements like Kleinsee and Koingnaas were established by De Beers Mining. Other settlements, like Kommagas and Buffelsfontein, were overwhelmingly reliant on De Beers for employment. The closure of mining activities has hit the area hard. Due to the more general decline in the local mining sector, traditional local labour-sending communities have not been able to find alternative employment in the LM.

Like the rest of the DM, extensive small stock farming constitutes the most dominant form of land use. Irrigated alfalfa and vegetables are produced on a limited scale at Vioolsdrif, and dates at Pella, both settlements located along the Orange River. The natural veld carrying capacity in the LM is very low, and stock farming operations are typically carried out on very large properties. This contributes to the very sparse rural settlement pattern. Communal farms are typically farmed by farmers based in nearby settlements. The livestock sector provides limited employment, and is very vulnerable to recurrent major droughts.

Very little agricultural beneficiation takes place within the LM. Game farming is currently very limited in extent.

Like the DM, local tourism is largely anchored by botanical richness. As indicated, the Namakwa NP is partially located in the LM. Seasonal wildflower displays are the major drawcard. These conspicuous displays largely occur in the inland portions of the LM. Much of the LM coastline is historically associated with diamond mining. Until recently, this area was not accessible to the public. This includes portions of the coastline and adjacent land between Kleinsee and Koingnaas. Until recently, a permit was required to enter both of these settlements. Tourism facilities and supporting infrastructure in the coastal region are therefore very under-developed. Existing activities, all based along the coastline, are essentially associated with limited guided walking- and 4x4 trails. Thanks to its strategic location at the intersection of the N7 and N14, Springbok is a well-established stopover. Traffic along both routes also bolsters its ability to serve as regional service centre offering a range of commercial and other services.

Like the DM, and for the same reasons, the NKLM keenly supports the development of REFs in its area. A large portion of the LM falls within the Springbok REDZ. The area around Kleinzee has been identified in the SDF as suitable for accommodating WEFs. To date only one WEF has been constructed in the LM, namely the 270 MW Kangnas WEF approximately 50 km inland of Springbok constructed 2018-2019[19]. A number of WEFs have been proposed in the Kleinsee-Komaggas are, but none have achieved preferred bidder status yet.

3.4.2 Demographics

Population

In 2016, the NDM had a total estimated population of 115 488, and the NKLM one of 46 512. This represents a slight decrease in both the Namakwa (-0.1%) and Nama Khoi (-0.3%) populations compared to Census 2011 (Table 3.3). The Coloured population group is historically the most dominant. In 2016, the Coloured group accounted for 93% of the Nama Khoi population, followed by the White (5.5%) and Black African (1.4%) groups. Afrikaans remains the most dominant first language in the LM, accounting for more than 90% of the population.

[19] https://kangnaswind.co.za/kangnas-wind-farm/overview/.

Table 3.2: Overview of key demographic indicators for the NDM and NKLM

	NDM		NKLM	
ASPECT	**2011**	**2016**	**2011**	**2016**
Population	115 842	115 488	47 041	46 512
% Population <15 years	25.8	22.5	24.9	21.4
% Population 15-64	66.2	68	66.9	68.1
% Population 65+	8	9.5	8.2	10.5
Households	33 856	37 669	13 193	14 546
Household size (average)	3.4	3.1	3.6	3.2
Formal Dwellings %	93.8	95.2	94.7	93.6
Dependency ratio per 100 (15-64)	51.2	47.1	49.4	46.8
Unemployment rate (official) - % of economically active population	20.2	n/a	22.9	n/a
Youth unemployment rate (official) - % of economically active population 15-34	25.4	n/a	30.1	n/a
No schooling - % of population 20+	6.6	4.5	2.2	1.5
Matric highest - % of population 20+	18.8	24.8	20	24.2

Source: Compiled from StatsSA Census 2011 and 2016 Community Household Survey[20]

While the 0-14 age group decreased in both the DM and LM, the working age and retirement-age population groups both increased for both the DM and LM. The relative sizes of these age cohorts are closely mirrored over the 2011-2016 period. Surprisingly, the number of households had increased during this period, by 3813 to 37 669 in the DM (10%), and by 1353 to 14 546 in the NKLM (10.2%). This is linked to a decrease in household sizes, viz. by 0.2 people per household for the DM, and 0.4 for the LM.

The dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working age population group (15-64). The dependency ratio for both the DM and LM have decreased during the period 2011-2016, indicating fewer people who are dependent on the economically active age group. This represents a positive socio-economic gain. The gap between the DM and LM dependency ratios has decreased, but the LM still has a 0.9 lead on the DM.

Household income

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.

[20] https://municipalities.co.za/demographic/1171/nama-khoi-local-municipality; https://municipalities.co.za/demographic/136/namakwa-district-municipality.

Based on this measure, 46% of the households in the NKLM lived close to or below the poverty line in 2016. These low income levels reflect the limited formal employment opportunities in the LM and DM, given constraints to growth in the agricultural sector and the decline of the mining sector. These low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. These low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the district and local municipality.

Employment
In terms of employment, the official unemployment rate in the NkLM was 2.7% higher (22.9%) than that of the DM (20.2%) in 2011. The LM's youth unemployment rate was significantly higher, viz. 30.1%. No information for youth unemployment was collected in 2016. The national youth unemployment rate in 2019 was 39.6%, one of the highest in the world. Given the decline of mining activities and the prevailing drought, the LM's youth unemployment rate is likely to be on par with the national average.

Education
Education levels in both the DM and LM improved between 2011 and 2016. This is reflected in decreases in the percentage of people aged 20 or older without any formal education, as well as increases in the percentage of matriculants. Despite these gains, the DM and LM matriculant cohort is still smaller than that for the Northern Cape Province in 2016 (viz. 29.1%). Overall education levels therefore remain relatively low in both the DM and LM.

3.4.3 Municipal services

Municipal service levels in the NKLM outperformed those of the DM with regard to all indices in 2016 (Table 3.3).

Table 3.3: Overview of access to basic services in the NDM and NKLM

	NDM		NKLM	
ASPECT	**2011**	**2016**	**2011**	**2016**
% households with access to flush toilet	71.7[21]	67.9	63.5	74.2
% households with weekly municipal refuse removal	82.2	81.7	89.4	89.2
% households with piped water inside dwelling	95.4[22]	70.5	74.9	79.8
% households with access to electricity	86.5	96.1	93.7	97.3

Source: Compiled from StatsSA Census 2011 and 2016 Community Household Survey

With the exception of a slight decrease in access to weekly refuse (by 0.2%, to 89.2%), service levels in the NKLM have improved for all indices. This includes a 10.7% increase in the number of households with access to a flush toilet, a 4.9%

[21] Figure includes access to tap in yard (not differentiated from tap in dwelling).
[22] Figure includes chemical toilets (not differentiated from flush toilets).

increase in the number of households with access to piped water in their dwellings, and a 3.6% increase in the number of households with access to electricity.

3.4.4 Economic overview

The NKLM economy was valued at R8.5 billion (constant prices) in 2016. It contributed 55% to the Namakwa DM economy, and 7% to that of the provincial economy. Between 2010 and 2016 the LM's economy grew at an average of 2% per year, but slightly dipped between 2015 and 2016. The primary sector contracted by 1.6% between 2015 and 2016, with the Mining sector down 1.4%, and the agricultural sector 5.6%. In contrast, both the Secondary (+2.6%) and Tertiary (+1.3%) sectors witnessed growth. The biggest gains were in Manufacturing (5.3%) and General Government spending (3.8%) (Urban-Econ, 2018).

Like elsewhere in the NCP, the Mining and Quarrying sector is the greatest contributor to GDP-R. In the NKLM, this sector accounted for almost half (R4.1 billion) of the economy in 2016. Nevertheless, the sector is generally in decline as a result of resource depletion. The agricultural sector, while spatially and culturally the most dominant sector, is the smallest contributor to GDP-R. In 2016 the sector accounted for only R194 million (Urban-Econ, 2018). In terms of employment provision, 6% of households were engaged in livestock production in 2016, followed by the poultry (3%), and vegetable production (1.4%) sub-sectors (Nama Khoi IDP 2019/2020).

3.5 SITE AND SURROUNDING LAND USES

3.5.1 Land uses and settlement patterns

The study area is located in the sparsely populated, broad arid coastal plain west of Komaggas in the western portion of the Namaqualand region (Photograph 3.1). Komaggas is the only settlement located in the vicinity of the proposed Komas WEF site. The ex De Beers diamond mining town of Kleinsee is located on the coast approximately 23 km to the north-west of the site. Kleinsee offers more retail and commercial services than Komaggas.

Photograph 3.1: Arid grazing land on Zonnekwa A to the north-west of the proposed Komas WEF site

The study area originally formed part of the extensive grazing lands utilized by the Nama Khoi people. Like other Khoi-khoi groups, the Nama moved between grazing grounds in patterns dictated by season and weather and did not create any permanent settlements. Komaggas originated as a mission station in the early 1800s. Kleinsee originated as a mining town after diamonds were discovered in the area in the late 1920s. The town was established by De Beers in 1942.

Diamond mining was the backbone of the local economy, with De Beers historically playing the key role, including the development of the Kleinsee and Koingnaas to support its coastal mining activities. Most of the employment opportunities were associated with the De Beers mining operations. Until recently, a permit was required to enter these settlements. Many of the farms on the coastal plain were also acquired by De Beers and public access was prohibited. De Beers started downscaling mining operations in 1992 due to dwindling diamond reserves and most of the workforce was retrenched by 2009. As part of the downscaling De Beers sold most of its properties, including erven in Kleinsee and its farms. A number of farms were also transferred to the Komaggas community for use as communal farming land.

During 2018 Kleinsee was invaded by a large number of informal miners and De Beers had to obtain a court order to have them removed. At present, all commercial diamond mining at Kleinsee is understood to have come to a stand-still. De Beers still provides basic municipal services to Kleinsee, but the infrastructure and responsibility has been transferred to the NKLM. The decline of De Beers' activities coincided with a general decline in Namaqualand's mining activities, which also witnessed the closing of copper mines in Okiep and Nababeep over the past 20 years. This has had a significant impact on the local economy. Given the isolated location of the area relative to key markets, the limited availability of water and low rainfall, the potential economic opportunities are limited. Renewable energy therefore provides an opportunity for the area and its economy.

The study area and broader region is extremely arid. Kleinsee and Kommagas are provided with potable water via pipelines. Stock farming is currently the primary economic activity in the study area and includes commercial as well as communal farming operations. Commercial farms are typically extensive (6500-10 000 ha) and consist of a number of properties. All operations are reliant on boreholes for domestic and farming use. The veld consists of karroid scrub, mainly suitable for small-stock such as sheep and goats (Photograph 3.2). The general veld carrying capacity is 1 small-stock unit to 7 hectares. Given the nature of farming operations, the employment opportunities are limited. In this regard most commercial operations only provide casual opportunities. Casual labour is sourced from Komaggas and Buffelsrivier and typically reside on the property for a number of weeks at a time. The employment is therefore both temporary and seasonal.

Photograph 3.2: Sheep on Rooivlei farm to the north-west of the proposed Komas WEF site

No game farming is currently carried out in the study area and few farmers harvest game for own use. The region is vulnerable to recurring droughts and is currently in the grips of a severe drought that is into its 6th year. One of the interviewees indicated that only 32 mm of rain had been recorded per annum on their property over this period (A van Dyk – pers. comm). The farmers in the study area indicated that they have had to buy fodder and sell off large portions of their flocks. Many farmers have indicated that they are 'on their last knees'.

Access to the study area is via Kleinsee and Komaggas. The R355 links Kleinsee to Springbok and the N7 (Cape Town-Namibia route) in the east. Only the initial portion from Springbok to Buffelsrivier is tarred. South of Kleinsee the R355 continues as a tarred road to Koingnaas (approximately 60 km to the south). The Kleinsee-Koingnaas tarred road runs parallel to the coastline, 12 km to the west of the Komas WEF site (Photograph 3.3).

