# SOCIAL IMPACT ASSESSMENT

# HIGHLANDS WIND ENERGY FACILITY

# EASTERN CAPE PROVINCE

**SEPTEMBER 2018**

**Prepared for**

**ARCUS CONSULTANCY SERVICES SA (PTY) LTD**

**By**

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# EXECUTIVE SUMMARY

## INTRODUCTION AND LOCATION

Arcus Consultancy Services South Africa (Pty) Ltd (Arcus) was appointed by WKN Windcurrent (Pty) Ltd to manage the Basic Assessment (BA) process for the establishment of a proposed 140 MW Highlands Wind Farm (WF) and associated infrastructure located ~ 20 km west of the town of Somerset East in the Blue Crane Route Local Municipality in the Eastern Cape Province.

Tony Barbour was been appointed by Arcus to undertake a specialist Social Impact Assessment (SIA) as part of the BA process. This report contains the findings of the SIA undertaken as part of the BA process.

## APPROACH TO THE STUDY

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

- 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;
- No-development option.

Based on input from the Visual and Heritage specialists the original proposed layout was revised. The changes included relocation of a number of wind turbines, substations and internal roads and cabling. The Visual Impact Assessment specialists (Lawson and Oberholzer) have indicated that the revised layout of wind turbines will not impact on the overall findings of the Visual Impact Assessment. The changes to the proposed layout will therefore have no bearing on the findings of the SIA. The findings of the SIA therefore apply to the revised wind turbine layout and changes in terms of substation locations and access roads.

**FIT WITH POLICY AND PLANNING**

The findings of the review indicated that renewable energy is strongly supported at a national, provincial and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Eastern Cape Provincial Growth and Development Plan (ECPGDP), The Sarah Baartman District Municipality Integrated Development Plan (IDP) and the Blue Crane Route Local Municipality Integrated Development Plan (IDP). The site is also located in a Renewable Energy Development Zone (REDZ). The general area has therefore been identified as suitable for the establishment of renewable energy facilities. However, there is a need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the area's tourism potential. In this regard the area to north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF.

**CONSTRUCTION PHASE**

The key social issues associated with the construction phase include:

**Potential positive impacts**

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

The construction phase for a single 140 MW WF 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 the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Cookhouse, Somerset East and Pearston. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. 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 is confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and DBSA (30 June 2017). The study found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more job years[1] for South African citizens than anticipated. 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 140 MW WF will be in the region of R 2.5 billion (2018 Rand value). The total wage bill will be in the region of R69 million (2018 Rand value). A percentage of the wage bill will be spent in the local economy which will create opportunities for local businesses in the towns in the area, such a Somerset East and Cookhouse. 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

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

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;
- Impact of heavy vehicles, including damage to roads, safety and dust; and
- Impact on farming activities.

The findings of the SIA 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** | Medium (+) | Medium (+) |
| **Presence of construction workers and potential impacts on family structures and social networks** | Medium (-) | 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** | Medium (-) | Low (-) |
| **Increased fire risk** | Medium (-) | Low (-) |
| **Impact of heavy vehicles and construction activities** | Medium (-) | Low (-) |
| **Impact on farming activities** | Medium (-) | 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 Highlands WF, 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 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.

In terms of investment, the REIPPPP has attracted R48.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and IS2). This is more than double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 48% (R31.5 billion) of the total equity shareholding (R66.7 billion) was held by South African's across BW1 to BW4, 1S2 and IS2. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 31% of projects that have reached financial close. The combined (construction and operations) procurement value for BW1 to BW4, 1S2 and IS2 is projected as R147.6 billion, of which R47.4 billion has been spent to date. In terms of employment, a total of 32 532 job years[2] have been created for South African citizens, of which 29 046 were in construction and 3 486 in operations.

The establishment of renewable energy facilities, such as the Highlands WF, 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 140 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 (2018

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

Rand value). The majority of the low and semi-skilled beneficiaries are likely to be historically disadvantaged (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 Somerset East and Cookhouse.

Procurement during the operation phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (2017) notes that the procurement spend over the 20 year operation phase for BW1 to BW4, 1S2 and IS2 will be in the region of R 75 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 SMME's.

The 2017 IPPP Overview notes that to date (across 7 bid windows) a total contribution of R20.6 billion has been committed to Socio-economic Development (SED) initiatives linked to Community Trusts. Of this total commitment, R16.5 billion has been specifically allocated to local communities where the IPPs operate. 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 Somerset East and Pearston can be regarded in the same category of 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.

***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 findings of the VIA indicate that the duration of the visual impact is expected to be long term as the project life is expected to extend beyond 20 years. In terms of significance ratings the findings of the VIA indicate that the magnitude of the visual impact for the Northern Phase is expected to be **Medium Negative** with mitigation for Operational Phase. For the Central and South Phase the significance is **Medium Negative** with mitigation.

Based on the findings of the SIA, none of the landowners on whose farms the proposed WF is located raised any concerns regarding visual impacts. However, the adjacent landowners involved in game farming raised significant concerns about the visual impacts associated with wind farms and the potential impact on their operations. The concerns were not only linked to day time impacts, but also night time impacts associated with aviation lights and the impact on the dark, undisturbed night time sky. Based on the findings of the VIA all three Phases would impact on the current, established game farming operations located from the north-east to the south-west. Kamala Game Reserve would be most significantly affected by the North and Central Phases, East Cape Safaris by the Central and South Phases, and Side by Side Safaris by the South Phase.

***Impact on property values and existing operations***
The most comprehensive study appears to the study by Gibbons (2014), which found that "averaging over wind farms of all sizes" the price reduction was 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. While the focus of the Gibbons study was on residential properties it does indicated that the larger the distance the less the impact. The findings of the Urbis (2016) study indicate that "wind farms may not significantly impact rural properties used for agricultural purposes".

However, while the findings of the literature review indicate that the potential impact of WFs on rural property values is likely to be low, the value of the current game farming operations in the vicinity of the site are strongly linked to areas current, relatively undisturbed sense of place and African Veld character. This character could potentially be impacted by the establishment of the proposed WF. While the wind turbines associated with the Highlands WF may not be visible from some of the lodges on the affected farms, they are likely to be visible from sections of the affected farms. This is may have a negative impact on the current operations, which in turn may have a negative impact on property values of the affected properties. Based on the findings of the SIA the significance of this impact is rated at **Medium Negative**[3]. However, as indicated above, the proposed Highlands WF is located in the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of wind energy facilities. The establishment of renewable energy facilities will create significant socio-economic benefits and opportunities for the area. These benefits need to be considered when assessing the potential impact on adjacent game farming and hunting operations.

***Impact on tourism***
Based on the findings of the literature review there is limited evidence to suggest that the proposed Highlands WF would impact on the tourism in the SBDM and

[3] The SIA is not in a position to assess the potential quantitative impact on property values. This would require a specialist property evaluation assessment.

BCLM. The findings also indicate that wind farms do not impact on tourist routes. At a regional level the impact is rated **Low Negative**. However, the proposed WF may have a localised impact on the game farming operations in the immediate vicinity of the site. The significance of this impact is rated **Moderate Negative**. The potential localised impact would however need to be considered within the context of the Highlands WF location within the Cookhouse Wind REDZ and the significant socio-economic benefits associated with the establishment of renewable energy facilities.

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** | Medium (+) | Moderate (+) |
| **Establishment of Community Trust** | Medium (+) | High (+) |
| **Benefits for local affected landowners** | Low (+) | Medium (+) |
| **Visual impact and impact on sense of place[4]** | Medium-High (-)<br>Low (-) | Medium (-)<br>Low (-) |
| **Impact on property values and adjacent operations** | Medium (-) | Medium (-) |
| **Impact on tourism[5]** | Low (-)<br>Medium (-) | Low (-)<br>Medium (-) |

## CUMULATIVE IMPACTS

***Cumulative impact on sense of place***

The findings of the VIA (June 2018) note that the development of the proposed wind farms and grid connections, when seen together with the existing wind farms and power lines in the vicinity, would result in cumulative visual impacts resulting in further change to the largely rural character to the area. In addition to the Highlands wind farms and powerline grid connections, there are existing Eskom powerlines parallel with the R63 Route, an approved solar PV farm near Pearston and a proposed Middleton wind farm south of Cookhouse on the N10 National Route, both within 35 kilometres of the Highlands site. The VIA also notes that the fact that the proposed Highlands wind farms fall within the gazetted Cookhouse Renewable Energy Development Zone (REDZ) means that it forms part of a renewable energy node. In conclusion the VIA states the "Given that the renewable energy projects mentioned above are not within viewing distance of each other and that they form part of REDZ, the cumulative visual impact significance is considered to be **Low (Negative)** in the local context".

As indicated above, while certain stakeholders are opposed to the proposed WF, others either support the development and or do not have an objection to the establishment of a WF on the proposed site. This will also have implications for the

[4] Ratings reflect findings of VIA (Medium-High Negative) and findings of stakeholders interviewed that do not regard wind farm as a having a negative visual impact (Low Negative).
[5] The rating applies to the impact on tourism in the broader area (Low Negative) and adjacent game farming and hunting operations (Medium).

perceptions of different people towards to the nature and significance of the cumulative impacts associated with wind farms on sense of place. However, the potential impact of wind energy facilities 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 WF and the other renewable energy facilities in the SBDM and BCRLM 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 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 WF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the SBDM and BCRLM, 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. This benefit is rated as **High Positive** with enhancement.

**POTENTIAL HEALTH IMPACTS**

The potential health impacts typically associated with WFs include, noise, 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 in fact will have positive health benefits (WHO, 2004). Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WF is of **Low Negative** significance.

**NO-DEVELOPMENT OPTION**

The No-Development option 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-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed Highlands WF 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 WF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Eastern Cape and other parts of South Africa. Foregoing the proposed establishment of WFs would therefore not necessarily compromise the development of renewable energy facilities in the Eastern Cape Province and or South Africa. However, the socio-economic benefits for local communities in the SBDM and BCRLM would be forfeited.

**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[6]. 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 WF as scrap metal should be allocated to the rehabilitation of the site.

**CONCLUSION**

**Conclusions**

The findings of the SIA indicate that the development of the proposed Highlands WF 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 SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.

The Highlands WF site is also located within the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities. However, a the key concern identified during the SIA relates to the visual impacts associated with the wind turbines and the potential impact on existing, well established game farming and hunting operations in the area, specifically the area to the north, east and south of the site. The majority of these operations cater for up-

[6] 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.

market overseas visitors and the existing "African veld" sense of place represents a key component of their marketing strategy. The establishment of a wind farm on their western boundary would impact on the areas current sense of place, which in turn, may negatively impact on their operations and property values. The potential impacts will be largely confined to four to five existing game farming operations. The potential localised impacts would therefore need to be considered within the context of the location of the Highlands WF within the Cookhouse Wind REDZ and the significant socio-economic benefits associated with the establishment of renewable energy facilities.

**Recommendations**

- The applicants should meet with the affected landowners located to the north, east and south of the site to discuss the possibility relocating wind turbines that have the highest potential visual impact.

## 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, p7, Annexure C, p144 |
| (b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Section 1.6, p7, Annexure D, p145 |
| (c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 1.1, p1, Section 1.2, p2 |
| (cA) an indication of the quality and age of base data used for the specialist report; | Section 1.2, p2, Section 3, p43 |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 4, p86 |
| (d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; | Interviews undertaken in 2016 and 2018 (Annexure A) |
| (e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | Section 1.2, p2, Annexure B, p140 |
| (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, p86, Section 5, p127 |
| (g) an identification of any areas to be avoided, including buffers; | Section 4, p.186. |
| (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, p6 |
| (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, p86, Section 5, p127 |
| (k) any mitigation measures for inclusion in the EMPr; | Section 4, p86 |
| (l) any conditions for inclusion in the environmental authorisation; | Section 4, p86, Section 5, p127 |
| (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | N/A |
| (n) a reasoned opinion—<br>i. as to whether the proposed activity, activities or portions thereof should be authorised;<br>iA. Regarding the acceptability of the proposed activity or activities; and<br>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 5.2, p136 |
| (o) a description of any consultation process that was undertaken during the course of preparing the specialist report | Annexure A, p137, lists key stakeholders interviewed |
| (p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | Annexure A, p137, 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. | |

**ACRONYMS**

| | |
|---|---|
| BCRLM | Blue Crane Route Local Municipality |
| DM | District Municipality |
| DEA&DP | Department of Environmental Affairs and Development Planning |
| ECPGDP | Eastern Cape Provincial Growth and Development Plan |
| EIA | Environmental Impact Assessment |
| IDP | Integrated development Plan |
| IPP | Independent Power Producer |
| kV | Kilovolts |
| LED | Local Economic Development |
| LM | Local Municipality |
| MW | Megawatt |
| SBDM | Sarah Baartman District Municipality |
| SEA | Strategic Environmental Assessment |
| SIA | Social Impact Assessment |
| WEF | Wind Energy Facility |
| WF | Wind Farm |

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# SECTION 1: INTRODUCTION

## 1.1 INTRODUCTION

Arcus Consulting was appointed by WKN Windcurrent (Pty) Ltd to manage the Basic Assessment (BA) process for the establishment of a proposed 140 MW Highlands Wind Farm (WF) and associated infrastructure located ~ 20 km west of the town of Somerset East in the Blue Crane Route Local Municipality in the Eastern Cape Province (Figure 1.1).