Photograph 3.3: Looking south along the R355 Kleinsee-Koingnaas road from just to the south of Kleinsee

A tarred road off the R355 (Springbok-Kleinsee) provides access to the settlements of Buffelsrivier and Komaggas. The tarred road continues as a gravel road west of Komaggas and links up with the Kleinsee-Koingnaas road approximately 9 km south of Kleinsee (Photograph 3.4). The road is known locally as the Rooipad ('Red Road') and provides the most direct road connection between Komaggas and Kleinsee. The Rooipad is located 5 km to the north of the WEF site.

Photograph 3.4: Looking east from the intersection of the Komaggas gravel road ('Rooipad') and the Kleinsee-Koingnaas Road

Zonnekwa farm, as well Rooivlei and Graafwater, are only accessible via a small public gravel road located to the south of the Rooipad, linking the Kleinsee-Koingnaas Road to the Rooipad via these properties (Photograph 3.5). The road passes in close proximity to at least 3 farmyards, namely Rooivlei (Mostert), Rooivlei (D Engelbrecht) and Sonnewka (W Engelbrecht). This road also provides primary access to the Komaggas communal farming area located to the east of Zonnekwa. The road traverses the WEF site and would potentially be affected by construction traffic.

Photograph 3.5: Looking east along the public road across Rooivlei and Zonnekwa.

There is limited infrastructure located in the vicinity of the proposed Komas WEF site. The nearest Eskom distribution line is located immediately to the south of the Komaggas gravel road (Rooipad), approximately 5 km north of the site. The line feeds into a small SS on the western outskirts of Komaggas, approximately 14.4 km north-east of the site (Photograph 3.6).

Photograph 3.6: The small Eskom substation on the western outskirts of Komaggas

The Gromis Main Transmission Substation (MTS) is located to the west of Kleinsee along the R355 (Photograph 3.7). A small SS is located at the intersection of the Kleinsee-Koingnaas tarred road and the Rooipad.

Photograph 3.7: Eskom's Gromis Main Transmission Substation located 11 km to the north-east of Kleinsee

Komaggas (3116, 2011 Census) is the only community located in relatively close proximity (15-16 km) to the north east of the WEF site. The settlement straddles the road from Springbok to the Kleinsee-Koingnaas gravel road (Photographs 3.8

and 3.9) and includes a few small shops stocking basic groceries, a liquor store and a fuel station. A municipal service centre, post office, police station, clinic and school (Grades 1-12) are also located in Komaggas. The smaller settlement of Buffelsrivier, located 17 km to the north east, is commonly viewed as part of the same community as Komaggas. Springbok is the nearest large settlement in the area.

Photograph 3.8: Komaggas, seen from its eastern entrance along the tarred road from the R355 via Buffelsrivier.

Photograph 3.9: Komaggas seen from the west along the Rooipad.

Komaggas originated as one of a number of mission stations founded by Rev Schmelen of the London Missionary Society in Namaqualand and Southern Namibia during the early 19th century. The current community is largely Coloured and Afrikaans-speaking. Nama has essentially disappeared as spoken language.

The settlement evolved in response to the economic base provided by De Beers mining activities at Kleinsee and Koingnaas during the last half of the 20th century, and has been severely impacted by the closure of these operations. De Beers provided stable employment for a number of decades. More than 1000 jobs are estimated to have been lost to the Komaggas and Buffelsrivier communities as a result of retrenchments between 1992 and 2009. As a result of the general decline in the Namaqualand mining sector very few community members have been able to find alternative employment. A small group which found employment at mines in Kathu have recently been retrenched. Currently only around 20 people are still employed in the mining sector, viz. at the Gamsberg mine near Aggenys.

Around 40-60 farmers farm on communal land located to the west of Komaggas. These include the farms Platvlei (314/RE), Berseba, Pienaarsbult, Karootjie and portions of the original Zonnekwa parent property. The majority of farmers have small herds of 8-10 sheep or goats. However, a few also have larger herds. The farmers all live in Komaggas and visit their flocks when required. Due to the low carrying capacity there is limited potential for more famers to be accommodated on the communal area. The community benefits from limited casual employment opportunities on commercial farms in the study area, including on the farm Zonnekwa where the proposed Komas WEF is located.

The vast majority of Komaggas households currently rely on state grants for income. Unemployment levels, especially youth unemployment levels, are very high. Substance abuse levels are high. Tik has already gained a foothold in the community. Due to the lack of economic opportunities, the settlement attracts few new residents. No tourism facilities or activities are currently associated with Komaggas (Diergaard, Landry, van Reenen – pers. comm).

In terms of tourism, the study area forms part of the Namaqua Coastal Route (Hondeklipbaai to the mouth of the Groen River). A tourism information office is located in Kleinsee and largely focusses on existing and proposed local walking trails. A few self-catering and long-stay accommodation facilities are located in Kleinsee. The Kleinplasie Pub and Restaurant on the grounds of the old Kleinsee shooting club south of Kleinsee is the only restaurant in Kleinsee.

Existing tourism activities on the coastal plain between Kleinsee and Koingnaas are concentrated in the area between the Kleinsee-Koingnaas road and the coastline and are limited. The study area is not an established wildflower watching area. A Strandveld Conservation Area is currently proposed for the coastal area south of Kleinsee up to the state-owned Brazil farm. Around 2-3 local operators currently provide guided walking trips (e.g. shipwreck route) and 4x4 activities. These activities are concentrated along the coast, west of the Kleinsee-Koingnaas tarred road, and are not located in meaningful proximity to the WEF site (de Vries, Heyn – pers. comm). The extreme north-western portion of the Namakwa NP is located approximately 14 km to the south-east of the Komas. The WEF site does not appear to be in significant proximity to any of the camps in the park. The main camp and park entrance at Sklipad, are located 54 km to the south-east of the proposed Komas WEF site.

Only one tourism facility located in the study area is Die Houthoop Guest Farm located on Steenvlei Farm (Kannabiesduin 324/RE). The guest farm is located along the Rooipad gravel road approximately 11.2 km north-west of the WEF site. Die Houthoop provides a range of accommodation facilities ranging from camp

sites (10), to huts (24) and on-suite chalets (8) (Photograph 3.10), and also has a restaurant.[23] The facility caters for tourists, contractor staff, large tour groups and local functions. No turbines are likely to be visible from Die Houthoop. The owner of Die Houthoop has identified potential opportunities to provide catering and accommodation during the construction phase (V van Dyk – pers. comm).

Photograph 3.10: Self-catering huts on Die Houthoop Guest Farm

3.5.2 Proposed Komas WEF site

The Komas WEF development area is located on the eastern portions of 5 cadastral units forming part of two larger farming operations, Zonnekwa (W Engelbrecht) and Rooivlei (D Engelbrecht). Farms 315/4 and 328/4 constitute the southern portion of the Komas site. No substation alternatives are proposed on these properties. These properties belong to Mr Willem Engelbrecht, and form part of a 6500-ha operation based on Zonnekwa 328/4. Zonnekwa Farm is only accessible via the public road which links the R355 to the Komaggas gravel road via Rooivlei. The farmstead is inhabited by the owner, and is located adjacent to the north of the road on the non-site portion of 328/4 (Photograph 3.11).

[23] http://www.houthoop.co.za/accommodation.html

Photograph 3.11: Zonnekwa farmstead and werf seen from the east.

The Zonnekwa farming operation also includes the farm Langberg (Platvlei 314/1) located 3 km to the south of the Komas site. The properties are used for sheep farming. No permanent employment opportunities or labour tenure is associated with the operation. Limited casual opportunities are provided to members of the Komaggas and Buffelsrivier communities. The farmstead is located approximately 1.6 km to the south-west of the WEF site (Photograph 3.12). The 270 MW Gromis WEF is currently proposed on Langberg (parallel EIA application). Apart from stock watering points and fencing, no infrastructure is located on the site portion of the property (W Engelbrecht).

Photograph 3.12: Looking east from the Zonnekwa yard towards the Komas WEF site.

Farms 328/1-3 constitute the northern portion of the Komas site. The southern project substation alternative is proposed on 328/3, and the northern one on 328/1. These properties belong to Mr Danie Engelbrecht, and form part of the Rooivlei (Engelbrecht) farming operation based on a portion of Rooivlei 327. Rooivlei Farm is only accessible via the public road which links the R355 to the Komaggas gravel road via Rooivlei and Zonnekwa (Engelbrecht). The farmstead is inhabited by the owner (Photograph 3.13).

Photograph 3.13: Rooivlei (D Engelbrecht) farmstead and outbuildings. The Namas WEF has been approved on this portion of Rooivlei Farm.

The properties are used for sheep farming. No permanent employment opportunities or labour tenure is associated with the operation. Limited casual opportunities are provided to members of the Komaggas and Buffelsrivier communities. The farmstead is located approximately 8 km to the west of the Komas WEF site. The Nama WEF has been approved on non-site portions of Rooivlei, but the project has not yet achieved preferred bidder status. Apart from stock watering points and fencing, no infrastructure is located on the site portion of the property (M Engelbrecht – pers. comm) (Photograph 3.14).

Photograph 3.14: Portion of Komas development site on Rooivlei, viewed from the public farm road to Komaggas.

3.5.3 Surrounding properties and land uses

The proposed Komas WEF site is surrounded by properties primarily used for grazing, with a few that also supporting limited residential use. This includes communal farms located to the east and south-east of the site, as well as commercial farms to the north, west and south. As indicated above, the communal land is used by farmers based in the Komaggas settlement. Adjacent and significant near-adjacent commercial farms include:

- Graafwater (331/RE) is located adjacent to the south of the Komas site. It is one of three properties owned by Mr Deon Kotze, and which make up Graafwater Farm. The operation also includes Paardevlei Farm located adjacent to the west of Langberg Farm (i.e. Gromis WEF site). The property is only accessible via the gravel road across Rooivlei and Sonnewka (Engelbrecht). Mr Kotze resides on Graafwater 331/RE (Photograph 3.15). Paardevlei is not inhabited. The operation is based on small-stock farming and provides permanent employment to 2 tenured labourers as well as casual opportunities to members of the Komaggas community. Juwi Renewble Energy has signed an option to develop a WEF on Paardevlei (Kotze – pers. comm). The Komas site is located approximately 1.9 km to the north-east of the farmstead.

Photograph 3.15: Farmstead on Graafwater with bales of emergency fodder in foreground

- Farm 315/RE located adjacent to the south-east of the Komas site forms part of Kap Vley farm and is owned by Mr Bertus Roux. Mr Roux is based in Kamieskroon and the farm is used as a stock-post in a multi-farm operation which also includes farms in Bushmanland. Kap Vley is mainly used to raise small-stock but also supports some cattle and ostriches. The property is not inhabited, and no dedicated employment opportunities are associated with the property. Access to the property is from the east, via Garies or Komaggas. The Kap Vley WEF has been approved on the property, but the project has not gained preferred bidder status yet (Roux – pers. comm).
- Farm 326/RE (Zonnekwa A) is located adjacent to the north-west and north of the proposed Komas site and is owned by Ms Annebie van Dyk, who resides on the property. The farmstead is accessed from the Rooipad via a private road and is located approximately 6.5 km to the south of the road (Photograph 3.16). The property is used for sheep farming. No permanent employment opportunities or labour tenure is associated with the operation. Limited casual opportunities are provided to members of the Komaggas and Buffelsrivier communities. The farmstead is located approximately 700-800m to the west of the proposed Komas WEF site. The Zonnequa WEF has been approved on portions of Rooivlei farm, but the project has not yet achieved preferred bidder status (A van Dyk – pers. comm).

Photograph 3.16: Farmstead on Zonnekwa looking south from the access road

3.5.4 Other renewable energy facilities

Several REFs are currently being proposed within 50 km from the proposed Komas WEF (8 approved WEFs and one approved solar PV facility; i.e. 9 approved projects in total). These projects were considered in assessing the potential cumulative impacts. In addition to these, the application for an additional solar PV facility is currently in process. The proposed Gromis WEF comprises a separate BA process. The projects are listed in Table 3.4 and Figure 3.5.

One of the original applications (Kleinzee WEF) have subsequently been split and renamed, namely to the Namas and Zonnequa WEFs. These WEFs would be located on portions of Graafwater (Kotze) Zonnekwa A (A van Dyk) and Rooivlei Farms (D Engelbrecht). The proposed Gromis development area is located approximately 2.5 km to the south of the Komas development area. The owner of Graafwater Farm also indicated that Juwi Renewable Energies (Pty) Ltd had taken out an option on the farm Paardevlei immediately to the west of the proposed Gromis WEF site (Kotze – pers. comm).

Local farmers, tourism officials and the Komaggas Ward Councillor have indicated that the Kleinsee-Komaggas-Koingnaas area is well suited to the establishment of WEFs. This is linked to the sparse settlement pattern, low productive grazing value of the land, the relative absence of sensitive social and tourism receptors, and the fact that the WEFs would be able to provide economic opportunities for the local communities impacted by the closure of mining activities in the area. In addition, due to their low water requirement, WEFs would be sustainable in an arid area that is vulnerable to severe droughts. As such it is generally perceived as a potential stable source of income to buffer local farmers against droughts, and thus increase the viability and resilience of local farming.

Table 3.4: Other Renewable Energy Facilities within 50 km of the proposed Komas WEF site

DEA REFERENCE NUMBER	PROJECT TITLE	APPLICANT	EAP	TECHNOLOGY	MEGAWATT	STATUS
12/12/20/2331/1 12/12/20/2331/1/AM1 12/12/20/2331/2 12/12/20/2331/3	Project Blue Wind Energy Facility Near Kleinsee within the Namakwa Magisterial District, Northern Cape Province. (Phase 1-3)	Diamond Wind (Pty) Ltd	Savannah Environmental Consultants (Pty) Ltd	Wind and Solar PV	150 MW Wind 65 MW Solar PV	Approved
12/12/20/2212	Proposed 300 MW Kleinzee WEF in the Northern Cape Province.	Eskom Holdings SOC Limited	Savannah Environmental Consultants (Pty) Ltd	Wind	300 MW	Approved
14/12/16/3/3/2/1046	The proposed Kap Vley WEF and its associated infrastructure near Kleinzee, Nama Khoi Local Municipality, Northern Cape Province.	Kap Vley Wind Farm (Pty) Ltd	Council for Scientific and Industrial Research	Wind	300 MW	Approved
14/12/16/3/3/1/1971	Proposed Namas Wind Farm near Kleinsee, Namakwaland Magisterial District, Northern Cape.	Genesis Namas Wind (Pty) Ltd	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/1/1970	Proposed Zonnequa Wind Farm near Kleinsee, Namakwaland Magisterial District, Northern Cape.	Genesis Zonnequa Wind (Pty) Ltd	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/2154	Proposed construction of the 7.2 MW Koingnaas Wind Energy Facility Within The De Beers Mining Area on the Farm Koingnaas 745 near Koingnaas, Northern Cape Province.	Just PalmTree Power Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	Wind	7.2 MW	Approved
12/12/20/1807	Proposed establishment of the Kannikwa Vlakte wind farm.	Kannikwa Vlakte Wind Development Company Pty Ltd	Galago Environmental cc	Wind	120 MW	Approved

DEA REFERENCE NUMBER	PROJECT TITLE	APPLICANT	EAP	TECHNOLOGY	MEGAWATT	STATUS
12/12/20/1721 12/12/20/1721/AM1 12/12/20/1721/AM2 12/12/20/1721/AM3 12/12/20/1721/AM4 12/12/20/1721/AM5	The proposed Springbok Wind Energy facility near Springbok, Northern Cape Province.	Mulilo Springbok Wind Power (Pty) Ltd	Holland & Associates Environmental Consultants	Wind	55.5 MW	Approved
TBA	The proposed Gromis WEF and associated infrastructure near Kleinsee in the Northern Cape Province.	Genesis ENERTRAG Gromis Wind (Pty) Ltd	Council for Scientific and Industrial Research	Wind	200 MW	In process
14/12/16/3/3/1/416	Nigramoep Solar PV Solar Energy Facility on a site near Nababeep, Northern Cape.	South African Renewable Green Energy (Pty) Ltd	Savannah Environmental Consultants (Pty) Ltd	Solar PV	20 MW	In process

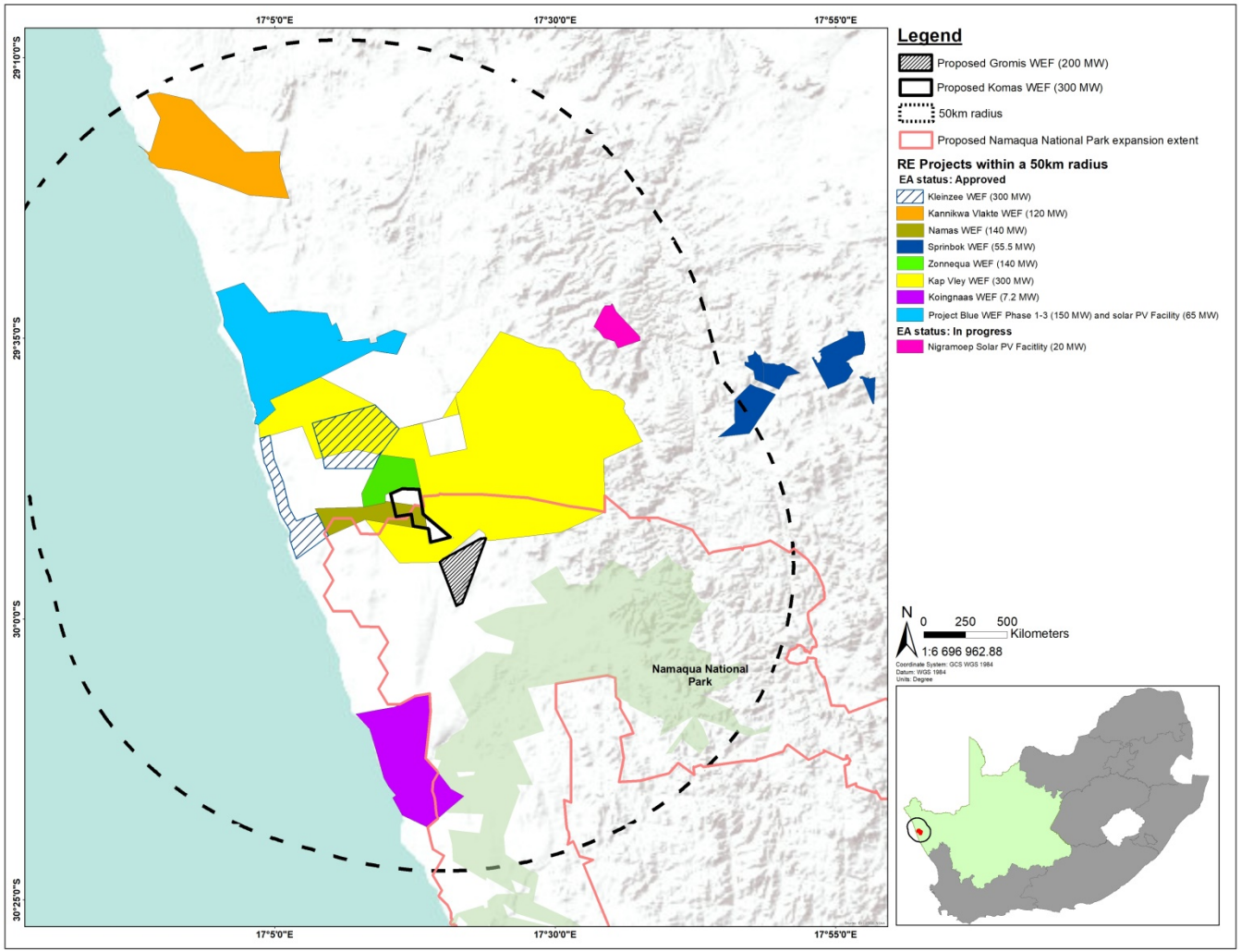


Figure 3.5: Other Renewable Energy Facilities within 50 km from the proposed Komas WEF site

SECTION 4: ASSESSMENT OF 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;
- Interviews with key interested and affected parties;
- Experience/ familiarity of the authors with the area and local conditions; and
- 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 socio-economic issues associated with the construction phase;
- Assessment of socio-economic issues associated with the operational phase;
- Assessment of socio-economic issues associated with the decommissioning phase; and
- Assessment of the "no development" alternative; and
- Assessment of cumulative impacts.

4.2 ASSESSMENT OF POLICY AND PLANNING FIT

Legislative and policy context plays an important role in identifying and assessing the potential socio-economic impacts associated with a proposed development. In this regard a key component of the Socio-Economic Assessment process is to assess the proposed Komas WEF development in terms of its fit with key planning and policy documents.

The findings of the review indicate that renewable energy is strongly supported at a national, provincial and local level. At a national and provincial level, the development of and investment in renewable energy is supported by the NDP, New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. The proposed SEF also supports a number of objectives contained in the NCP PGDS. At a district and local level, the NDM IDP, NDM Climate Change Response Plan, NKLM's IDP and NKLM's SDF all support the establishment of renewable facilities. The proposed Komas WEF is also located within the Springbok REDZ 8, which was formally gazetted in 2018[24]. The area has therefore been identified as suitable for the establishment of REFs, including WEFs.

[24] GN114 of 2018

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that renewable energy and the establishment of suitably sited WEFs is supported at a national, provincial and local level.

4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

The key socio-economic issues associated with the construction phase include:

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 job-seekers;
- 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; and
- Noise, dust, waste and safety impacts of construction related activities and vehicles.

4.3.1 Creation of local employment, training, and business opportunities

Based on the information from other WEF projects the construction phase for a 300 MW WEF is expected to extend over a period of 20-24 months and create approximately 200-250 (full-time equivalent) employment opportunities during peak construction. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the WEF and the associated components, including, access roads, substation, services and power line. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.).

Members from the local community in the area are likely to be in a position to qualify for the majority of the low skilled and a proportion of the semi-skilled employment opportunities. Given the historic role played by mining in the area, some members from the local community may also be qualified to take up some of the high-skilled employment opportunities. The majority of these employment opportunities will accrue to HD members from the NKLM community. As indicated above, due the demise of the mining sector, the levels of unemployment in the NKLM are high. The towns that are likely to benefit are Komaggas, Buffelsrivier, Kleinsee, and Springbok. The creation of potential employment opportunities, even temporary employment, will represent a significant, if localised, social benefit. 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 the enhancement measures listed below by the proponent in consultation with the NKLM and NDM.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (March 2019). The study found that to date, a total of 40 134 job years[25] have been created for South African citizens, of which 33 019 job years were in construction and 7 115 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 101% of the planned number during the construction phase (i.e. 32 602 job years), with 26 projects still in construction and employing people as of March 2019. The number of employment opportunities is therefore likely to continue to grow beyond the original expectations. By the end of March 2019, 64 projects had successfully completed construction and moved into operation. These projects created 31 633 job years of employment, compared to the anticipated 20 689. This was 53% 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 89% during construction (against a target of 80%), while it was 95% during operations for BW1 – BW3 (against a target of 80%). In terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. The expectation for local community participation was 13 058 job years. To date 18 253 job years have been realised (i.e. 140% more than initially planned), with 26 projects still in construction. The number of black SA citizens employed during construction also exceeded the planned numbers by 22%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 79%, 41% and 49% of total job opportunities created by IPPs to date.