Tony Barbour was been appointed by Arcus Consulting to undertake a specialist Social Impact Assessment (SIA) as part of the BA process. This report contains the findings of the SIA undertaken as part of the BA process.

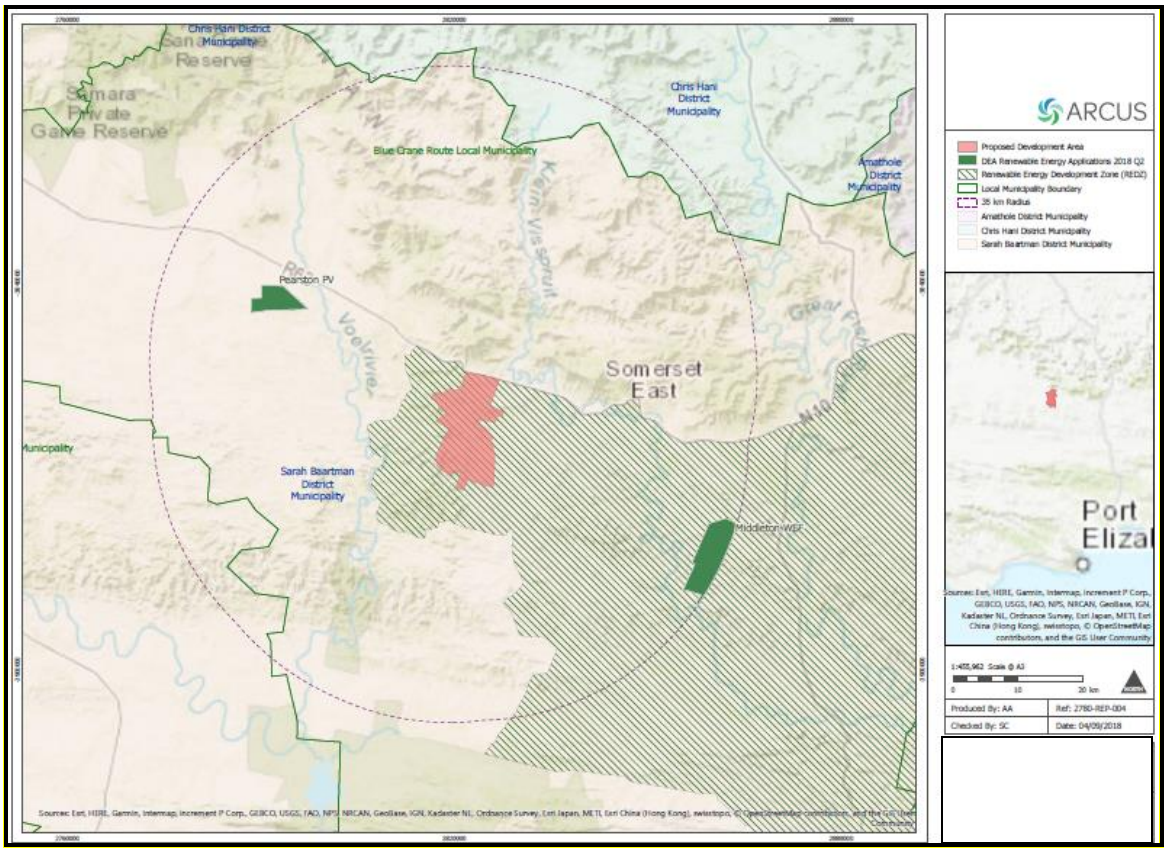



**Figure 1.1: Regional location of Highlands Wind Farm**

## 1.2 TERMS OF REFERENCE AND APPROACH TO STUDY

The terms of reference for the SIA require:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed Wind Energy Facility;
- A description and assessment of the potential social issues associated with the proposed development and the associated alternatives;
- Identification of enhancement and mitigation measures aimed at maximizing opportunities and avoiding and or reducing negative impacts.

The approach to the SIA study is based on the Western Cape Department of Environmental Affairs and Development Planning Guidelines for Social Impact Assessment (DEADP, 2007). The key activities in undertaken as part of the SIA 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.
- Identification of enhancement and mitigation measures aimed at maximizing opportunities and avoiding and or reducing negative impacts; and

The identification of potential social issues associated with proposed facility 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 B outlines the assessment methodology used to assign significance ratings during the assessment phase.

One of the key challenges facing SIA does not necessarily involve the physical disruption of human populations, but understanding the meanings, perceptions and/or social significance of these changes. In order to understand the role of social assessment in the EIA process one needs to define what social impacts are. This issue is complicated by the way in which different people from different cultural, ethic, religious, gender, and educational backgrounds etc., view the world. This is referred to as the "social construct of reality". The social construct of reality informs people's worldview and the way in which they react to changes. However, in many instances these constructs are frequently treated as perceptions or emotions, to be distinguished from "reality."

The social construct of reality is a characteristic of all social groups, including the agencies that attempt to implement changes, as well as the communities that are affected (Guidelines and Principles for Social Impact Assessment, 1994). The

tendency of development agencies and proponents to dismiss the concerns of others as being merely imagined and perceived is therefore a key issue that needs to be addressed by social impact assessments.

In this regard the findings of the SIA indicate that while certain stakeholders are opposed to the proposed WEF, others either support the development and or do not have an objection to the establishment of a WEF on the proposed site.

## 1.3 PROJECT DESCRIPTION AND AFFECTED PROPERTIES

A wind energy facility (WEF) consists of multiple wind turbines which are used to capture the kinetic energy of the wind and generate electricity. This captured kinetic energy is used to drive a generator located within the wind turbine and the energy is subsequently converted into electrical energy. A typical wind turbine consists of four primary components (Figure 1.2).

- The **foundation unit** upon which the turbine is anchored to the ground. The area required for the concrete foundation is typically in the region of ~ 200 $m^2$;
- The **tower**, which is a hollow structure allowing access to the nacelle. The height of the tower is a key factor in determining the amount of electricity a turbine can generate. The tower houses the transformer which converts the electricity to the correct voltage for transmission into the grid. The transformer can also be placed in a small housing outside the tower depending on the design;
- The **nacelle** (generator/turbine housing). The nacelle houses the gearbox and generator as well as a wind sensor to identify wind direction. The nacelle turns automatically ensuring the blades always face into the wind to maximise the amount of electricity generated;
- The **rotor**, which is typically comprised of three rotor blades with a diameter varying between 100 and 180 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.

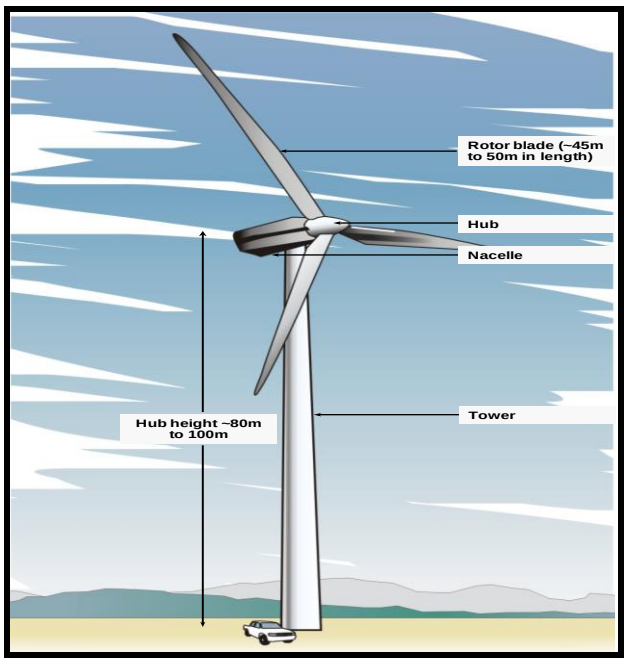



**Figure 1.2: Typical example of wind turbine structure and components**

The proposed Highlands WF consists of an overall total of 49 turbines. The development is made up of three Phases, namely:

- Phase 1 Highlands North: 17 turbines;
- Phase 2 Highlands Central: 14 turbines;
- Phase 3 Highlands South: 18 turbines.

The supporting infrastructure within the site includes roads, underground and overhead medium voltage (MV) power lines (33 kV or lower) and a substation, as well as control, operation, workshop and storage buildings. A full list of proposed facilities is provided in Table 1.1 below.

**Table 1.1: Description of Proposed Highlands WF**

| Facility | Extent/Footprint | Height | Comments |
|---|---|---|---|
| **Affected land parcels:**<br>**Development area of interest:** | Approx. 11 180 ha<br><br>Approx. 9 000 ha | n/a | |
| **WEF North Phase 1**<br>**WEF Central Phase 2**<br>**WEF South Phase 3** | 17 turbines<br>14 turbines<br>18 turbines | Hub ht. max. 135m<br>Rotor diam. max. 150m | Colour: off-white / grey - TBC |
| **Grid North Phase 1**<br>**Grid Central Phase 2**<br>**Grid South Phase 3** | Max. length 5 km<br>Max. length 8 km<br>Max. length 20 km | Max. 30m<br>"<br>" | 66 and 132 kV lines.<br>31m servitudes.<br>Preferred 300m corridor containing both servitudes. |
| **Turbine pads** | 100 x 50m crane pad and laydown area per turbine | n/a | Foundation 20 to 25m diameter. |

| | | | |
|---|---|---|---|
| **Permanent hardstand for maintenance** | 100 x 30m per turbine | n/a | |
| **Internal access roads** | Internal road linking turbine locations. | n/a | 6m width, and wider in places to accommodate abnormal trucks. |
| **Electrical substation** | 110 x 100m | Single storey building | Eskom switching station attached to substation? |
| **Operations and maintenance structures** | 50 x 100m demarcated area. | Single storey building | Located adjacent to substation.<br>Workshop/office buildings, maintenance and storage. |
| **Security fencing** | Around substation and O&M building. | Max. 3m? | Type unknown? |
| **Security Lighting**<br><br>**Navigation lights** | To be confirmed.<br><br>To be confirmed. | To be confirmed.<br><br>At hub height. | At substation and O&M building.<br>Flashing red light on selected turbines (to CAA requirements). |
| ***Construction Phase:*** | | | |
| **Lay down area, construction camp** | Main laydown area and construction yard 1 ha each. | Single storey structures | Temporary site camp, laydown areas incl. prefab buildings, access road, site offices. |
| **On-site concrete batching plant** | To be confirmed. | n/a | Temporary plant. |
| **Borrow pits** | To be confirmed. | n/a | Possibly from existing sources. |

### 1.3.1 Changes to the proposed (assessed) layout

Based on input from the Visual and Heritage specialists the original proposed layout was revised. The changes included relocation of a number of wind turbines, substations and internal roads and cabling. The revisions are summarised below.

***Turbines***

- T6 – moved approximately 230m to the SW (based on updated bat buffer to the dam);
- T17 – moved approximately 20m to the NW (based on ground-truth visit);
- T18 – moved approximately 55m to the N (based on ground-truth visit);
- T26 – moved approximately 45m to the N (based on ground-truth visit);
- T29 – moved approximately 75m to the SW (based on ground-truth visit);
- T33 – moved approximately 50m to the SE (based on ground-truth visit);
- T38 – moved approximately 20m to the W (based on ground-truth visit);
- T39 – moved approximately 45m to the W (based on ground-truth visit);
- T42 – moved approximately 45m to the NE (based on ground-truth visit);
- T43 – moved approximately 95m to the W (based on ground-truth visit);
- T47 – moved approximately 130m to the W (based on ground-truth visit).

***Substations***

- Substation compound A moved approximately 80m to the North to a flatter location:
- Substation compound C2 moved approximately 80m to the North to a flatter location.

The internal roads and internal cabling were also revised to reflect the above changes. In addition, the internal road alternative between T27 and T28 was revised as well as the straightening of the bend on the Southern Access road.

The Visual Impact Assessment specialists (Lawson and Oberholzer) have indicated that the revised layout of wind turbines will not impact on the overall findings of the Visual Impact Assessment. The changes to the proposed layout will therefore have no bearing on the findings of the SIA. The findings of the SIA therefore apply to the revised layout and associated changes in terms of substation locations and access roads.

## 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 wind energy facility. The site is also located in the Cookhouse Renewable Energy Development Zone (REDZ).

**Strategic importance of the project**

The strategic importance of promoting wind 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 SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported. However, the study recognises the strategic importance of wind energy and the technical, spatial and land use constraints required for wind energy facilities.

### 1.4.2 Limitations

**Demographic data**

The information contained in some key policy and land use planning documents, such as Integrated Development Plans etc., is based on the 2011 Census. Where relevant, information from the 2016 Community Survey has been added.

## 1.5 SPECIALIST DETAILS

Tony Barbour, the lead author of this report is an independent specialist with 24 years' experience in the field of environmental management. In terms of SIA experience Tony Barbour has undertaken in the region of 130 SIA's and is the author of the Guidelines for Social Impact Assessments for EIA's adopted by the Department of Environmental Affairs and Development Planning (DEA&DP) in the Western Cape in 2007. Annexure C contains a copy of 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 Draft SIA Report, are independent and do not have vested or financial interests in the proposed development being either approved or rejected. Annexure D 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[7]" of the proposed development therefore constitutes a key aspect of the Social Impact Assessment (SIA). In this regard, assessment of "planning fit" conforms to international best practice for conducting SIAs. Furthermore, it also constitutes a key reporting requirement in terms of the applicable Western Cape Department of Environmental Affairs and Development Planning'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));
- 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);
- Eastern Cape Provincial Growth and Development Strategy (2004-2014);
- Sarah Baartman District Municipality Integrated Development Plan (2015/2016 Review);
- Sarah Baartman District Municipality Spatial Development Framework (2013)[8];
- Blue Crane Route Local Municipality Integrated Development Plan (2015/2016 Review).

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.

[7] 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.

[8] The Sarah Baartman District Municipality was previously called the Cacadu District Municipality.

## 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[9];
- Lower energy densities; and
- Lower levels of availability, depending on specific conditions, especially with sun and wind based systems.

The IRP 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[10], 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).

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

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

[10] 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)

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;
- The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met.

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

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

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

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

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

In 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 IRP2010 should continue to be pursued.

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

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

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

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

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

### 2.1.5 National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies 9 key challenges and associated

remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

### 2.1.6 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;
- One water and sanitation SIP.

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

**SIP 8: Green energy in support of the South African economy**

- Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010);
- Support bio-fuel production facilities.

**SIP 9: Electricity generation to support socio-economic development**

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

**SIP 10: Electricity transmission and distribution for all**

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

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

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2015) identified eight (8) ***Renewable Development Zones*** (REDZs). The REDZs identified areas where large scale wind energy facilities can be developed in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. The proposed Highlands WF falls within the Cookhouse Wind REDZ (Figure 2.1). On 17 February 2016, the Cabinet of the Republic of South Africa (Cabinet) approved the gazetting of Renewable Energy Development Zones (REDZs). 8 REDZs and 5 Power Corridors have been identified. 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 8 Renewable Development Zones and electricity grid expansion within the 5 Power Corridors will be subjected to a Basic Assessment 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.

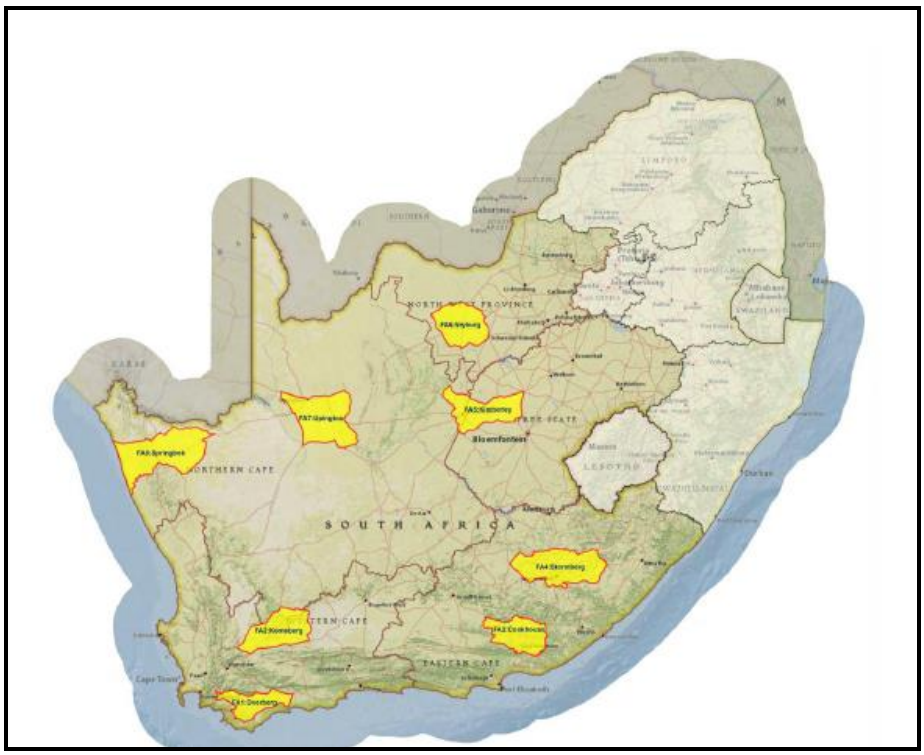



**Figure 2.1: Location of Renewable Development Zones in South Africa *(Source CSIR)***

## 2.3 PROVINCIAL POLICY AND PLANNING ENVIRONMENT

### 2.3.1 Eastern Cape Provincial Growth and Development Program

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

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

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

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

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

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

Infrastructure development, in turn, will have strong growth promotion effects on the agriculture, manufacturing and tourism sectors by improving market access and by "crowding in" private investment. Poverty alleviation should also be promoted through labour-intensive and community based construction methods.

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

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

## 2.4 DISTRICT AND LOCAL POLICY AND PLANNING ENVIRONMENT

### 2.4.1 Sarah Baartman District Municipality Integrated Development Plan

The vision for the SBDM is "an innovative and dynamic municipality striving to improve the quality of life for all our communities". The mission statement is "to provide equitable, affordable services and sustainable socio-economic development through:

- Stakeholder participation;
- Capacity building;
- Efficient and effective management of resources.

The IDP identifies a number of key challenges, including, water supply, housing and services, and maintenance of the road network.

***Water resources***
The IDP notes that the acquisition and provision of water resources represents the largest challenge in the SBDM. The District depends predominantly on ground water for human consumption and agricultural activity, which is one of the drivers of the economy in the District. Due to the low rainfall in the inland areas water shortages are a common problem, especially for the smaller towns and rural villages. Water quality is also an issue.

***Road maintenance***
The Sarah Baartman District is extensively covered by a network of both road and rail, with road being the preferred mode of transport. A total of 8 420km of roads cover the Sarah Baartman District. However, 82% - approximately 6 880km, of the total road network are gravel roads. The IDP notes that the maintenance of the gravel road network is the second largest challenge the District faces after the provision of water. The main road linkages in the SBDM include the N2 and N9, which link the Eastern Cape Province with the Western Cape, the N10, which links the Eastern Cape and the Nelson Mandela Metro (NMM) with the hinterland, and the R 75, which links the NMM with Graaf Reinet.

***Provision of housing and services***
Major issues pertaining to housing and settlement aspects within the District include:

- Shortage of suitable land to address current housing demand;
- Influx of migrants to the area in search of employment opportunities, specifically in the smaller coastal and farming towns;
- Isolated location of some rural settlements and distances from existing community services;
- Rapid increase of informal settlements in and around small towns within the District due to the changing pattern of labour utilisation on farms.

In terms of potential opportunities the IDP notes that opportunities exist in the renewable energy sector. In this regard the IDP refers to a the development of a number of wind generation initiatives in the SBDM, noting that eight of the thirteen approved wind farm developments in South Africa are located in the district. The two largest energy generating wind farms, i.e. Amakhala Emoyeni (Phase 1, 137.9MW) and Cookhouse Wind Farm (135MW) are located in the SBDM. In addition, the Blue Crane Route region has been identified by the National Department of Environmental Affairs as one of three potential wind generation 'preferred locations' in the country.

The Economic Growth and Development Strategy for the SBDM, renamed the Socio-Economic and Enterprise Development Strategy (SEEDS), is structured around seven core strategies. The following are relevant to the proposed development:

***Increasing agricultural income***
The IDP notes that agriculture remains the single most economic driver in the district. The starting point for rural development is to find ways of increasing agricultural income. The initiatives identified that could potentially benefit from the Community Trust associated with the proposed development include:

- Facilitating investments in local and regional agro-processing operations;
- Investing in research and knowledge sharing to improve the quality and resilience of crops and livestock;
- Supporting local and regional food systems that keep wealth in rural communities.

***Investing in natural capital***
The IDP highlights the importance of protecting and restoring natural resources and ecosystems such as catchments, wetlands, rivers, forests and other natural areas to preserve bio-diversity, to ensure sustainable water supplies as well as to exploit the economic potential of such areas. The section also highlights the link between tourism in the region and the areas exceptional and diverse natural assets. The

initiatives identified that could potentially benefit from the Community Trust associated with the proposed development include:

- Promoting and incentivising natural resource restoration and conservation including alien vegetation clearing;
- Creating new generation green jobs and local income streams rooted in ***renewable energy***;
- Growing the rural tourism economy based on natural capital through agri-, adventure- and eco-tourism initiatives.

***Broadening economic participation***
The IDP notes that broadening economic participation is a key aspect of addressing the challenges faced by rural poverty. The initiatives identified that could potentially benefit from the Community Trust associated with the proposed development include:

- Promoting BBBEE, SMME and cooperative development;
- Linking up with and maximising the opportunities for Extended Public Works Programme (EPWP) and Community Work programme opportunities;
- Establishing community-based beneficiation projects;
- Facilitating community and worker participation in share ownership;
- Promoting social development investments.

***Developing the skills base***
The IDP notes that the low skills levels in the area are major constraint to development but also represents a significant area of opportunity given the wide range of good educational institutions in the region. The initiatives identified that could potentially benefit from the Community Trust associated with the proposed development include:

- Improving the quality and quantity of school education and early childhood development (ECD) through partnerships;
- Creating further education opportunities linked to work opportunities in the region;
- Developing skills transfer partnerships between established and emerging farmers and between established and emerging businesses.

***Improving connectivity and utility infrastructure***
Transport, water and energy infrastructure are major challenges in an arid low-density rural area such as SBDM. The costs of such infrastructure are particularly high in such areas given distance and the area enjoys relatively low priority for infrastructure given its small population. The IDP therefore highlights the importance of being innovative so as to ensure that sufficient infrastructure is in place to support development. The initiatives identified that could potentially benefit from the Community Trust associated with the proposed development include assisting with the developing rural broadband and mobile phone connectivity.

Section 3 of the IDP lists the developmental interventions required in the district to address the challenges. The key challenge that is relevant to the proposed project and associated strategic interventions is Socio-economic development.