The study also found that the share of black citizens employed during construction (79%) had significantly exceeding the 50% target. Likewise, the share of skilled black citizens (as a percentage of skilled employees) for both construction (67%) and operations (79%) has also exceeding the 30% target and is at least 3.5 times more than the minimum threshold of 18%. The study also found that the share of local community members as a share of SA-based employees was 49% and 67% for construction and operations respectively – exceeding the minimum threshold of 12% and more than 2.5 times more than the target of 20%.

The capital expenditure associated with the construction of a 300 MW WF will be in the region of R 2.5 billion (2017 Rand value). A percentage of the capital expenditure associated with the construction phase has the potential to benefit local companies and communities. Given the location of the site, the majority of suitably qualified and experienced companies that can provide key services, such as construction and engineering companies, are likely to be based in Cape Town and the Cape Town Metropolitan area. The Green Jobs study (IDC, DBSA, and TIPS, 2011) found that South Africa is in a position to leverage upon some of its existing manufacturing capacities in order to produce components and parts for various sections of wind turbines.

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

The total wage bill for the 20-24 month construction phase of a 300 MW WF will be in the region of R 69 million (2020 Rand value). This is based on an average monthly wage of R 8 000 for low-skilled workers, R 12 000 for semi-skilled workers and R 30 000 for skilled workers over a period of 22 months. Due to the location of the site, the majority construction workers are likely to be accommodated in Kleinsee. However, the members of the local community that are employed on the project will reside in Komaggas, Buffelsrivier and Springbok. A percentage of the wage bill will therefore be spent in the local economy over the 18-24 month construction phase. This will create opportunities for local businesses in the area. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. This is confirmed by the experience with the other renewable projects. The potential opportunities for the local service sector are linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site.

Although the hospitality industry in the immediate vicinity of the site area is limited, the facilities in the surrounding area, such as towns like Springbok and Kleinsee, and the Die Houthoop Guest Farm, will benefit from the provision of accommodation and meals for contractors and professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other renewable energy projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project. The benefits to the local economy will be confined to the construction period (20-24 months). The implementation of the proposed enhancement measures listed below would also enable the establishment of the proposed WEF to support co-operation between the public and private sectors which would support local economic development in the NKLM and NDM.

The local Ward Councillor, Mr van Reenen, indicated that he supported the proposed Komas WEF development, premised on its potential for employment creation and skills training during the construction phase. Interviews with representatives from the Die Houthoop Guest Farm also indicated that they would benefit from the project.

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

Impact pathway: Construction activities		
Nature: Creation of employment and business opportunities during the construction phase		
	Without Mitigation	**With Enhancement**
Extent	Local – Regional (3)	Local – Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	Moderate (44)	Moderate (56)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A

Can impact be enhanced?	Yes
Enhancement: See below	
Cumulative impacts: Opportunity to up-grade and improve skills levels in the area.	
Residual impacts: Improved pool of skills and experience in the local area.	

Assessment of No Go Alternative
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; 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 B-BBEE criteria;
- Before the construction phase commences the proponent should meet with representatives from the NKLM and NDM 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, relevant community representatives and local farmers 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 a training and skills development programmes for local workers should be initiated prior to the initiation of the construction phase; and
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business
- The proponent should liaise with the NKLM and NDM with regards the establishment of a database of local companies, specifically B-BBEE 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 B-BBEE companies to complete and submit the required tender forms and associated information; and
- The NKLM and NDM, 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

Experience has shown that the presence of construction workers can pose a potential risk to family structures and social networks. These risks however tend to be more pronounced in isolated rural areas. 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. The risks are linked to:

- 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; and
- An increase in sexually transmitted diseases (STDs), including HIV.

However, while the risk does exist, the majority of the low skilled (136) and semi-skilled (76) work opportunities associated with the construction phase are likely to benefit members from the local community. If these opportunities are taken up by local residents the potential impact on the local family and social network will be low as these workers come from local community. As indicated in the Overview of the IPPPP (March 2019), in terms of benefits for local communities, significantly more people from local communities were employed during construction than was initially planned. The expectation for local community participation was 13 058 job years. To date 18 253 job years have been realised (i.e. 140% more than initially planned), with 26 projects still in construction. The likelihood of local community members being employed during the construction phase is therefore high. Employing local residents to will also reduce the need to provide accommodation for construction workers in Kleinsee and or Springbok.

Employing members from the local community to fill the low-skilled job categories will reduce the risk and mitigate the potential impact on the local communities. The use of local residents to fill the low skilled job categories will also reduce the need to provide accommodation for construction workers in local towns in the area, such as Komaggas, Buffelsrivier, Kleinsee and Springbok. The non-local skilled workers (38) are likely to be accommodated in local guest facilities in the area, such as Die Houthoop Guest Farm. The presence of an additional 38 or so worker's over a period of 18-24 months is unlikely to have a significant impact on local family networks and structures in the area.

In terms of potential threat to the families of local farm workers in the vicinity of the site, the risk is likely to be low. This is due to the low number of permanent and temporary farm workers on local farms in the area. The potential risk is therefore likely to be limited. The risks can also be effectively mitigated by ensuring that the movement of construction workers on and off the site is carefully controlled and managed. However, given the nature of construction projects it is not possible to totally avoid these potential impacts at an individual or family level.

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, it will not be possible to avoid this. This potential risk should also be viewed within the context of the socio-economic benefits associated with the creation of employment opportunities for locals.

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

Impact pathway: Construction activities		
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	Moderate 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	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		
Cumulative 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.		
Residual impacts: See cumulative impacts.		

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

Recommended mitigation measures
The potential risks associated with construction workers can be effectively mitigated. The detailed mitigation measures should be outlined in the EMPr 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 need for 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 the NKLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers 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 contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;
- Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks; and
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

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. 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 manner in which they conduct themselves can impact on the local community.

Experience from other projects has also shown that the families of job seekers may accompany individual job seekers or follow them at a later date. In many cases the families of the job seekers that become "economically stranded" and the construction workers that decided to stay in the area, subsequently moved to the area. The influx of job seekers to the area and their families can also place pressure on the existing services in the area, specifically low-income housing. In addition to the pressure on local services the influx of construction workers and job seekers can also result in competition for scarce employment opportunities. Further secondary impacts included increase in crime levels, especially property crime, as a result of the increased number of unemployed people. These impacts can result in increased tensions and conflicts between local residents and job seekers from outside the area.

These issues are similar to the concerns associated with the presence of construction workers and are discussed in Section 4.4.2. However, in some instances the potential impact on the community may be greater given that they are unlikely to have accommodation and may decide to stay on in the area. In addition, they will not have a reliable source of income. The risk of crime associated with the influx of job seekers may therefore be greater.

However, the potential for economically motivated in-migration and subsequent labour stranding in the area linked to the proposed project is likely to be low. This is due to the location of the site, the relatively small size of the project (300 MW), the limited employment opportunities (~250) and short duration of the construction phase (20-24 months). There are limited economic opportunities in area, specifically Komaggas, Buffelsrivier, Kleinsee and Springbok. The risks associated with job seekers being attracted to and staying on in the area will therefore be low.

Table 4.3: Assessment of impact of job seekers on local communities associated with the construction phase

Impact pathway: Construction activities		
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 the town)	Permanent (5) (For job seekers that stay on the town)
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	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		
Cumulative 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.		
Residual impacts: See cumulative impacts.		

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

Recommended mitigation measures
It is not possible to prevent job seekers from coming to the area in search of a job. However, as indicated above, due to the location of the site the potential influx of job seekers to the area as a result of the proposed Komas WEF will be low. In addition:

- The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities.

4.3.4 Risk to safety, livestock, farm infrastructure and farming operations

The presence and movement of construction workers on and off the site may pose a potential safety threat to local famer's 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 local farmers in the area interviewed

indicated that the presence of construction workers on the site increased the exposure of their farming operations and livestock to the outside world, which, in turn, increased the potential risk of stock theft and crime. Stock theft is currently not a major issue. This is linked to the isolation and relative inaccessibility of study area. This would however be affected by the improved access roads and presence of outside construction workers.

The local farmers interviewed did, however, indicate that the potential risks (safety, livestock, farm infrastructure and farming operations) can be effectively mitigated by careful planning and managing the movement of construction on the workers on site during the construction phase.

Table 4.4: Assessment of risk to safety, livestock, infrastructure and farming operations

Impact pathway: Construction activities		
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	Moderate (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	
Mitigation: See below		
Cumulative impacts: No**,** provided losses are compensated for.		
Residual impacts: See cumulative impacts.		

Assessment of No-Go Alternative
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 the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
- Contractors appointed by the proponent should provide daily transport for 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 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 EMPr should 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 who are found guilty of trespassing, 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; and
- The housing of construction workers on the site should be limited to security personnel.

4.3.5 Increased fire risk

The presence of construction workers and construction-related activities on the site poses an increased fire risk, which could, in turn, pose a threat grazing and livestock. Due to the climate and sparseness of vegetation, the study area is not considered veld fire prone. However, all the farming operations depend on grazing and any fires would have the potential to have a significant impact on the already stressed farming operations. The potential fire risk of grass fires is highest towards the end of the dry summer months (November-March). This period also coincides with dry, windy conditions in the area.

Table 4.5: Assessment of impact of increased risk of fires

Impact pathway: Construction activities		
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	Moderate (36)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	Yes, compensation paid for stock and crop losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative impacts: No, provided losses are compensated for.		
Residual impacts: See cumulative impacts.		

Assessment of No-Go Alternative
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 losses associated with fires that can be proven to be associated with the construction activities for the WEF 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;
- No smoking should be permitted on site, except in 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 higher-risk dry, windy summer months;
- Contractor to provide adequate fire-fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- No construction staff, with the exception of security staff, to be accommodated on site over night; and
- As per the conditions of the Code of Conduct, in the event of a fire proven to be 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 Impacts associated with construction vehicles

The movement of heavy construction vehicles during the construction phase has the potential to damage local farm roads and create dust and safety impacts for other road users in the area and also impact on farming activities.

At this stage it is unclear which road(s) will be affected by construction traffic. Local roads currently mainly carry local traffic and traffic volumes are low and there are no significant seasonal variations. Some farms, e.g. Rooivlei, Zonnekwa and Graafwater are only accessible via single access roads (viz the one linking the R355 to the Komaggas road). Interviewees indicated that the project would potentially lead to the improvement of local roads, which would remain as a post-construction benefit. The manager of Kleinsee tourism also has indicated that the project also had the potential to improve access roads to Kleinsee (from e.g. Port Nolloth) which would benefit tourism in Kleinsee (de Vries – pers. comm).

In terms of the movement of construction traffic on the site, all the affected landowners indicated that the movement should be strictly limited to the relevant access road(s) and construction site. Off-road vehicle movement poses a significant risk to fragile vegetation, which, once damaged, may take a decade or more to recover. All the farmers interviewed also emphasized the need to keep farm gates closed and adherence to suitable speed limits, as failure to do so would endanger livestock on their properties. One interviewee proposed fencing in portions of road located across site-adjacent land to limit the risk of trespassing (Mostert – pers. comm).

The project components are likely to be transported to the site via the N7, which is an important tourist route between Namibia and the Cape. The transport of components to the site therefore has the potential to impact on other road users travelling along the N7, including tourists. Measures will need to be taken to ensure that the potential impact on motorist using the N7 is minimised. The potential impacts on tourists and locals can be effectively mitigated by restricting construction traffic movements to weekdays, and, where possible, limiting activities during over holiday periods, specifically Christmas and Easter holiday periods and other long weekends. The movement of heavy construction vehicles will also damage internal farm roads and other unsurfaced public roads that may be used to access the site. The damage will need to be repaired after the completion of the construction phase.