***Development Priority 3: Economic Development***
The need to focus on economic development is linked to the commitment of the SBDM to the creation of new, decent, sustainable employment opportunities, job

creation and sustainable enterprise development, retention and expansion in the district. The IDP indicates that this will be achieved through targeted investment promotion to grow strategic sectors that are able to create employment opportunities on a substantial scale in the short to medium term, and more advanced industries that are crucial for long term economic growth. Of relevant the specific sectors that are earmarked for further development in the district include:

- Green economy (including, but not limited to ***renewable energy*** and ecosystem services);
- Tourism; and,
- Skills development and Education (predominantly, but not exclusively further education and training)

With regard to the green economy the IDP refers to the need to create ***"new generation green jobs rooted in renewable energy".***

### 2.4.2 Cacadu District Municipality Spatial Development Framework[11]

The SBDM Spatial Development Framework (SDF) is informed by the key principles that underpin the Eastern Cape Spatial Development Framework. The principles of relevance to the proposed development include:

- Integrated spatial development plans (SDFs) which are the principal development management tool for all stakeholders, across the province ("wall to wall") founded on flourishing livelihoods, conserving natural resources and the needs of community neighbourhoods;
- Environmental integrity and sustainability through achieving a balance between safeguarding natural resources, optimizing the livelihoods of communities and developing a flourishing economy;
- Optimum use of existing resources including agriculture, forestry, renewable energy potential, already impacted land (brownfield areas) minerals, bulk infrastructure, roads, transportation and social facilities;

Under the heading "Economic Spatial Outcomes" the Cacadu (Sarah Baartman) SDF highlights a number of key points that are relevant to the proposed development. These include:

- The districts economy is dependent on the natural resources of the area;;
- The SDF should identify areas for renewable energy production;
- Spatial planning must recognise that game reserves and farming are playing a bigger role in the economy;
- Inappropriate land use change can have a negative impact on district resources and the economy;
- The introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district. (Potential changes to the visual and cultural landscapes);
- The protected area network together with the intended expansion areas (Nature reserves and parks) provide significant and expanding ecotourism opportunities within the District;

[11] As indicated above the Sarah Baartman DM was previously called the Cacadu DM. The SDF was prepared before the DM was renamed, hence the reference to the Cacadu DM SDF.

- Both the tourism and productive components of the economy are dependent on effective access. (Transportation infrastructure).

Based on the information contained in two high level land use maps for the SBDM the location of the proposed WEF does not appear to conflict with the land use planning objectives contained in the SDF. In this regard the site does not appear to be located within a Tourism Focus Area (Figure 2.2) or a Protected and Critical Biodiversity Areas (Figure 2.3). In terms of land use, the site is located in an area designated as grazing potential. The area to the north of the site is however identified as a Tourism Focus area.

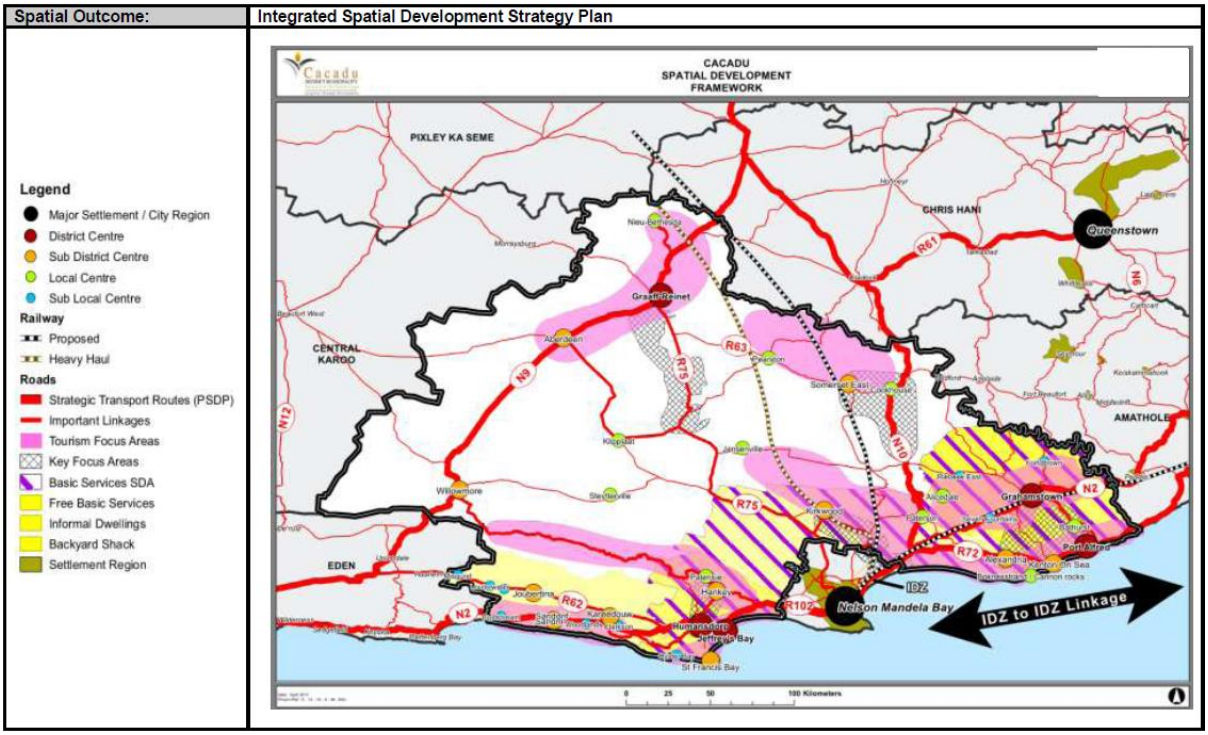



**Figure 2.2: Location of Tourism Focus Areas and Strategic Routes**

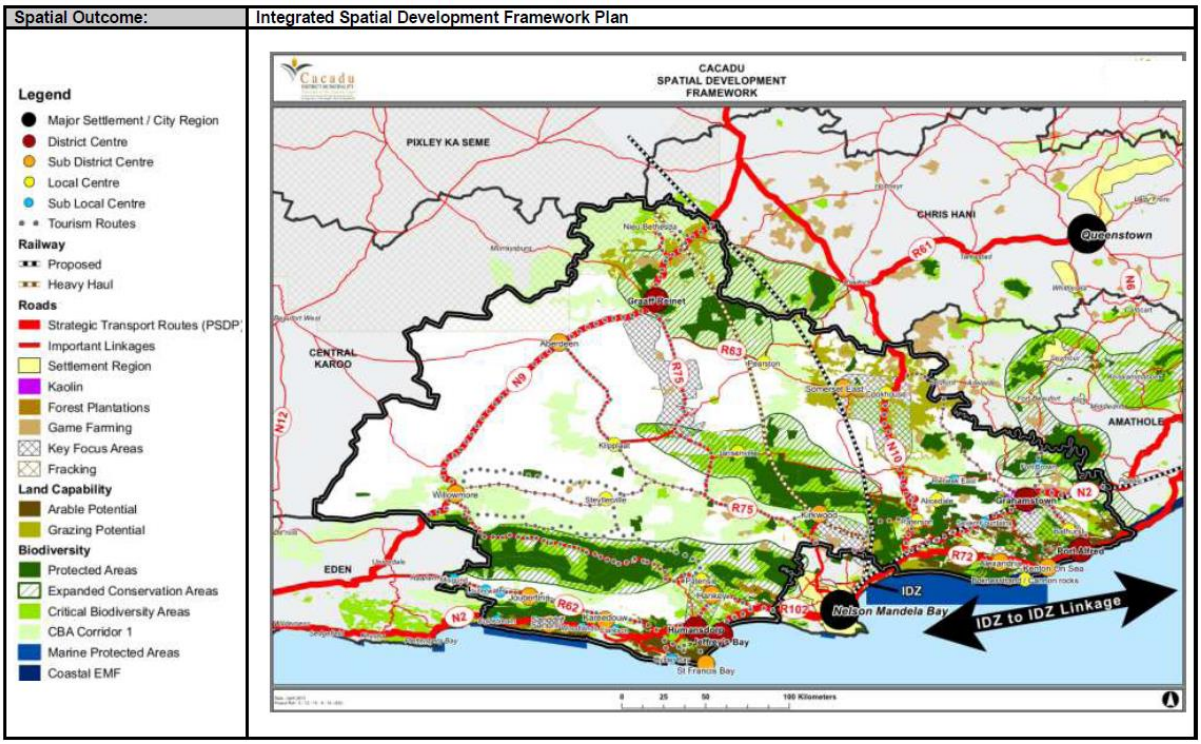



**Figure 2.3: Location of Protected Areas and Critical Biodiversity Areas**

### 2.4.3 Blue Crane Route Integrated Development Plan (2016)

The vision and mission for the BCRLM are:

- Vision: **"**A municipality that strives to provide a better life for all its citizens."
- Mission: **"**Through responsible local government, zero tolerance for corruption and creating an environment for up-liftment and sustainable economic growth."

The IDP identifies six key performance areas, of which the following two are relevant to the proposed development:

- Spatial Development Framework;
- Local Economic Development.

The IDP notes that the BCRLM has strived to broaden the local economy through the establishment of a strong industrial sector. Initial studies, exploring the options of rural town local economic expansion's, confirmed that small rural towns can only be sustainable in the long term through the establishment of a strong industrial sector.

However, a key challenge facing the local economy is the lack of value adding. In this regard the majority of the agricultural products are exported in their raw form with limited values adding. The IDP identifies the need to establish a local industrial cluster with the required facilities to address this issue. The IDP also notes that this initiative will be linked to the Local Economic Strategy of the SBDM.

With regard to renewable energy, specifically ***wind energy***, the IDP notes that there are significant opportunities in the area. The IDP notes that "wind generation initiatives in the Sarah Baartman District are fast growing with a large number of

generation facilities under investigation" and the "the importance of wind energy generation in the district has been confirmed by the announcement by the Department of Energy in terms of successful wind farm developments, as three of the eight approved wind farm developments are to be developed in the district, with an additional wind farm to be developed in Nelson Mandela Bay Municipality. One of the largest energy generating wind farms, i.e. Cookhouse Wind Farm (135MW) has been developed in the last year and is currently supplying electricity to the National Grid".

The IDP identifies a number of key challenges facing the BCRLM. These include:

- Poverty and inequality in the rural areas;
- Shortage of skills;

***Rural poverty and inequality***
Inequality and poverty are deeply entrenched with rural South Africa and represent a major constraint to development. However, the poor of the region also represent a major resource for economic progress. Broadening economic participation of rural communities as part of a broader social development emphasis is therefore identified as a key pillar for rural regeneration. Key areas of action that are potentially relevant to the proposed development include:

- Promoting BBBEE, SMME and cooperative development;
- Maximising the opportunities for Extended Public Works Programme (EPWP) and Community Work programme opportunities;
- Facilitating community and worker participation in share ownership;
- Promoting social development investments.

As part of the strategy to address challenges facing the rural areas the Development Bank of Southern Africa initiated the Rural Economic Development Initiative (REDI). The Sarah Baartman REDI, one of three pilot sites in South Africa, is a partnership between SBDM, the Development Bank of Southern Africa (DBSA) and other major stakeholders in the region aimed at identifying and unlocking economic potential to realize the latent economic growth potential of the district. Areas of intervention include (a) agri-innovation primarily in the areas of agro-processing, aquaculture, natural fibre beneficiation; ***renewable energy*** and agri-tourism and (b) strategy and institutional development. The REDI process has identified a number of catalytic factors that could accelerate economic growth in the District including ***renewable energy***, fibre innovation, the potential for agro-processing in key niches, tourism development and growing the education sector.

The BCRLM IDP identifies a number of deliverables emanating from REDI. Of relevance to the proposed development are:

- Renewable Energy Rapid Assessment and Audit;
- Provincial Renewable Energy Coordinating Forum;
- Land Use and Location Policy for Renewable Energy Projects;
- Preparation of a Project Plan for the Establishment of a Wind Research and Training Centre in BCRM;
- Investigation into the Social Economy and Identification of Interventions to Address Poverty and Unemployment.

The primary sector focus of REDI in BCRLM will be on improving the performance of agriculture-related sectors (including priority sectors from phase one research, ***renewable energy***, land restoration, agro-tourism and aquaculture).

***Skills shortage***
The IDP notes that skills base of the region is a key driver of both economic progress and poverty reduction. However, the majority of the population, specifically the rural population, have limited skills and limited educational attainment. This is both a major constraint to development but also represents a significant area of opportunity given the wide range of good educational institutions in the region. Of significance to the proposed development the identification of infrastructure that opens up new economic opportunities is identified as a potential opportunity for improving the skills levels in the area.

The IDP notes that the BCRLM has identified Local Economic Development (LED) as a key factor in the development of the BCRLM economy and all of its communities. The objectives for the Blue Crane Route LED Strategy that are relevant to the proposed development include:

- Promote investor confidence in BCRLM through the provision of sound infrastructure and reliable services;
- Promote SMMEs to increase employment opportunities;
- Promote the development of the tourism sector.

The LED strategy identifies six main pillars aimed at stimulating local economic development in Blue Crane Route Municipality. The following are of relevance to the proposed development:

- Alternative sources of energy;
- Enterprise Development;
- Agricultural Development;
- Tourism Development;
- Investment in Human Capital.

## 2.5 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 (30 June 2017), Department of Energy, National Treasury and DBSA;
- Green Jobs Study (2011), IDC, DBSA Ltd and TIPS;
- Powering the Future: Renewable Energy Roll-out in South Africa (2013), Greenpeace South Africa;
- WWF SA, Renewable Energy Vision 2030, South Africa, 2014

- Jacqueline M. Borel-Saladin, Ivan N. Turok, (2013). The impact of the green economy on jobs in South Africa, ), South African Journal of Science, *Volume 109 |Number 9/10, September/October 2013;*
- The potential for local community benefits from wind farms in South Africa, Louise Tait (2012), Master's Thesis, Energy Research Centre University of Cape Town
- Market Intelligence Report: Renewable Energy (2014). Mike Mulcahy, Greencape.

### 2.5.1 Independent Power Producers Procurement Programme (IPPPP): An Overview

The document presents an overview of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) undertaken by the Department of Energy, National Treasury and the Development Bank of South Africa in June 2017. By the end of June 2017, the REIPPPP had made the following significant impacts:

***Energy supply***
In terms of renewable energy 6 422 MW[12] of electricity had been procured from 112 RE Independent Power Producers (IPPs) in seven bid rounds to date. Of this 3 162 MW of electricity generation capacity from 57 IPP projects has been connected to the national grid. To date 16 991 GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational (making a 15% contribution to morning and evening system peak periods).

***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), including interest during construction, of projects under construction and projects in the process of closure is R201.8 billion (this includes total debt and equity of R200.4 billion, as well as early revenue and VAT facility of R1.4 billion).

The REIPPPP has attracted R48.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and 1S2). This is more than double the inward FDI attracted into South Africa during 2015 (R22.6 billion).

***South African citizen shareholding***
In terms of local equity shareholding, 48% (R31.5 billion) of the total equity shareholding (R66.7 billion) was held by South African's across BW1 to BW4, BW1S2 and 1S2. This equates to substantially more than the 40% requirement. Foreign equity amounts to R35.8 billion and contributes 52% of total equity.

The REIPPPP also contributes to Broad Based Black Economic Empowerment and the creation of black industrialists. In this regard Black South Africans own, on average, 31% of projects that have reached financial close, which is slightly above the 30% target.

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 11% of projects that have reached financial close. This is well above the 5% target. In addition, an average of 18% shareholding by black people in engineering, procurement and construction (EPC) contractors has been attained in

[12] 6323 MW from 92 largescale RE + 99MW from 20 small scale REIPPs.

projects that have reached financial close under the REIPPPP. This is slightly below the 20% target. The shareholding by black people in operating companies of IPPs has averaged 20% (against a targeted 20%) for the 57 projects in operation (i.e. in BW 1, 2 and 3). The target for shareholding by black people in top management has been set at 40%, with an average 61% 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 R29.3 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. With only 57 IPPS currently operational over a short period of time the revenue generated has been limited to R 36.3 billion.

***Procurement spend***

The total projected procurement spend for BW1 to BW4, 1S2 and 2S2 during the construction phase was R75 billion, more than the projected operations procurement spend over the 20 years operational life (R72 billion). The combined (construction and operations) procurement value is projected as R147.6 billion of which R50.1 billion has been spent to date. For construction, of the R46.4 billion already spent to date, R36.6 billion is from the 57 projects which have already been completed. These 57 projects had planned to spend R33.6 billion. The actual procurement construction costs have therefore exceeded the planned costs by 9% for completed projects.

The majority of the procurement spend to date has been for construction purposes. Of the R46.6 billion spent on procurement during construction, R41.1 billion has reportedly been procured from BBBEE suppliers, achieving 89% of total procured. Actual BBBEE spend during construction for BW1 and BW2 alone was R25.5 billion. The R 41.1 billion spent on BBBEE during construction already exceeded the R34.8 billion that had originally been anticipated by IPPs.

***Local Content***[13]

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 R75 billion, the result is a substantial stimulus for establishing local manufacturing capacity. Actual local content spend reported for IPPs that have started construction amounts to R38.1

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

billion against a corresponding project value (as realised to date) of R75.8 billion. This means 50% of the project value has been locally procured, exceeding the 45% commitment from IPPs and the thresholds for BW1 – BW4 (255-45%).

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.

For the 57 projects that have reached COD, local content spend has been R 29 billion, which represents 97% of planned local spend of R 29.9 billion.

***Preferential procurement***

The share of procurement that is sourced from Broad Based Black Economic Empowered (BBBEE) suppliers, Qualifying Small Enterprises (QSE), Exempted Micro Enterprises (EME) and women owned vendors are tracked against commitments and targeted percentages. The IA target requirement for BBBEE is 60% of total procurement spend. However, the actual share of procurement spend by IPPs from BBBEE suppliers for construction and operations combined is currently reported as 88%, which is significantly higher than the target of 60%, but also the 73% that had been committed by IPPs. BBBEE, as a share of procurement spend for projects in construction, is also reported as 89% with operations slightly lower at 78%. However, these figures have not been verified and the report notes that they are reported with caution.

Total procurement spend by IPPs from QSE and EMEs has amounted to R16.4 billion (construction and operations) to date, which exceeds commitments by 24% and is 33% of total procurement spend to date (while the required target is 10%). QSE and EME's procurement spend for construction is achieving 34% of total procurement to date and operations is less at 22%, however this is still well above the 10% target. QSE and EME share of construction procurement spend totals R15.5 billion, which is almost 3 times the targeted spend for construction of R5.0 billion during this procurement phase. However, procurement from women owned vendors is lagging, with only 3%f or construction and 5% 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.

***Leveraging employment opportunities***

To date, a total of 32 532 job years[14] have been created for South African citizens, of which 29 046 job years were in construction, 40% higher than the planned 20 689, and 3 486 in operations. These job years should rise further past the planned target as more projects enter the construction phase. By the end of June 2017, 57 projects had successfully completed construction and moved into operation. The projects had planned to deliver 14 639 job years during the construction phase, but had achieved 23 987. This was 64% more than planned.

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

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 – BW3.5 was 89% during construction (against a target of 80%), while it was 96% 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 6 772 job years. To date 16 376 job years have been realised (i.e. 142% greater than initially planned), with 16 projects, which have reached financial close, still to reach COD. The number of black SA citizens employed during construction also exceeded the planned numbers by 83%.

Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 80%, 41% and 52% 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 (80%) and the early stages of operations (82%) 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 (77%) 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 of SA-based employees was 50% and 67% for construction and operations respectively – at least 4 times more than the minimum threshold of 12% and more than 2.5 times more than the target of 20%.

***Socio-economic development (SED) contributions***

An important focus of the REIPPPP is to ensure that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. In this regard IPPs are required to contribute a percentage of projected revenues accrued over the 20 year project operational life toward SED initiatives. These contributions accrue over the 20 year project operation life and are used to invest in housing and infrastructure as well as healthcare, education and skills development. The minimum compliance threshold for SED contributions is 1% of the revenue with 1.5% the targeted level over the 20 year project operational life. For the current portfolio of projects the average commitment level is 2.2%, which is 125% higher than the minimum threshold level. Therefore, based on current projects average commitment level is 2.2% or 125% more than the minimum compliance threshold. To date (across seven bid windows) a total contribution of R20.6 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R1.03 billion. Of the total commitment, R16.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

To date, with the limited number of operational IPPs (57), the SED contribution amounts to R 403.7 million. 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 0.7% or 11% more than the target. Enterprise development contributions committed for BW1 to BW4, 1S2 and 2S2 amount to R6.4 billion. Assuming an equal distribution of revenue over the 20 year project operational life, enterprise development contributions would be R320 million per annum.

Of the total commitment, R4.9 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. Up until the end of June 2017 a total of R 129.8 had been contributed to enterprise development by the 57 operating IPPs.

### 2.5.2 Green Jobs Study

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

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

It is also worth noting that the study only considered direct jobs in the formal economy. Multiplier effects were not taken into account. As a result the analysis only captures a portion of the potential employment impact of a greening economy. International studies have indicated that there are considerable backward and forward linkages through various value chains of production, as well as of indirect and induced employment effects. The employment figures can therefore be regarded as conservative.

The analysis reveals the potential of an unfolding green economy to lead to the creation of approximately 98 000 new direct jobs, on average, in the short term,

almost 255 000 in the medium term and around 462 000 employment opportunities in the formal economy in the long term. The number of jobs linked to the power generation was estimated to be ~ 12 500 in the short term, 57 500 in the medium term and 130 000 in the long term. Power generation jobs therefore account for 28% of the employment opportunities created in the long term. However, the report notes that the contribution made by a progressively expanding green energy generation segment increases from 14% of the total in the short term, or just over 13 500 jobs, to more than 28% in the long term (166 400) (Table 2.1).

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

In addition, as projects related to a greening economy are progressively commissioned, the potential for local manufacturing also become increasingly viable. Employment gains in manufacturing are also expected to be relatively more stable than construction activities, since the sector should continue exhibiting growth potential as new and replacement components are produced, as additional markets are penetrated and as new green technologies are introduced. Manufacturing segments with high employment potential in the long term would include suppliers of components for wind 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 carbon dioxide ($CO_2$) 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 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 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 are 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.

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

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

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

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

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 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.

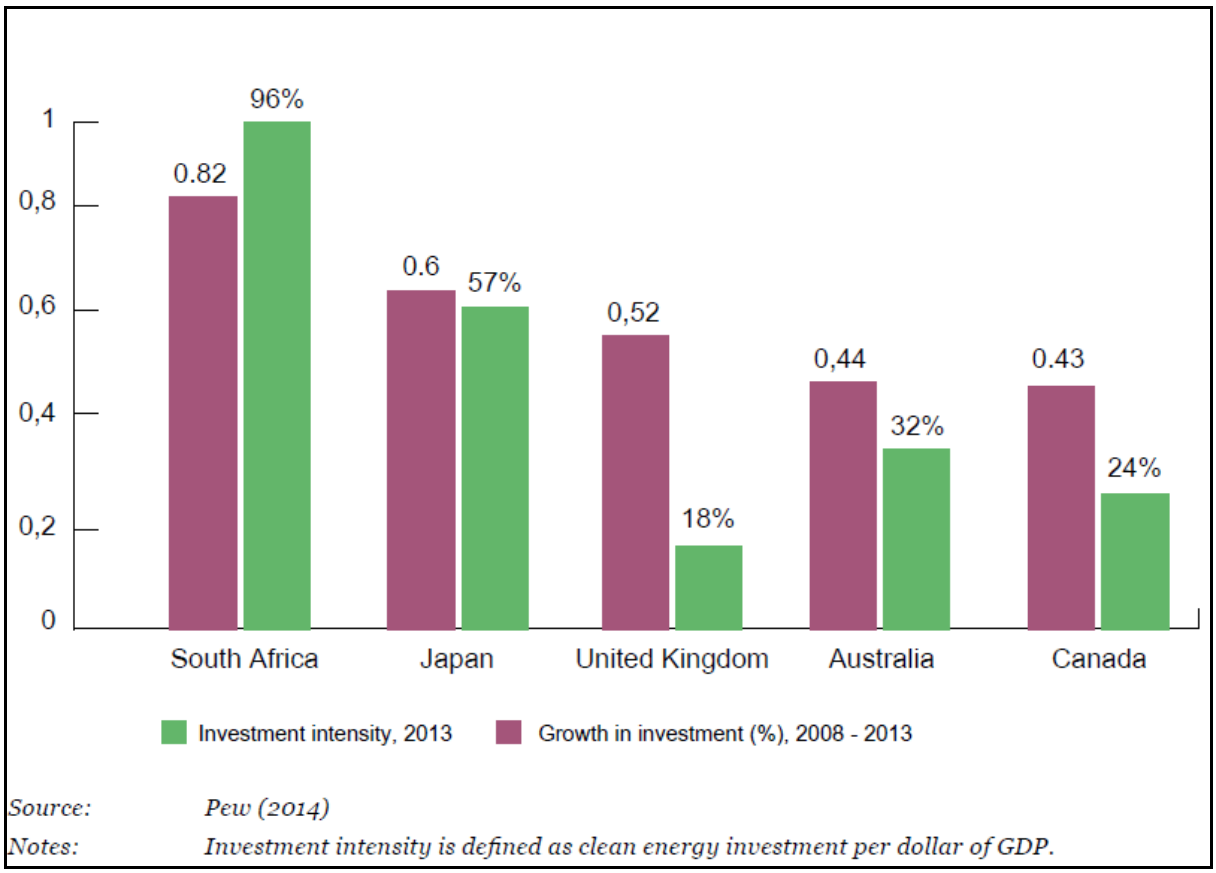
### 2.5.4 WWF SA, Renewable Energy Vision 2030

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

The report notes that Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) introduced in 2011, has by all accounts been 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).