Experience from other projects also indicates that the transportation of construction workers to and from the site can result in the generation of waste along the route (packaging and bottles etc. thrown out of windows etc.)

Table 4.6: Assessment of the impacts associated with construction vehicles

Impact pathway: Construction activities		
Nature: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site		
	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	Moderate (30)	Low (15)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative 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 not responsible for the damage. Dust impacts to vineyards could also impact on future contracts.		
Residual impacts: See cumulative impacts		

Assessment of No-Go Alternative
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:

- As far as possible, the transport of components to the site along the N7 should be planned to avoid weekends and holiday periods;
- The contractor should inform local farmers and representatives from the NLM and NDM Tourism of dates and times when abnormal loads will be undertaken;
- The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[26], adhering to speed limits 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;

[26] Treated effluent (non-potable) water should be used for wetting of roads and construction areas

- The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;
- The Contractor should be required to collect waste along access roads on a weekly basis;
- Waste generated during the construction phase should be transported to the local permitted landfill site;
- EMPr measures (and penalties) should be implemented to ensure farm gates are closed at all times; and
- EMPr measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.

4.3.7 Impacts on productive farmland due to construction activities

Activities such as the establishment of access roads, the movement of heavy vehicles, the establishment of lay-down areas and foundations for the wind turbines, as well as the establishment of Substations and power lines will potentially damage topsoil and vegetation. As indicated above, all the affected landowners indicated that the movement should be strictly limited to the relevant access road(s) and construction site. Off-road vehicle movement poses a significant risk to fragile vegetation, which, once damaged, may take a decade or more to recover. The construction footprint should be minimized to mitigate the damage to the natural veld and disturbed areas should be rehabilitated upon completion of the construction phase.

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

Impact pathway: Construction 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 WEF and power lines 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	Moderate (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	
Mitigation: See below		
Cumulative 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.
Residual impacts: See cumulative impacts.

Assessment of No-Go Alternative

There would be no impact as the current status quo is maintained.

Recommended mitigation measures

With mitigation, the potential impacts on farming activities and livelihoods as a result of damage to and loss of farmland are assessed to be of low significance due to the relatively small portions of arable land likely to be affected. Impacts may be further reduced by the implementation of the following mitigation measures:

- The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of the Agriculture and Terrestrial Biodiversity (flora) study. In this regard areas of sensitive vegetation and soils of high agriculture potential should be avoided;
- The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible;
- An ECO should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from the soil scientist and discussed with the local farmer;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed;
- The implementation of the Rehabilitation Programme should be monitored by the ECO;
- All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;
- EMPr measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;
- Disturbance footprints should be reduced to the minimum; and
- Compensation should be paid by the developer to farmers that suffer a permanent loss of land due to the establishment of the WEF. Compensation should be based on accepted land values for the area.

4.4 OPERATIONAL PHASE SOCIAL IMPACTS

The following key socio-economic issues are of relevance to the operational phase:

Potential positive impacts

- Establishment of renewable energy infrastructure;
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Benefits associated with the establishment of a Community Trust; and
- Benefits for affected landowners.

Potential negative impacts

- The visual impacts and associated impact on sense of place;
- Impact on property values and operations; and
- Impact on tourism.

Positive impacts:

4.4.1 Development of renewable energy infrastructure

The establishment of renewable energy infrastructure, such as the proposed WEF, should be viewed, firstly 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.

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. 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 study also identifies a number of advantages associated with wind power as a source of renewable energy with a large 'technical' generation potential. In this regard wind energy does not emit CO_2 in generating electricity and is associated with exceptionally low lifecycle emissions. The construction period for a wind farm is much shorter than that 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 GHG associated with the construction phase are offset within a very short period of time compared with the project's lifespan. Wind energy therefore provides an ideal means for reaching emission reduction targets in a relatively easy manner. In addition, and of specific relevance to South Africa, wind as 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.

The Greenpeace Report (powering the future: Renewable Energy Roll-out in South Africa, 2013), notes that 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 National Climate Change Response White Paper outlines the national response to the impacts of climate change, as well as the domestic contribution to international efforts to mitigate green-house gas emissions. As part of the global commitment, South Africa is targeting an emissions trajectory that peaks at 34% below a "business as usual" case in 2020, 42% below in 2025 and from 2035 declines in absolute terms. The emission reductions between March 2018 and 2019 are estimated to be 10.9 million tonnes of CO_2. This represents 53% of the total projected annual emission reductions achieved with only partial operation to date. Since operation, the IPPs have generated 35 699 GWh, resulting in 36.2

Mton of CO_2 emissions being offset and saving 42.8 million kilolitres of water related to fossil fuel power generation.
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.

Benefits associated with REIPPPP

The overview of the IPPPP (March 2019) indicates that the REIPPPP has attracted R41.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and 2S2). This is more than 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 (R61.0 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 R 29.5 billion and contributes 48% to total equity. As far as B-BBEE is concerned, Black South Africans own, on average, 33% of projects that have reached financial close, which is slightly above the 30% target.

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 R63.1 billion has been spent to date. For construction, of the R55.7 billion already spent to date, R51.1 billion is from the 64 projects which have already been completed. These 64 projects had planned to spend R50.4 billion.

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 report also notes that the strategy has prompted several technology and component manufacturers to establish local manufacturing facilities. The report also notes that this will improve with greater certainty relating to subsequent bid windows and further determinations will continue to build on these successes.

In terms of employment, to date, a total of 40 134 job years[27] have been created for South African citizens, of which 33 019 were in construction and 7 115 in operations. Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 79%, 41% and 49% of total job opportunities created by IPPs to date. 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. 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 19% shareholding by black people in engineering, procurement and construction (EPC) contractors has been attained for the 64 projects in operation (BW1, BW2 and BW3). This is slightly below the 20% target.

The SED contributions associated with the 64 operational IPPs have to date amounted to R 860.1 million. The majority of the spend has been on education and skills development (40.9%), followed by enterprise development (24.2%),

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

social welfare (21.3%), general administration (9%) and health care (4.5%). In terms of education, the IPPs have supported 1 044 education institutions, with a total spend of R 236.7 million between 2015 and March 2018. It is estimated that these contributions have benefitted in the region of 375 737 learners.

The SED of wind 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, wind as 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.

The WWF (2014) study also notes that the REIPPPP requirement of 30% allocated to the local economic development has ensured that non-price criteria linked to socio-economic upliftment have a much heavier weighting than they would normally enjoy under Government's preferential procurement policy (WWF, 2014). The establishment of renewable energy facilities, such as the proposed WEF, therefore not only address the environmental issues associated with climate change and consumption of scarce water resources, but also creates significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

Table 4.8: Implementation of clean, renewable energy infrastructure

Impact pathway: Operational		
Nature: Development of infrastructure to generate clean, renewable energy		
	Without Mitigation	**With Mitigation**
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		
Cumulative 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.		
Residual impacts: See cumulative impacts		

Assessment of No-Go Alternative

The No-Go Development alternative would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. This would represent a negative opportunity cost.

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

- Implement a skills development and training program aimed at maximizing the number of employment opportunities for local community members;
- Maximise opportunities for local content, procurement and community shareholding; and
- Consider establishing a visitor centre. As indicated in the literature review, visitor centers in Scotland have attracted large numbers of visitors to wind farms.

4.4.2 Creation of employment and business opportunities and support for local economic development

Based on information from other wind projects the establishment of a 300 MW WEF would create ~ 20 employment opportunities over a 20-year period. Of this total ~70 % will be low and semi-skilled and 30% skilled. The annual wage bill for the operational phase would be ~ R 3 million. The majority of employment opportunities associated with the operational phase is likely to benefit HD members from the local community. It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting employment and skills development contained in the NKLM and NDM. The operational phase will also require regular maintenance which will also create employment opportunities.

A percentage of the monthly wage bill earned by permanent staff will be spent in the regional and local economy. This will benefit local businesses in the relevant towns. The benefits to the local economy will extend over the anticipated 20-year operational lifespan of the project.

The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

Procurement during the operational phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (March 2019) notes that the operational phase procurement spend over the 20 year for BW1 to BW4, 1S2 and 2S2 will be in the region of R 73.1 billion. The combined (construction and operations) procurement value is projected as R149.9 billion of which R63.1 billion has been spent to date. For construction, of the R55.7 billion already spent to date, R51.1 billion is from the 64 projects which have already been completed. These 64 projects had planned to spend R50.4 billion. The actual procurement construction costs have therefore exceeded the planned costs by 1% for completed projects.

The Green Jobs study (2011) 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. The study notes that largest gains are likely to be associated with O&M activities. In this regard, operations and

maintenance employment linked to renewable energy generation plants will also be substantial in the longer term.

The establishment of WEFs, such as the proposed Komas WEF, also supports the development of a green energy manufacturing sector in South Africa. The Green Jobs study (2011) found that South Africa is in a position to leverage upon some of its existing manufacturing capacities in order to produce components and parts for various sections of wind turbines. The study does however note that critical mass would have to be developed in order to obtain economies of scale. The establishment of WEFs, such as the proposed WEF, would therefore contribute to achieving this critical mass.

Table 4.9: Impact assessment of employment and business creation opportunities

Impact pathway: Operational		
Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Definite (5)
Significance	Low (27)	Moderate (50)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

Assessment of No-Go Alternative
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. In addition:

- The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;

- The proponent, in consultation with the NKLM and NDM, should investigate the options for the establishment of a Community Development Trust (see below).

4.4.3 Benefits associated with the establishment of a Community Trust

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 are linked to Community Trusts and 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.

Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20-year 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 plant 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; and
- Support for SMME's.

Socio-economic development (SED) contributions
Socio-economic development (SED) contributions 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. 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 SED contributions associated with the 64 IPPs has to date amounted to R 860.1 million. The majority of the spend has been on education and skills development (40.9%), followed by enterprise development (24.2%), social welfare (21.3%), general administration (9%) and health care (4.5%). In terms of education, the IPPs have supported 1 044 education institutions, with a total spend of R 236.7 million between 2015 and March 2018. It is estimated that these contributions have benefitted in the region of 375 737 learners.

The province with the highest SED contribution has been the Northern Cape Province, followed by the Eastern Cape and Western Cape.

Enterprise development contributions
The target for IPPs to spend on enterprise development is 0.6% of revenues over the 20- year project operational life. Enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R7.2 billion. 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 March 2019 a total of R 254.3 million had already been made to the local communities located in the vicinity of the 64 operating IPPs.

The Green Jobs study (2011), found that the case for wind power is enhanced by the positive effect on rural or regional development. Wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. The findings of the thesis by Tait (2012) also note that the distributed nature of renewable energy generation can induce a more geographically dispersed pattern of development. As a result, renewable energy sites can be highly suited to rural locations with otherwise poor potential to attract local inward investment thus able to target particularly vulnerable areas. In her conclusion Tait notes that thesis found positive evidence for the establishment of community benefit schemes in the wind sector in South Africa. The BBBEE requirements for developers as set out in the DoE's IPPPP for renewables was 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. Based on the findings of the review it is clear that the establishment of Community Trusts associated with renewable energy projects create significant benefits for local rural communities. In addition to the benefits for local communities, the establishment of a WF has a limited impact on the current agricultural land uses that underpin the local economic activities in the area and consumes negligible volumes of water during the operational phase. Based on the findings of the review it is clear that the establishment of Community Trusts associated with renewable energy projects have the potential to 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 4.10: Assessment of benefits associated with establishment of Community Trust

Impact pathway: Operational activities		
Nature: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development		
	Without Mitigation	**With Enhancement[28]**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Moderate (30)	High (65)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	
Enhancement: See below		

[28] Enhancement assumes effective management of the community trust

Cumulative impacts: Promotion of social and economic development and improvement in the overall well-being of the community
Residual impacts: See cumulative impacts

Assessment of No-Go Alternative
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.