*Source:* *Pew (2014)*

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

**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.

### 2.5.5 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 Development Bank of South Africa, and Trade and Industrial Policy Strategies. Many role players from other organisations were also consulted, including the World Wide Fund for Nature, the Green Building Council, the Economic Development Department and private companies involved in green industries.

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

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

In her thesis, Tait[15] 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

[15] 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

social responsibilities of business in all sectors definitely has a South African flavour, borne out of the political history of the country and the imperatives for social transformation laid out in the constitution.

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

### 2.5.7 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.

## 2.6 INTERNATIONAL EXPERIENCE WITH WIND FARMS

Three documents were reviewed, namely:

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

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

***Health related impacts***

The potential health impacts typically associated with WFs include, noise, dust shadow flicker and electromagnetic radiation. The findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human

health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation, and may therefore in fact result in the minimisation of adverse health impacts for the population as a whole (WHO, 2004).

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

***Landscape impacts***

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

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

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

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

## 2.7 IMPACT OF WIND FARMS ON TOURISM

A review of international literature in the impact of wind farms was undertaken as part of the SIA. Three articles were reviewed, namely[16]:

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

- Atchison, (April, 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh
- Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government
- Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector

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

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 Highlands WF on the perceptions of visitors, specifically international visitors, has been raised by owners of adjacent game farming operations.

## 2.8 IMPACT ON WIND FARMS ON PROPERTY VALUES

The literature review undertaken as part of the SIA does not constitute a property evaluation study and merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas[17]. The literature reviewed was based on an attempt by the authors of the SIA to identify what appear to be "scientifically" based studies that have been undertaken by reputable institutions. In this regard it is apparent that there are a number of articles available on the internet relating to the impact of wind farms on property values that lack scientific vigour. The literature review also sought to identify research undertaken since 2010. The literature review does not represent an exhaustive review.

In total five articles were identified and reviewed namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159;

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

- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012;
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;
- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

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

In terms of the proposed project the most relevant study is the Urbis study (2016). The authors of the study found that appropriately located wind farms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values. In this case of the proposed Highlands WF the issue of appropriate location has been raised by owners of adjacent game farming operations.

# 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;
- The municipal level socio-economic context.

## 3.2 ADMINISTRATIVE CONTEXT

The proposed Highlands WF is located in the Blue Crane Route Local Municipality (BCRLM), within the Eastern Cape Province. The Blue Crane Route Local Municipality (BCRLM) is one of nine local municipalities that make up the Sarah Baartman District Municipality (SBDM), previously known as the Cacadu DM (Figure 3.1). The other eight LMs are the Camdeboo, Ikwezi, Makana, Ndlambe, Sundays River Valley, Baviaans, Kouga and Kou Kamma Local Municipalities (LMs). The Nelson Mandela Metropolitan Municipality (NMMM) is surrounded on all sides by the LMs that make up the SBDM. There are three National Parks located within the SBDM, namely the Addo Elephant National Park, Tsitsikamma National Park and Camdeboo National Park. These parks are managed by the South African National Parks Board.

The Sarah Baartman District Municipality (SBDM) is the largest (58 243 km2) of the six (6) District Municipalities in the Eastern Cape Province. The other five DMs and are the Amatole (DC12), Chris Hani (DC13), Ukhahlamba (DC14), Oliver Tambo (DC15) and Alfred Nzo (DC44) DMs. There are also two metros in the Province, namely the Nelson Mandela Bay Metro (NMBM) and Buffalo City Metro. The District is situated in the western portion of the Eastern Cape, bordering the Western Cape, Northern Cape and two other District Municipalities in the Eastern Cape, the Chris Hani District Municipality and Amathole District Municipality.

The town of Somerset East serves as the administrative centre of the BCRLM. The main settlements in the municipality are Somerset East, which serves as the administrative and commercial centre, Cookhouse and Pearson. The most significant roads passing through the area are the N10, R61, R63, and the R390. The administrative seat of the SBDM is currently located in the Nelson Mandela Bay Metro area, with disaster centres located throughout the district.

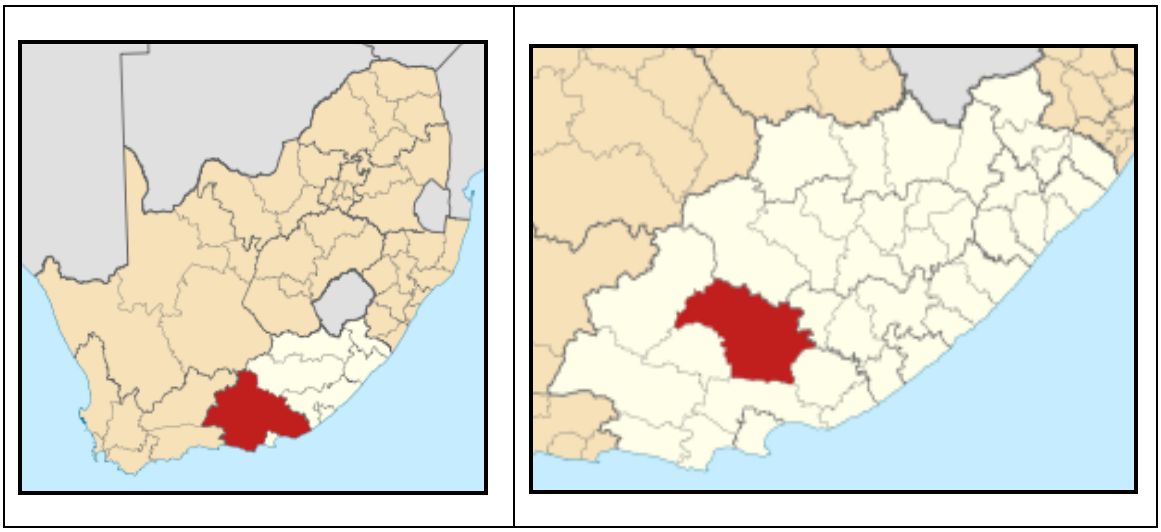


**Figure 3.1: Location of Sarah Baartman District Municipality (left) and Blue Crane Route Local Municipality (right) within the Eastern Cape Province (white) *(Source: Wikipedia)***

## 3.3 PROVINCIAL SOCIO-ECONOMIC CONTEXT[18]

The proposed WEF is located in the Eastern Cape Province, which is divided into six district municipalities (DMs) and two Metropolitan Areas (see above). The province faces significant social challenges: namely, addressing poverty, income inequality, food insecurity, and unemployment.

***Population***

According to the 2011 census, the province was home to 6.7 million people, which constituted 12.7% of the national population. This makes the Eastern Cape the third most populated province after Gauteng (12.2 million) and KwaZulu-Natal (10.2 million). The Province's population grew by 4.5% between 2001 and 2011. The demographics for the Province also indicate that 57% of the total population were under the age of 30, while the median age was 22.4, the second lowest after the Limpopo Province. The national average in 2011 was 24.4.

In terms of population distribution the OR Tambo DM (21%), NMBM (17%), Amotole (14%), and Buffalo City Metropolitan Area (12%), account for 64 % of the Provinces' population. The Cacadu DM makes up 7 % of the provinces total population. It is also important to note that youth constitute the largest share of the population in all DMs.

The average life expectancy for males in the Eastern Cape Province was 50.2 years in 2011. Only KwaZulu-Natal and the Free State Province had life expectancy estimates lower than the Eastern Cape Province at 48.4 and 44.9 years respectively. Average life expectancy for the South African male population between the years 2006 and 2011 was only 52.1 years. Males in the Western Cape Province had the highest life expectancy rate of 59.9 years followed by Limpopo at 55.8 and Gauteng at 54.4. Female expectancy in the Eastern Cape was 54 years for the period 2006 to

[18] The majority of the information in this section is based on a study undertaken by the University of Pretoria in 2013, titled Eastern Cape Socio-economic Review and Outlook, 2013.

2011, also lower than the national average of 56 years. The figures for the Western Cape and Limpopo were 65.8 years and 61.4 years respectively (Eastern Cape, Socio-economic Review and Outlook, 2013).

**Poverty and inequality**

As study undertaken by the University of Pretoria in 2013 (Eastern Cape, Socio-economic Review and Outlook, 2013) which used the Fuzzy Index of Poverty (FIP) to measure poverty[19] found that the Eastern Cape Province had the highest poverty levels in South Africa in 2011 (Figure 3.2).

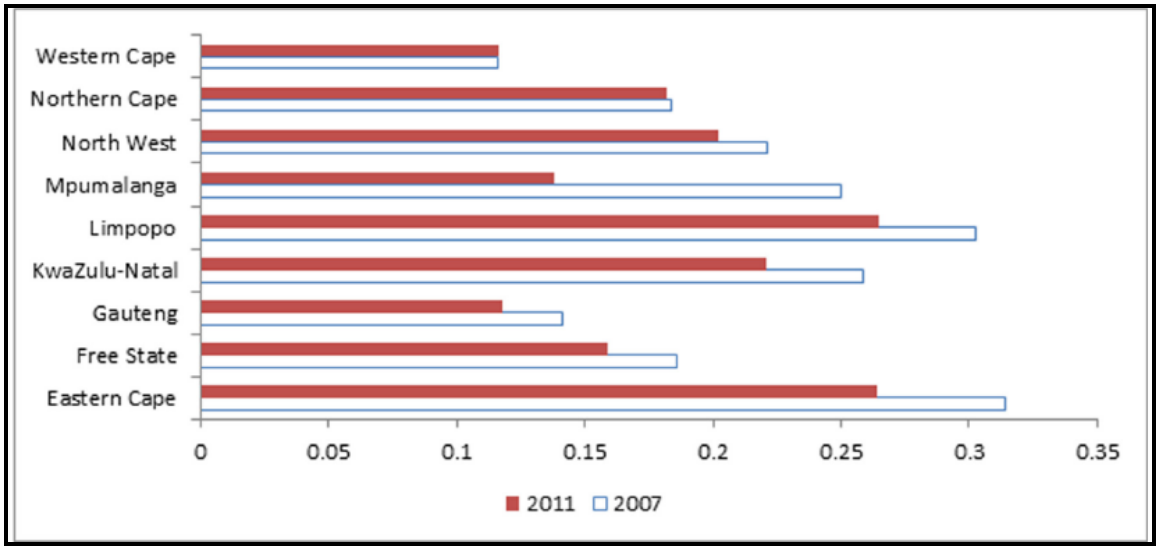



**Figure 3.2: Provincial poverty levels in SA**

Source: Eastern Cape, Socio-economic Review and Outlook, 2013

Within the province itself the poorest districts in 2011 were the Alfred Nzo followed by the O.R. Tambo and Amatole DMs. After the Nelson Mandela Bay Metro the SBDM was ranked the second best in terms of poverty levels (Figure 3.3).

In terms of inequality, South Africa is one of the most unequal societies in the world. According to data from IHS Global Insight, income national inequality, measured in terms of Gini Coefficient, was 0.68 in 2002 and fell marginally to 0.63 in 2011. The data from the Eastern Cape indicates that income inequality has fallen marginally in all DMs in the province. Three DMs in particular, namely, the O.R. Tambo, Alfred Nzo, and Amatole DMs were among those that managed to reduce inequality at a relatively higher pace than the others. The inequality level in the SBDM was 0.64 in 2011, which is marginally higher than the national figure of 0.63. Income equality however, remains major challenge facing the Eastern Cape Province.

[19] The FIP approach does not rely on a monetary poverty line, but used a the FIP uses a set of 12 indicators of well-being to measure poverty levels, namely, employment, municipal services (such as refuse collection, access to water, access to toilet, and access to electricity for lighting, cooking, and heating), type of dwelling, education, income, household size, and access to means of communication such as cell phones.

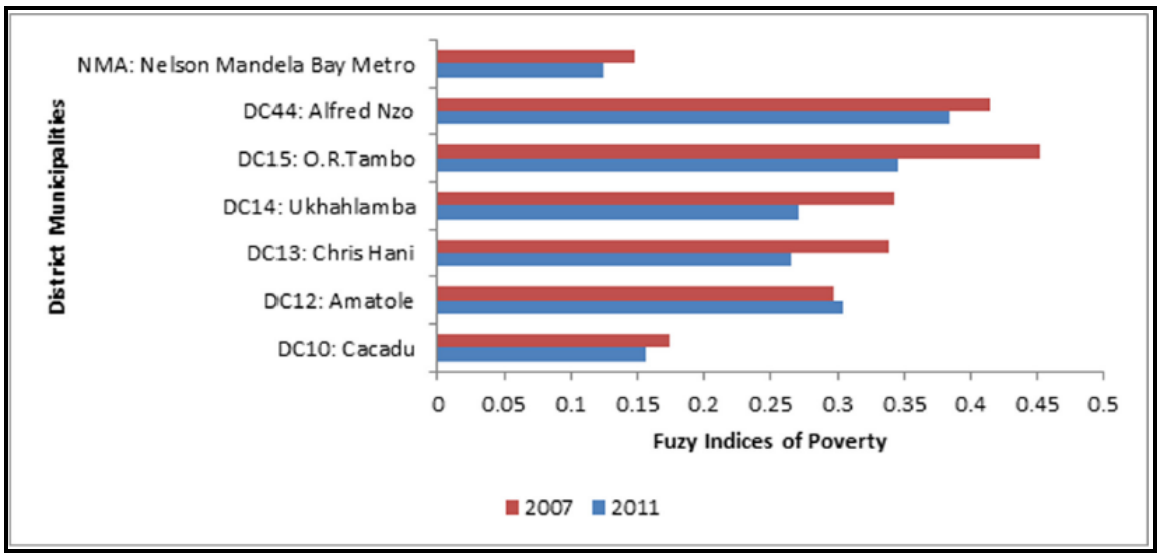



**Figure 3.3: Poverty levels with the Eastern Cape Province**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013

**Food security**
The Eastern Cape has one of the highest levels of food insecurity in South Africa. According to the estimates, about 78% of the households in the province may be classified as food insecure. This is significantly higher than national average of 64% (Eastern Cape, Socio-economic Review and Outlook, 2013).

Vulnerability to food insecurity is widespread, particularly among households in Alfred Nzo, Chris Hani and O.R Tambo DMs (81-86%). Food insecurity is relatively lower in the SBDM (66%-71%) and less prevalent in the Western regions of the Eastern Cape (Figure 3.4). Within the SBDM the food insecurity levels in the BCRLM are between 40-60% of households, which makes the BCRLM one of the least food-insecure LMs in the DM.

The majority of households in the province that are affected by food insecurity are located in the rural areas. A number of these are also headed by females, have larger family sizes, and have higher dependency ratios.

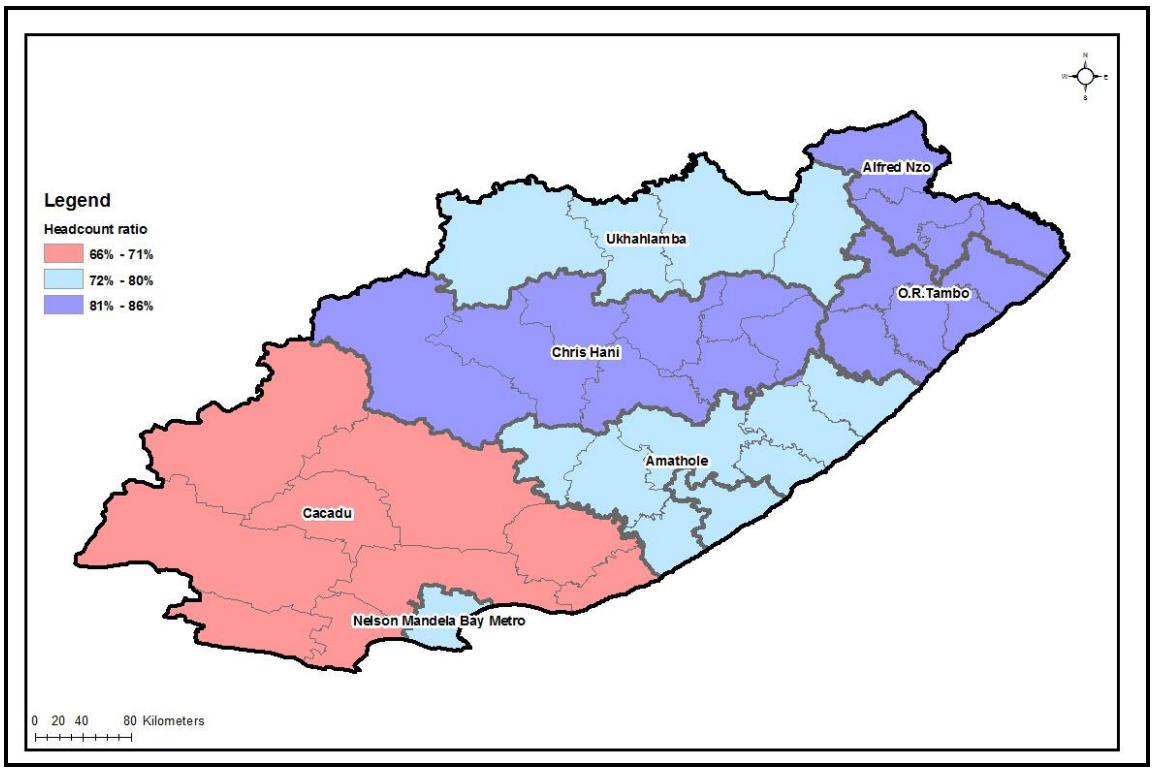



**Figure 3.4: Food Insecurity in the Eastern Cape**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013

**Economic Performance**

The Eastern Cape Province accounted for 7.8% of the national GDP in 2011 making it the fourth largest economy in South Africa, although only marginally ahead of the North West, Mpumalanga and Limpopo. Gauteng (35%) is the biggest contributor to the national economy, followed by KwaZulu-Natal (16.4%) and the Western Cape (14.8%). It is also worth noting that the contribution of the Eastern Cape Province to national GDP has fallen marginally since 2002 (Figure 3.5).

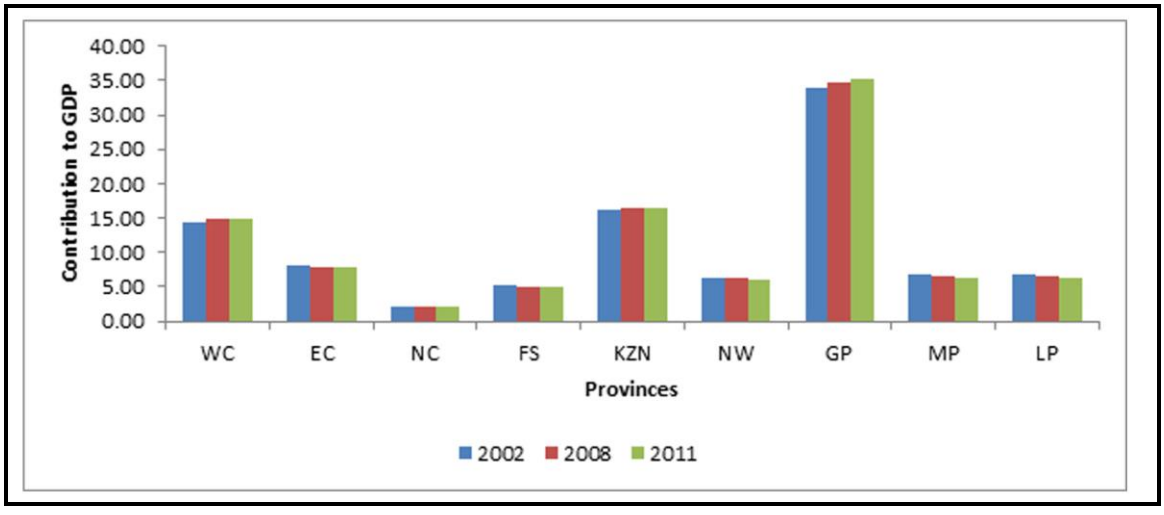



**Figure 3.5: Provinces' Contribution to GDP**

In terms of sectors the most important sector in the Eastern Cape economy is the tertiary sector, which contributed 76.7% of the regional GDP, followed by the secondary sector (21.2%), and the primary sector (2.2%). Within the tertiary sector the most important sub-sectors were finance, real estate and business services (22.4%), general government services (21.2%) and wholesale and retail trade (13.8%). Within the Secondary Sector the most important sub-sectors were manufacturing (17.5%), followed by construction (2.6%). The most important sub-sector in the Primary Sector was agriculture, forestry and fishing (2.1%) followed by mining and quarrying (0.1%)(Table 3.1).

In terms of contribution of the provincial GDP, the NMBM (43%) and Buffalo City Metropolitan Area (23%) are the two most important areas, followed by the Amotole DM (9%) and the SBDM and OR Thambo DM with 7% each in 2011 (Figure 3.7). The contribution of the SBDM to the Province's GDP has remained constant since 2002.

**Table 3.1: Sectoral contribution to Provincial economy**

| Sectors | 2002 | 2011 | % Point Change |
|---|---|---|---|
| Primary Sector | 2.7 | 2.2 | -0.5 |
| Agriculture, forestry and fishing | 2.5 | 2.1 | -0.5 |
| Mining and quarrying | 0.2 | 0.1 | -0.1 |
| Secondary Sector | 22.3 | 21.2 | -1.2 |
| Manufacturing | 19.6 | 17.5 | -2.2 |
| Electricity, gas and water | 1.1 | 1.1 | 0.0 |
| Construction | 1.6 | 2.6 | 1.1 |
| Tertiary Sector | 75.0 | 76.7 | 1.7 |
| Wholesale & retail trade | 14.5 | 13.8 | -0.7 |
| Transport, storage and communication | 8.8 | 8.9 | 0.1 |
| Finance, real estate and business services | 20.1 | 22.4 | 2.4 |
| Personal services | 10.2 | 10.3 | 0.1 |
| General government services | 21.5 | 21.2 | -0.2 |
| All industries at basic prices | 100 | 100 | |

Source: Eastern Cape, Socio-economic Review and Outlook, 2013

In terms of key sectors in each of the DMs, as in the case at provincial level, the tertiary sector is the largest sector in all DMs followed by the secondary sector. In 2011 the contribution of the tertiary sector in each DM's GVA ranged between 63% (in Nelson Mandela Bay Metro) to 82% (in O.R Tambo DM). The secondary sector is the second largest sector. While the contribution of the primary sector was low for each of the DMs, the contribution of the primary sector to GVA was the highest in the SBDM DM (8.7%). However, the contribution of the primary sector to GVA in all of the DMs declined between 2002 and 2011. The decline was most significant in the SB and Ukhahlamba DMs (Table 3.2). The low contribution of the primary sector to the GVA of the DMs and the decline over time is a concern given high number of rural households in these areas and the province as a whole.

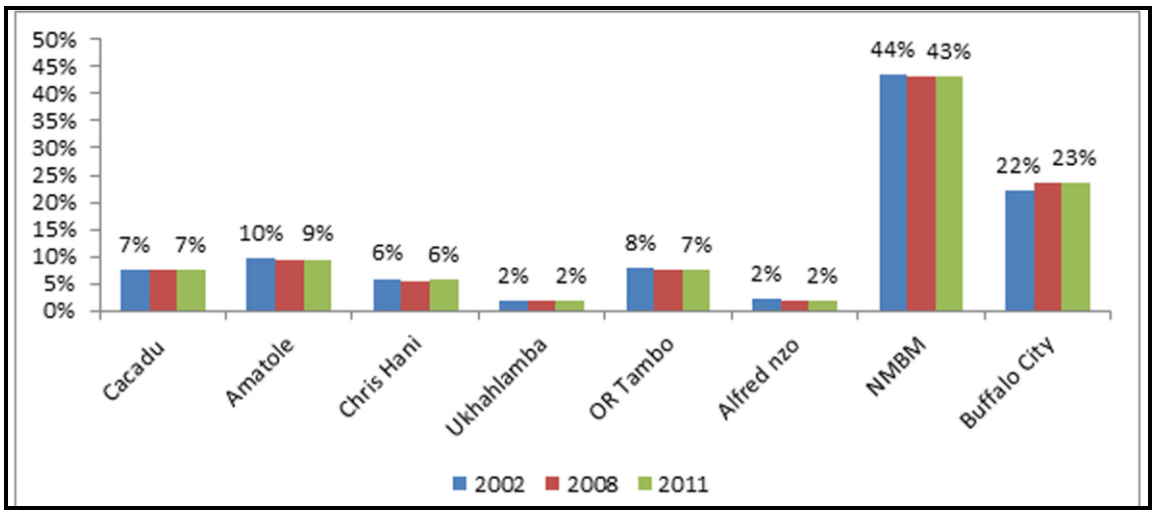



**Figure 3.6: Contribution of District Municipalities to Provincial GDP**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013