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

- The NKLM and NDM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the NKLM and NDM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager;
- 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 funds generated for the Community Trust from the WEF.

4.4.4 Generate income for affected landowners

The proponent has entered into rental agreements with the affected landowners for the use of the land for the establishment of the proposed Komas WEF. In terms of the rental agreement the affected landowner(s) will be paid an annual amount dependent upon the number of wind turbines located on the property. Based on the findings of the Socio-Economic Assessment the area is prone to droughts and farming operations can be challenging. Any additional source of income therefore represents a significant benefit for the affected landowner(s). The additional income reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. The additional income from the WEF would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy.

Table 4.11: Assessment of benefits associated with income generated for affected farmer(s)

Impact pathway: Operational activities		
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 Mitigation	**With Enhancement[29]**
Extent	Local (1)	Local (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)

[29] Enhancement assumes effective management of the community trust.

Likelihood	Probable (3)	Definite (5)
Significance	Low (27)	Moderate (53)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: Support for local agricultural sector and farming		
Residual impacts: See cumulative impacts		

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

Recommended enhancement measures
Implement agreements with affected landowners.

Negative impacts:

4.4.5 Impact on sense of place and rural character of the landscape

The potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The is also located within the Springbok REDZ 8. The area has therefore been identified as suitable for the establishment of renewable energy facilities, including WEFs. In addition, the local farmers, tourism officials and the Komaggas ward councillor indicated that the Kleinsee-Komaggas-Koingnaas area is well suited to the establishment of WEFs. This is linked to the sparse settlement pattern, low productive grazing value of the land, the relative absence of sensitive social and tourism receptors, and the fact that the WEFs would be able to provide economic opportunities for the local communities impacted by the closure of mining activities in the area. Due to the low water requirements WEFs were also regarded as sustainable in an arid area that is vulnerable to severe droughts. As such it is generally perceived as a potential stable source of income to buffer local farmers against droughts, and thus increase the viability and resilience of local farming. Based on the findings of the Socio-Economic Assessment the significance is rated as **Low Negative**.

The VIA undertaken by SiVEST (2020) rate the impact as **Moderate Negative.**

Table 4.12: Assessment of visual impact on sense of place

Impact pathway: Operational activities		
Nature: Visual impact associated with the proposed solar facility 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	Minor (2)	Minor (2)
Probability	Probable (4)	Highly Probable (4)
Significance	Moderate (32)	Low (28)
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
- The recommendations contained in the VIA should be implemented;
- Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.

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 Socio-Economic Assessment to identify what appear 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. This was confirmed by the feedback from the local landowners interviewed, none of whom raised concerns about the potential impact on property values.

Table 4.13: Assessment of potential impact on property values and operations

Impact pathway: Operational activities		
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	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (24)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impact be enhanced?	Yes
Enhancement: See below	
Cumulative impacts: The proposed WEF is one of a number of WEFs proposed in the area. However, site is located in the Springbok REDZ and has therefore been identified as suitable for WEFs.	
Residual impacts: See cumulative impacts	

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

Recommended mitigation measures
- The recommendations contained in the VIA should be implemented;
- Recommended that the applicants meet with the affected landowners to discuss the possibility relocating wind turbines that have the highest potential visual impact.

4.4.7 Potential impact on tourism

A review of international literature in the impact of wind farms was undertaken as part of the Socio-Economic Assessment (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 NKLM and NDM at a local and regional level. The findings also indicate that wind farms do not impact on tourist routes. The manager of Kleinsee tourism also indicated that potential for improving the access roads to Kleinsee (from e.g. Port Nolloth) associated with the proposed WEF had the potential to significantly benefit Kleinsee tourism (de Vries – pers. comm).

Table 4.14: Impact on tourism in the region

Impact pathway: Construction activities		
Nature: Potential impact of the WEF on local tourism		
	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24) (Applies to both – and +)	Low (24) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: The proposed WEF is one of a number of WEFs proposed in the area. However, site is located in the Springbok REDZ and has therefore been identified as suitable for WEFs.		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
- The recommendations contained in the VIA should be implemented.

4.5 ASSESSMENT OF DECOMMISSIONING PHASE

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 25 years post commissioning[30]. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning. The number of people employed during the operational phase of a single 300 MW WEF will be in the region of 20. Given the relatively low number of people employed during the operational phase the decommissioning of the facility is unlikely to have a significant negative social impact on the local community. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. The decommissioning phase will also create employment opportunities. This will represent a positive impact. These jobs will, however, be temporary.

Table 4.15: Impacts associated with decommissioning

Impact pathway: Decommissioning activities		
Nature: Social impacts associated with retrenchment including loss of jobs, and source of income		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (1)
Duration	Medium Term (2)	Very Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (40)	Low (24)
Status	Negative	Negative
Reversibility	Yes, assumes retrenchment packages are paid to all affected employees	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative impacts: Loss of jobs and associated loss of income etc. can impact on the local economy and other businesses. However, decommissioning can also create short term, temporary employment opportunities associated with dismantling etc.		
Residual impacts: See cumulative impacts		

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

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

Recommended mitigation measures
The following mitigation measures are recommended:

- The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned;
- All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning; and
- The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

4.6 CUMULATIVE IMPACT ON SENSE OF PLACE

The Australian Wind Farm Development Guidelines (Draft, July 2010) indicate that the cumulative impact of multiple wind farm facilities is likely to become an increasingly important issue for wind farm developments in Australia. The key concerns in terms of cumulative impacts are linked to visual impacts and the impact on rural, undeveloped landscapes.

The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. The relevant issues raised by the Scottish Natural Heritage Report 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; and
- Perceived or actual change in land use across a character type or region; and
- 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 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). Research on wind farms undertaken by Warren and Birnie (2009) also highlights the visual and cumulative impacts on landscape character. The paper notes that given that aesthetic perceptions are a key determinant of people's attitudes, and that these perceptions are subjective, deeply felt and diametrically contrasting, it is not hard to understand why the arguments become so heated. Because landscapes are often an important part of people's sense of

place, identity and heritage, perceived threats to familiar vistas have been fiercely resisted for centuries. The paper also identifies two factors that important in shaping people's perceptions of wind farms' landscape impacts. The first of these is the cumulative impact of increasing numbers of wind farms (Campbell, 2008). The research found that if people regard a region as having 'enough' wind farms already, then they may oppose new proposals. The second factor is the cultural context. This relates to people's perception and relationship with the landscape. In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape.

Several REFs are currently being proposed within 50 km from the proposed Komas WEF. These projects were considered in assessing the potential cumulative impacts. There are currently nine approved WEFs and one approved solar Photovoltaic (PV) facility. In addition to these, the applications for two solar PV facilities are currently in process. The proposed Gromis WEF comprises a separate BA process and is currently being undertaken in parallel to this BA process. The projects are listed in Table 3.4 and Figure 3.5.

The potential for combined and sequential visibility is therefore high.

However, as indicated above, potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The is also located within the Springbok REDZ 8. The area has therefore been identified as suitable for the establishment of REFs, including WEFs. The potential cumulative impact on the areas character and sense of place is therefore regarded as **Low Negative**.

The findings of the VIA (SiVEST, 2020) rate the cumulative impact on the areas sense of place as **Moderate Negative**. The VIA notes however that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

Table 4.16: Cumulative impacts on sense of place and the landscape

Impact pathway: Operational activities		
Nature: Visual impacts associated with the establishment of more than one WEF and the potential impact on the area's rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Moderate (30)	Low (24)
Status	Negative	Negative
Reversibility	Yes. Wind energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Impact on other activities whose existence is linked to rural sense of place and character of the area, such as tourism. However, site is located in the Springbok REDZ and has therefore been identified as suitable for WEFs.		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
The recommendations contained in the VIA should be implemented.

4.7 CUMULATIVE IMPACT ON LOCAL SERVICES AND ACCOMMODATION

The establishment of the proposed 300 MW WEF and the other REFs in the NKLM and NDM may place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of renewable energy projects proposed in the area, including the proposed WEF. The potential impact on local services can be mitigated by employing local community members. The presence of non-local workers during both the construction and operation phase may also place pressure on property prices and rentals. As a result, local residents, such as government officials, municipal workers, school teachers, and the police, may no longer be able to buy or afford to rent accommodation in the local towns. The inflationary impact on rentals has been confirmed from experience with other renewable energy projects in South Africa.

However, as indicated below, the potential impacts should also be viewed within the context of the potential positive cumulative impacts for the local economy

associated with the establishment of renewable energy as an economic driver in the area. These benefits will create opportunities for investment in the NKLM, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy will create an opportunity for economic development in the area. The Community Trusts associated with each project will also generate revenue that can be used by the NKLM and NDM 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 NKLM and NDM.

Table 4.17: Cumulative impacts on local services

Impact pathway: Construction activities		
Nature: The establishment of a number of renewable energy facilities in the NKLM will place pressure on local services, specifically medical, education and accommodation		
	Without Mitigation	**With Mitigation**[31]
Extent	Local and regional (3)	Local and regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (52)	Low (28)
Status	Negative	Negative
Reversibility	Yes. Wind energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Negative impact on the local services		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
The Northern Cape Provincial Government, in consultation with the NKLM and NDM and the proponents involved in the development renewable energy projects in the area should consider establishing a Development Forum to co-ordinate and manage the development and operation of REFs in the area, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would

[31] The mitigation measures are linked to initiatives undertaken by Provincial and Local Government to address the additional demand for services and accommodation etc. created by the establishment of development renewable energy projects in the Upington Solar REDZ.

include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the NKLM and NDM.

4.8 CUMULATIVE IMPACT ON LOCAL ECONOMY

In addition to the potential negative impacts, the establishment of the proposed 300 MW WEF and other REFs in the area has the potential to result in significant positive cumulative socio-economic opportunities for the region, which, in turn, will result in a positive social benefit. As indicated above, there are a number of renewable energy projects proposed in the study area. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits.

As indicated above the review of the REIPPPP (March 2019) indicates that R 860.1 million has been generated by socio-economic development contribution associated with the current 64 operational IPPs. This has been spent on education and skills development (40.9%), followed by enterprise development (24.2%), social welfare (21.3%), general administration (9%) and health care (4.5%). In terms of education, the IPPs have supported 1 044 education institutions, with a total spend of R 236.7 million between 2015 and March 2018. It is estimated that these contributions have benefitted in the region of 375 737 learners.

In addition, enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R7.2 billion. 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 March 2019 a total of R 254.3 million had already been made to the local communities located in the vicinity of the 64 operating IPPs.

The potential cumulative benefits for the local and regional economy are therefore significant and are associated with both the construction and operational phase of renewable energy projects and extend over a period of 20-25 years.

Table 4.18: Cumulative impacts on local economy

Impact pathway: Construction activities		
Nature: The establishment of a number of wind energy facilities in the NKLM will create employment, skills development and training opportunities, creation of downstream business opportunities.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (3)	Local and regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	Moderate (44)	High (70)
Status	Positive	Positive
Reversibility	Yes. Wind energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Positive impact on the local and regional economy through the creation of downstream opportunities and wage spend in the local economy		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
The proposed establishment of suitably sited renewable energy facilities within the NKLM and NDM should be supported.

4.9 ASSESSMENT OF NO-GO DEVELOPMENT ALTERNATIVE

As indicated above, South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The No-Go Development Alternative would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a significant negative social cost.

However, at a provincial and national level, it should be noted that the proposed WEF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Northern Cape and other parts of South Africa. Foregoing the proposed establishment of WEFs would

therefore not necessarily compromise the development of renewable energy facilities in the Northern Cape Province and or South Africa. However, the socio-economic benefits for local communities in the NKLM would be forfeited. Given the decline in the role played by mining and the limited economic opportunities in the NKLM, the No-Go Development Alternative would represent a significant lost opportunity for the area and is not supported by the findings of the Socio-Economic Assessment.

Table 4.19: Assessment of No-Go Development Alternative

Nature: The No-Go Development Alternative would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy		
	Without Mitigation	**With Mitigation**[32]
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (56)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	N/A	N/A
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Recommended enhancement measures

The proposed establishment of suitably sited renewable energy facilities within the NKLM and NDM should be supported.

[32] Assumes establishment of a Community Trust

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;
- Semi-structured interviews with interested and affected parties;
- A review of social and economic issues associated with similar developments;
- A review of selected specialist studies undertaken as part of the EIA;
- A review of relevant literature on social and economic impacts; and
- The experience of the authors with other wind energy projects in South Africa

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; and
- No-Go Development Alternative.

5.2.1 Policy and planning issues

The findings of the review indicate that renewable energy is strongly supported at a national, provincial and local level. At a national and provincial level, the development of and investment in renewable energy is supported by the NDP, New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. The proposed WEF also supports a number of objectives contained in the NCP PGDS. At a district and local level, the NDM IDP, NDM Climate Change Response Plan, NKLM IDP and NKLM SDF all support the establishment of renewable facilities. The proposed Komas WEF is also located within the Springbok REDZ 8, which was formally gazetted in 2018[33]. The area has therefore been identified as suitable for the establishment of REFs, including WEFs.

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.

[33] GN114 of 2018

The construction phase for a single 300 MW WEF is expected to extend over a period of 20-24 months and create approximately ~ 200-250 employment opportunities. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers, 30% (76) to semi-skilled workers and 15% (38) for skilled personnel. The majority of low and semi-skilled employment opportunities will be available to Historically Disadvantaged (HD) members from the NKLM community. Due to the demise of the mining sector, the levels of unemployment in the NKLM are high. The towns that are likely to benefit are Komaggas, Buffelsrivier, Kleinsee, and Springbok. This would represent a significant positive social benefit in an area with limited employment opportunities. In order to maximise the potential benefits the developer should commit to employing local community members to fill the low and medium skilled jobs.

The potential benefits for local communities are confirmed by the findings of the Overview of the IPPPP undertaken by the Department of Energy, National Treasury and DBSA (March 2019). The review found that by the end of March 2019 the 64 renewable energy projects that had been successfully completed had created 31 633 job years[34] of employment, compared to the anticipated 20 689. This was 53% more than planned.
The study also found that significantly more people from local communities were employed during construction than was initially planned.

The capital expenditure associated with the construction phase for a 300 MW WEF will be in the region of R 2.5 billion (2020 Rand value). The total wage bill will be in the region of R69 million (2020 Rand value). A percentage of the wage bill will be spent in the local economy which will create opportunities for local businesses in the town in the area, such as Komaggas, Buffelsrivier, Kleinsee, and Springbok. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The benefits to the local economy will be confined to the construction period (20-24 months).

Potential negative impacts

- Impacts associated with the presence of construction workers on site and in the area;
- Influx of job seekers to the area;
- Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site;
- Increased risk of grass fires; and
- Impact of heavy vehicles, including damage to roads, safety and dust; and
- Impact on farming activities.

The findings of the Socio-Economic Assessment indicate that the significance of all the potential negative impacts with mitigation were **Low Negative**. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. Given that the majority of the low and semi-skilled construction workers can be sourced from the local area the potential risk posed by construction workers on local family structures and social networks is regarded as low for the community as a whole. Table 5.1

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

summarises the significance of the impacts associated with the construction phase.

Table 5.1: Summary of impacts associated with construction phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Creation of employment and business opportunities	Moderate (+)	Moderate (+)
Presence of construction workers and potential impacts on family structures and social networks	Moderate (-)	Low (-)
Influx of job seekers	Low (-)	Low (-)
Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site	Moderate (-)	Low (-)
Increased fire risk	Moderate (-)	Low (-)
Impact of heavy vehicles and construction activities	Moderate (-)	Low (-)
Impact on farming activities	Moderate (-)	Low (-)

5.2.3 Operational phase

The key social issues affecting the operational phase include:

Potential positive impacts
- The establishment of renewable energy infrastructure;
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Benefits associated with the establishment of a Community Trust; and
- Benefits for affected landowners.

Development of renewable energy infrastructure
The establishment of renewable energy infrastructure, such as the proposed WEF, should be viewed, firstly 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.

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 Greenpeace Report (Powering the future: Renewable Energy Roll-out in South Africa, 2013), notes that 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.

The Green Jobs study (2011) identifies a number of advantages associated with wind power as a source of renewable energy, including zero CO_2 emissions during generation and low lifecycle emissions. GHG associated with the construction phase are offset within a very short period of time compared with the project's lifespan. Wind 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, wind as 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.

The National Climate Change Response White Paper outlines the national response to the impacts of climate change, as well as the domestic contribution to international efforts to mitigate green-house gas emissions. As part of the global commitment, South Africa is targeting an emissions trajectory that peaks at 34% below a "business as usual" case in 2020, 42% below in 2025 and from 2035 declines in absolute terms. The emission reductions between March 2018 and 2019 are estimated to be 10.9 million tonnes of CO^2. This represents 53% of the total projected annual emission reductions achieved with only partial operation to date. Since operation, the IPPs have generated 35 699 GWh, resulting in 36.2 Mton of CO^2 emissions being offset and saving 42.8 million kilolitres of water related to fossil fuel power generation.

The REIPPPP had therefore contributed significantly towards meeting South Africa's GHG emission targets and, at the same time, supporting energy security, economic stability and environmental sustainability.

The establishment of renewable energy facilities, such as the proposed WEF, therefore not only address the environmental issues associated with climate change and consumption of scarce water resources, but also creates significant socio-economic opportunities and benefits, specifically for historically disadvantaged, rural communities.

Creation of employment and business opportunities

The total number of permanent employment opportunities associated with a 300 MW WEF would be ~ 20. Of this total ~ 12 are low skilled workers, 6 semi-skilled and 2 skilled. The annual wage bill for the operational phase will be ~ R 3 million (2020 Rand value). The majority of low and semi-skilled beneficiaries are likely to be HD members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in the local towns in the area, such as Komaggas, Buffelsrivier, Kleinsee, and Springbok.

Procurement during the operational phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (March 2019) notes that the operational phase procurement spend over the 20 year for BW1 to BW4, 1S2 and 2S2 will be in the region of R 73.1 billion. The Green Jobs study (2011) 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. The study notes that largest gains are likely to be associated with O&M activities. In this regard, O&M employment linked to renewable energy generation plants will also be substantial in the longer term.

Community Trust

The establishment of a community benefit structure (typically, a Community Trust) also creates an opportunity to support local economic development in the area. The requirement for the project to allocate funds to socio-economic contributions (through structures such as Community Trusts) provides an opportunity to advance local community projects, which is guaranteed for a 20-year period (project lifespan). The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including but not limited to:

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

The 2019 IPPP Overview notes that the SED contributions associated with the 64 IPPs has to date has amounted to R 860.1 million. The province with the highest SED contribution has been the Northern Cape Province, followed by the Eastern Cape and Western Cape.

Enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R7.2 billion. 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 March 2019 a total of R 254.3 million had already been made to the local communities located in the vicinity of the 64 operating IPPs.

The Green Jobs study (2011), found that the case for wind power is enhanced by the positive effect on rural or regional development. Wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. In this regard the towns of Komaggas, Buffelsrivier, Kleinsee, and Springbok are small rural towns.

The long-term duration of the contributions from the WEF also enables local municipalities and communities to undertake long term planning for the area. Experience has, however, shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust or other community benefit structure (entity). The REIPPP programme does however have stringent audit requirements in place to try and prevent the mismanagement of trusts.

Benefits to landowners

The income from the WEFs reduces the risks to the livelihoods of the affected landowners posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. The additional income from the WEF would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy.

Potential negative impacts

- The visual impacts and associated impact on sense of place;
- Impact on property values; and
- Potential impact on tourism.

Visual impacts and impact on sense of place

The potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The site is also located within the Springbok REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities, including WEFs. Based on the findings of the Socio-Economic Assessment the significance was rated as **Low Negative**.

The VIA undertaken by SiVEST (2020) rate the impact as **Moderate Negative.**

Table 5.2 summarises the significance of the impacts associated with the operational phase.

Table 5.2: Summary of impacts associated with operational phase

Impact	Significance No Mitigation/ Enhancement	Significance With Mitigation/ Enhancement
Promotion of renewable energy projects	High (+)	High (+)
Creation of employment and business opportunities	Moderate (+)	Moderate (+)
Establishment of Community Trust	Moderate (+)	High (+)
Benefits for local affected landowners	Low (+)	Moderate (+)
Visual impact and impact on sense of place[35]	Moderate (-) Low (-)	Moderate (-) Low (-)
Impact on property values	Low (-)	Low (-)
Impact on tourism	Low (-)	Low (-)

5.2.4 Assessment of cumulative impacts

Cumulative impact on sense of place

There are currently nine approved WEFs and one approved solar Photovoltaic (PV) facility. In addition to these, the applications for two solar PV facilities are currently in process. The proposed Gromis WEF comprises a separate BA process and is currently being undertaken in parallel to this BA process. The projects are listed in Table 3.4 and Figure 3.5. The potential for combined and sequential visibility is therefore high.

Based on the findings of the Socio-Economic Assessment the potential visual impact on the areas sense of place and rural character was not raised as a concern by local landowners and tourism representatives interviewed. The site is also located within the Springbok REDZ. The area has therefore been identified as suitable for the establishment of REFs including WEFs. The potential cumulative impact on the areas character and sense of place is therefore regarded as **Low Negative**.

The findings of the VIA rate the cumulative impact on the areas sense of place as **Moderate Negative**. The VIA notes however that that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

However, the potential impact of WEFs on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications and the potential implications for other land uses, specifically game farming and associated tourist activities.

Cumulative impact on services

The establishment of the proposed WEF and the other REFs in the NKLM and NDM may place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the potential influx of

[35] Ratings reflect findings of VIA (Medium) and findings of stakeholders interviewed (Low Negative).

workers to the area associated with the construction and operational phases of renewable energy projects proposed in the area, including the proposed WEF. The potential impact on local services can be mitigated by employing local community members. With effective mitigation the impact is rated as **Low Negative.**

In addition, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of renewable energy as an economic driver in the area.

Cumulative impact on local economies
In addition to the potential negative impacts, the establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the NKLM and MDM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits. These benefits should also be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector in recent years. This benefit is rated as **High Positive** with enhancement.

5.2.5 Assessment of No-Go Development alternative

The No-Go Development alternative would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. The No-Go Development alternative also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed Komas WEF and the benefits associated with the establishment of a Community Trust. This also represents a negative social cost.

However, at a provincial and national level, it should be noted that the proposed Komas WEF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Northern Cape and other parts of South Africa. Foregoing the proposed establishment of WEFs would therefore not necessarily compromise the development of REFs in the Northern Cape Province and or South Africa. However, the socio-economic benefits for local communities in the NKLM would be forfeited. Given the decline in the role played by mining and the limited economic opportunities in the NKLM, the No-Go Development Alternative would represent a significant lost opportunity for the area and is not supported by the findings of the Socio-Economic Assessment. The No-Go Development alternative is rated as **High Negative**.

5.2.6 Comparative assessment of alternatives

Two on-site Substation assessment site Alternatives (i.e. Option 1 and Option 2) have been identified for assessment as part of the BA process. Substation Option 1 and Option 2 have been assessed and both are found to be acceptable from a socio-economic perspective and may proceed as none are fatally flawed.

5.2.7 Decommissioning phase

In the case of decommissioning ~ 20 permanent jobs associated with the operational phase would be lost. The potential impacts associated with the

decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be **Low Negative.** The proponent should also investigate the option of establishing an Environmental Rehabilitation Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20-25 year operational life of the facility[36]. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF components and associated infrastructure as scrap metal should be allocated to the rehabilitation of the site.

5.3 CONCLUSIONS AND RECOMMENDATIONS

Conclusions
The findings of the Socio-Economic Assessment indicate that the development of the proposed Komas WEF and associated infrastructure will create employment and business opportunities for locals during both the construction and operational phase of the project. The establishment of a Community Trust will also benefit the local community. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the Socio-Economic Assessment also indicate that the REIPPPP has resulted in significant socio-economic benefits, both at a national, a local and community level. These benefits are linked to FDI, local employment and procurement and investment in local community initiatives.

The establishment of Community Trusts associated with renewable energy projects also have the potential to create significant benefits for local rural communities. These benefits should be viewed within the context of the limited economic opportunities in the area and the impact of the decline in the mining sector on the local economy. The proposed Komas WEF site is also located within a REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities.

Recommendation
The establishment of the proposed Komas WEF is strongly supported by the findings of the Socio-Economic Assessment.

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

ANNEXURE A: CURRICULUM VITAE

Tony Barbour
ENVIRONMENTAL CONSULTING AND RESEARCH

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(Tel) 27-21-761 2355 - (Fax) 27-21-761 2355 - (Cell) 082 600 8266
(E-Mail) tbarbour@telkomsa.net

Tony Barbour's experience as an environmental consultant 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 200 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, Mozambique, Mauritius, Kenya, Ethiopia, Oman, South Sudan and Sudan.

ANNEXURE B: SPECIALIST DECLARATION

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Basic Assessment for the proposed Komas Wind Energy Facility and associated infrastructure near Kleinsee in the Northern Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Tony Barbour Environmental Consulting			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Tony Barbour			
Specialist Qualifications:	BEcon (Honours) MSc Environmental Science			
Professional affiliation/registration:	IAIA			
Physical address:	10 Firs Avenue, Claremont, Cape Town			
Postal address:	10 Firs Avenue, Claremont, Cape Town			
Postal code:	7708	Cell:	082 600 8266	
Telephone:	021-797 1361	Fax:	021-797 1361	
E-mail:	tony@tonybarbour.co.za			

2. DECLARATION BY THE SPECIALIST

I, Anthony (Tony) Barbour, declare that

- 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

Name of Company:

5 October 2020

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, ANTHONY HARLEY BARBOUR swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

TONY BARBOUR CONSULTING
Name of Company

5 OCTOBER 2020
Date

Signature of the Commissioner of Oaths

2020-10-05
Date

SUID-AFRIKAANSE POLISIEDIENS
CSC
2020 -10- 05
COMMUNITY SERVICE CENTRE
CLAREMONT K.P. / C.P.
SOUTH AFRICAN POLICE SERVICE

Details of Specialist, Declaration and Undertaking Under Oath

ANNEXURE C: INTERVIEWS

- De Vries, Mr Herman (2020-03-05). Manager Kleinzee Tourism.
- Diergaard, Ms Laura (2020-03-05). Nama Khoi Local Municipality Kommagas Service Centre.
- Heyn, Ms Pearl (2020-03-04). CEO Namakwa District Tourism Springbok Office.
- Engelbrecht, Ms Meisie (2020-02-27 – telephonic). Rooivlei Farm.
- Engelbrecht, Mr Willem (2020-03-05). Zonnekwa Farm.
- Kotze, Mr Deon (2020-03-05). Graafwater Farm.
- Landry, Ms Maureen (2020-03-05). Nama Khoi Local Municipality Kommagas Service Centre.
- Mostert, Mr Johan (2020-03-05). Rooivlei and Hondevlei Farms.
- Roux, Mr Bertus (2020-03-06). Kapvlei Farm.
- Van Dyk, Ms Annebie (2020-03-05). Zonnekwa A Farm.
- Van Dyk, Veronica (2020-02-28 – telephonic). Steenvlei; Die Houthoop Guest Farm.
- Van Reenen, Cllr Paulus (2020-03-05). Nama Khoi Local Municipality Ward 8 Councilor.

REFERENCES

- Nama Khoi Local Municipality (2019). Nama Khoi Local Municipality Integrated Development Framework 2019/2020 Revision.
- Nama Khoi Local Municipality (2017). Nama Khoi Local Municipality Disaster Management Plan 2017-2022.
- Nama Khoi Local Municipality (2014). Nama Khoi Local Municipality Spatial Development Framework.
- Namakwa District Municipality (2019). Namakwa District Municipality Integrated Development Framework 2019/2020 Revision.
- Namakwa District Municipality (2017). Namakwa District Climate Change Response Plan 2017-2022.
- Namakwa District Municipality (2017). Namakwa District Tourism Sector Plan 2017-2022.
- Northern Cape Department of Economic Development and Tourism (2017). Northern Cape Province Green Document 2017/2018.
- Urban-Econ Development Economists (2018). Socio-economic Impact Assessment proposed Zonnequa Wind Energy Facility grid connection infrastructure. Prepared for Savannah Environmental.

LITERATURE REVIEW

- Aitken, M., McDonald, S. & Strachan, P. (2008) 'Locating 'power' in wind power planning processes: the (not so) influential role of local objectors', *Journal of Environmental Planning and Management* 51(6), pp. 777–799;
- Atchison, (April, 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh
- Australian Environment Protection and Heritage Council (EPHC), *National Wind Farm Development Guidelines* DRAFT - July 2010;
- Australian Health and Medical Research Council. *Literature review of health impacts of wind farms* (July 2010).
- Braunholtz, S. (2003) Public Attitudes to Windfarms: A Survey of Local Residents in Scotland (Edinburgh:MORI Scotland for Scottish Executive Social Research);

- Campbell, L. (2008) Onshore windfarms landscape visual and cumulative impacts – the SNH approach, in: C. A. Galbraith & J. M. Baxter (Eds) Energy and the Natural Heritage, pp. 195–203 (Edinburgh: TSO Scotland).
- Gibbons, S. (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;
- Gipe, P. (1995) Wind Energy Comes of Age (New York: John Wiley).
- Krohn, S. & Damborg, S. (1999) On public attitudes towards wind power, Renewable Energy, 16(1–4), pp. 954–960.
- Meyer, N. I. (2007) Learning from wind energy policy in the EU: lessons from Denmark, Sweden and Spain, European Environment, 17(5), pp. 347–362.
- National Infrastructure Plan (2012);
- New Growth Path Framework (2010);
- NFO System Three (2002) Investigation into the Potential Impact of Windfarms on Tourism in Scotland (Edinburgh: VisitScotland);
- Nielsen, F. B. (2002) A formula for success in Denmark, in: M. J. Pasqualetti, P. Gipe & R. W. Righter (Eds) Wind Power in View: Energy Landscapes in a Crowded World, pp. 115–132 (San Diego, CA: Academic Press).
- Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government
- Green Jobs Study (2011), IDC, DBSA Ltd and TIPS;
- Heintzelman, MD and Tuttle CM, (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;
- 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.
- Independent Power Producers Procurement Programme (IPPPP): An Overview (30 September 2016), Department of Energy, National Treasury and DBSA;
- 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;*
- Market Intelligence Report: Renewable Energy (2014). Mike Mulcahy, Greencape.
- Meyer, N. I. (2007) Learning from wind energy policy in the EU: lessons from Denmark, Sweden and Spain, European Environment, 17(5), pp. 347–362.
- National Infrastructure Plan (2012);
- New Growth Path Framework (2010);
- NFO System Three (2002) Investigation into the Potential Impact of Windfarms on Tourism in Scotland (Edinburgh: VisitScotland);
- Nielsen, F. B. (2002) A formula for success in Denmark, in: M. J. Pasqualetti, P. Gipe & R. W. Righter (Eds) Wind Power in View: Energy Landscapes in a Crowded World, pp. 115–132 (San Diego, CA: Academic Press).
- Pasqualetti, M. J., Gipe, P. & Righter, R. W. (2002) A landscape of power, in:M. J. Pasqualetti, P. Gipe & R. W. Righter (Eds) Wind Power in View: Energy Landscapes in a Crowded World, pp. 3–16 (San Diego, CA: Academic Press).
- Powering the Future: Renewable Energy Roll-out in South Africa (2013), Greenpeace South Africa;
- Redlinger, R. Y., Andersen, P. D. & Morthorst, P. E. (2002) Wind Energy in the 21st Century: Economics, Policy, Technology and the Changing Electricity Industry (Basingstoke: Palgrave).
- Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector

- Redlinger, R. Y., Andersen, P. D. & Morthorst, P. E. (2002) Wind Energy in the 21st Century: Economics, Policy, Technology and the Changing Electricity Industry (Basingstoke: Palgrave).
- Republic of South Africa (2003). *White Paper on Renewable Energy.*
- StatsSA (2012). *Census 2011 Municipal Fact Sheet*
- Szarka, J. (2007) Wind Power in Europe: Politics, Business and Society (Basingstoke: Palgrave Macmillan).
- Sunak, Y and Madlener, R (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;
- 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;
- Urbis Pty Ltd, (2016). Review of the Impact of Wind Farms on Property Values. Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Warren, Charles R. and Birnie, Richard V.(2009) *'Re-powering Scotland: Wind Farms and the 'Energy or Environment?'* Debate', Scottish Geographical Journal, 125: 2, 97 — 126;
- Wolsink, M. (2007a) Planning of renewables schemes: deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation, Energy Policy, 35(5), pp. 2692–2704;
- Wolsink, M. (2007b) Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives', Renewable and Sustainable Energy Reviews, 11(6), pp. 1188–1207.

INTERNET

- https://municipalities.co.za/demographic/1171/nama-khoi-local-municipality
- https://municipalities.co.za/demographic/136/namakwa-district-municipality
- https://portal.environment.gov.za/portal/apps/webappviewer/index.html?id=1c45081a7f65490c9ce58fad88e3b9e3
- https://www.afristay.com/a/kleinzee/self-catering/
- https://www.namakwa-dm.gov.za/tourism/
- https://www.polity.org.za/article/da-da-amplifies-call-to-minister-of-police-to-increase-safety-initiatives-in-kleinzee-2018-09-12
- https://www.safarinow.com/destinations/kleinzee/hub.aspx
- https://www.travelground.com/accommodation-in/kleinzee/2

BASE MAPS

- Chief Directorate National Geospatial Information (2003). 2916DB Kleinsee 1 in 50 000. Edition 2.
- Chief Directorate National Geospatial Information (2003). 2917CB Wolfberg 1 in 50 000. Edition 2.
- Chief Directorate National Geospatial Information (2003). 2917CC Brazil 1 in 50 000. Edition 2.
- Chief Directorate National Geospatial Information (2003). 3017AA_AB Koingnaas 1 in 50 000. Edition 2.
- Chief Directorate National Geospatial Information (2003). 31917CD Komaggas 1 in 50 000. Edition 2.

ANNEXURE D: ASSESSMENT METHODOLOGY

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 E: LITERATURE REVIEW: IMPACT ON TOURISM

The literature review undertaken as part of the Socio-Economic Assessment 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 WEFs on tourism. Here again, there is no evidence to support the assertion that WEF 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 development of WEFs 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 the development of WEFs 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 tourist's 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: LITERATURE REVIEW: IMPACT ON PROPERTY VALUES

The literature review undertaken as part of the Socio-Economic Assessment 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 Socio-Economic Assessment 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 WEFs 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 WEFs. 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 WEFs (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 WEFs have much bigger impacts that extend over a wider area.

The conclusion of the study notes that the fairly crowded geographical setting, with numerous WEFs 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 WEFs 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.