**Table 3.2: Sectoral Shares of GVA by District Municipality in the Eastern Cape (%)**

| | Cacadu | | Amatole | | Chris Hani | | Ukhahlamba | | O.R Tambo | | Alfred Nzo | | NMBM | | Buffalo City | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 | 2002 | 2011 |
| Primary | 10.4 | 8.7 | 3.0 | 2.6 | 4.9 | 4.3 | 8.3 | 7.2 | 4.4 | 4.3 | 3.5 | 2.9 | 0.4 | 0.3 | 1 | 1 |
| Agriculture | 10.4 | 8.6 | 2.8 | 2.5 | 4.8 | 4.2 | 8.3 | 7.2 | 4.4 | 4.3 | 2.6 | 2.5 | 0.2 | 0.2 | 1 | 1 |
| Mining | 0.0 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.4 | 0.2 | 0.1 | 0 | 0 |
| Secondary | 12.2 | 13.4 | 15.6 | 15.1 | 8.6 | 8.6 | 13.4 | 12.2 | 5.5 | 5.7 | 4.6 | 4.9 | 26.5 | 24.8 | 20 | 20 |
| Manufacturing | 8.2 | 7.7 | 13.9 | 12.7 | 5.6 | 4.6 | 11.4 | 9.5 | 3.6 | 3.1 | 2.7 | 2.2 | 24.2 | 21.7 | 17 | 16 |
| Electricity | 2.0 | 2.1 | 0.5 | 0.5 | 1.1 | 1.1 | 0.6 | 0.6 | 0.7 | 0.6 | 0.6 | 0.6 | 1.0 | 1.0 | 1 | 1 |
| Construction | 2.0 | 3.6 | 1.2 | 1.9 | 1.9 | 2.9 | 1.4 | 2.1 | 1.3 | 2.0 | 1.3 | 2.0 | 1.3 | 2.2 | 2 | 3 |
| Tertiary | 68.1 | 68.9 | 70.6 | 71.2 | 76.7 | 77.8 | 66.5 | 68.7 | 81 | 81.5 | 79.3 | 79.8 | 61.5 | 62.9 | 69 | 69 |
| Trade | 12.6 | 13.6 | 12.7 | 11.8 | 15.2 | 13.5 | 9.0 | 7.9 | 18.2 | 16.2 | 23.9 | 20.5 | 11.6 | 11.4 | 12 | 12 |
| Transport | 5.9 | 6.6 | 3.2 | 3.1 | 6.1 | 5.2 | 3.6 | 3.1 | 3.6 | 3.3 | 2.9 | 2.2 | 11.3 | 11.4 | 7 | 7 |
| Finance | 18.8 | 19.0 | 14.6 | 17.0 | 10.8 | 13.7 | 9.1 | 12.2 | 15.7 | 17.8 | 5.4 | 6.7 | 18.4 | 19.9 | 22 | 25 |
| Community | 30.7 | 29.8 | 40.1 | 39.2 | 44.6 | 45.4 | 44.7 | 45.5 | 43.5 | 44.2 | 47.1 | 50.5 | 20.2 | 20.2 | 28 | 25 |
| Total GVA | 90.7 | 91.0 | 89.2 | 88.9 | 90.2 | 90.7 | 88.1 | 88.1 | 90.9 | 91.4 | 87.4 | 87.6 | 88.4 | 88.0 | 89 | 89 |
| Taxes less Subs | 9.3 | 9.0 | 10.8 | 11.1 | 9.8 | 9.3 | 11.9 | 11.9 | 9.1 | 8.6 | 12.6 | 12.4 | 11.6 | 12.0 | 11 | 11 |
| Total | 100 | 100 | 100.0 | 100.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*Source: Eastern Cape, Socio-economic Review and Outlook, 2013. Computation based on data from Global Insight*

**Employment**
In terms of employment a total of 1.3 million people were employed in the Eastern Cape in 2011, which makes up 9.7% of the total number of people employed in the whole country. This makes the Eastern Cape the fourth largest employer after Gauteng (30.7%), KwaZulu-Natal (18.6%), and the Western Cape (13.2%)(Eastern Cape Socio-economic Review and Outlook, 2013).

The rate of unemployment in the province increased from 28.2% in the 3rd Quarter of 2011 to 30% in the 3rd Quarter of 2012, an increase of 1.8 percentage points. This is despite a 2.5% increase in employment. This simultaneous increase in both

the unemployment rate and employment levels is explained by an increase in the total size of the labour force (by 5%), in excess of the increase in the total number of new jobs (Eastern Cape, Socio-economic Review and Outlook, 2013).

The majority of the employed (68%) were between the ages of 30 and 55. However, the youth defined as people between the ages between 15 and 30 years accounted for only 21.3% of the total number of employed people. This is despite the situation where this group make the majority of the working age population in the Province (51%). In terms of key sectors, more than 60% of the 1.3 million people employed in the province in the third quarter of 2012 were employed in three sub-sectors, namely, government social and personal services (26.1%), wholesale and retail (23.5%), and manufacturing (12.2%). The primary sectors, comprising mining and quarrying (0.1%) and agriculture, forestry, hunting and fisheries (4.5%) employed far fewer numbers of people. As indicated in Figure 3.7 the role of the agriculture, forestry, hunting and fisheries sub-sector in terms of employment has fallen significantly since 2002. The share of Agriculture, forestry, hunting and fisheries declined to 4.5% from 21.1%, a significant decline of 16.6 %. During the same period all of the other sub-sectors reported an increase in their contribution to employment (Eastern Cape, Socio-economic Review and Outlook, 2013).

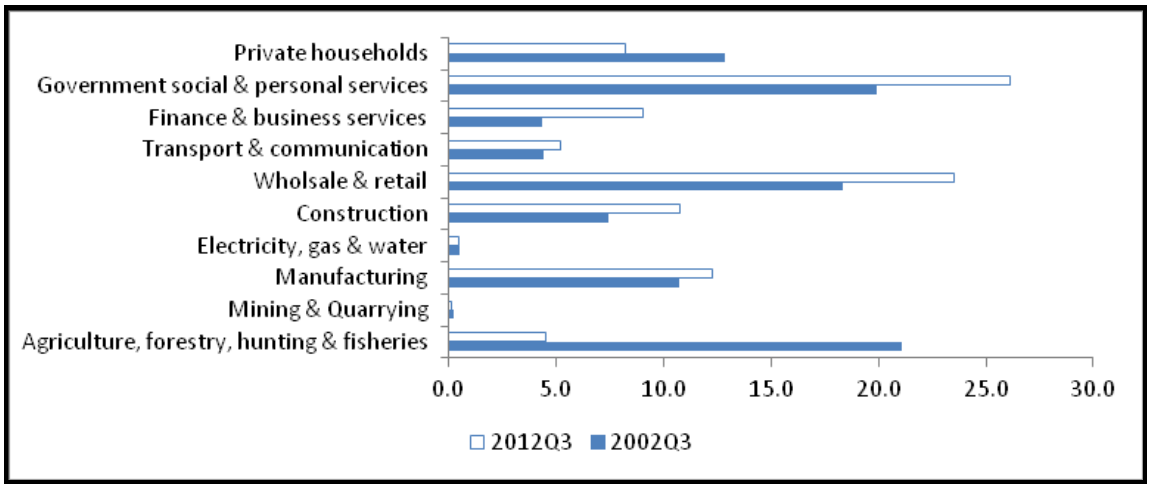



**Figure 3.7: Employment by sector**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013

In terms of employment by occupation category, in 2008, elementary occupations made up of 28.4% of total employment, followed by service workers and shop and market sales at 13.4% and technical and associate professionals at 11.4%. In 2011, elementary activities decreased to 24.1% while employment in service workers and shop and market sales workers as well as technical and associate professionals increased respectively to 14.9% and 14.4% (Figure 3.8). Between the two years, employment declined in the unskilled job categories while employment in the semi-skilled and skilled categories increased – evidence of skill-biased employment growth. This reflects the decrease in the contribution of the agriculture, forestry, hunting and fisheries sectors which would have employed a large number of unskilled workers.

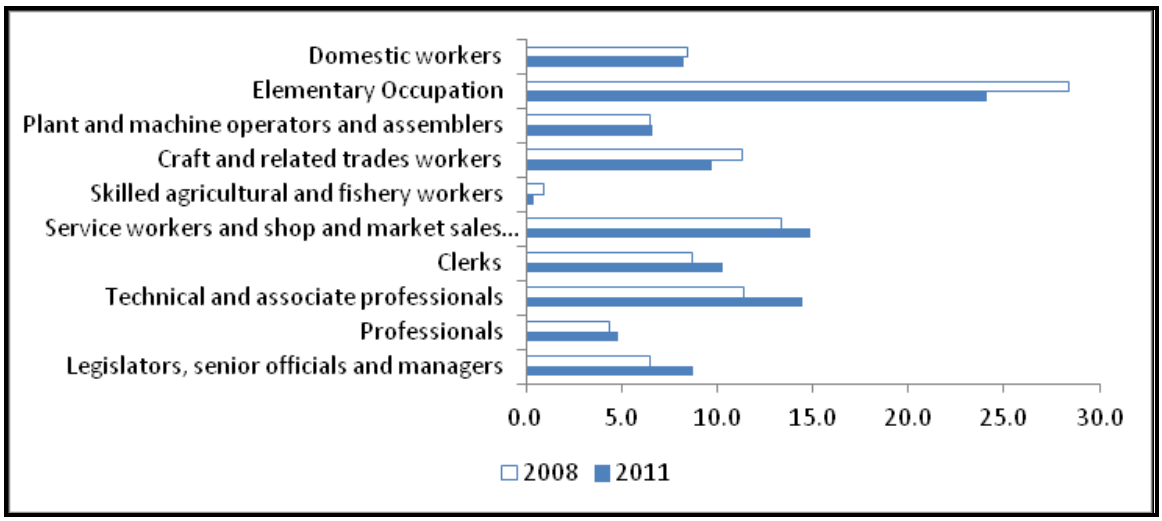



**Figure 3.8: Employment by Occupation**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013.

In terms of employment in the DMs, over 50% of the 1.3 million people employed in the province were employed in the NMBM and Buffalo City Metropole. These two areas accounted for 30% and 23% of the total provincial employment respectively. The remaining, namely, Cacadu, Amatole, and O.R Tambo DMs accounted for 10.9%, 10.8%, and 9.5% of the total provincial employment respectively (Figure 3.9).

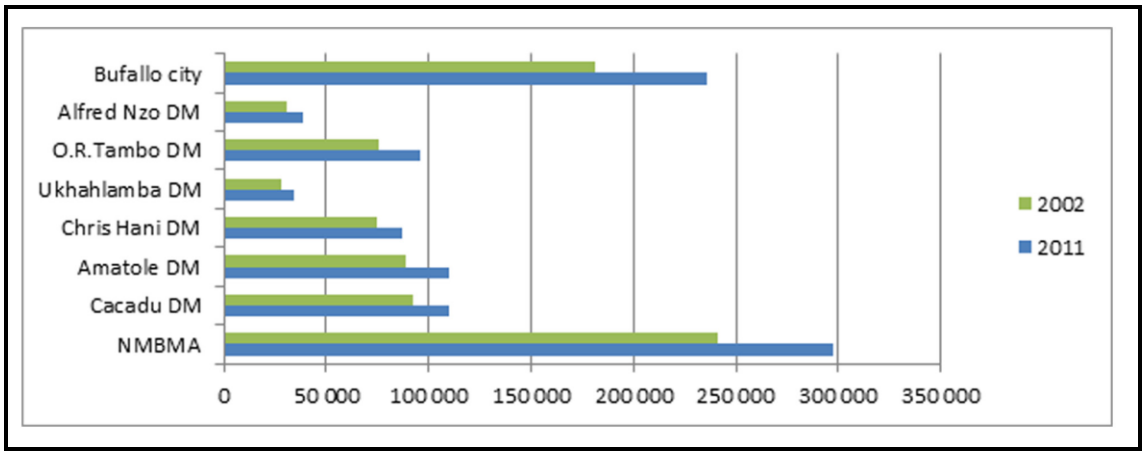



**Figure 3.9: Employment in the District Municipalities**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013.

While all of the DMs and the Metros managed to reduce the rate of unemployment over the period 2002-2011, the average rate of unemployment the Eastern Cape Province in 2011 (31%) remained higher than the national rate of 24.7%. Of the DMs only the Cacadu DM with an unemployment rate of 23.7% had a rate of unemployment that was lower than the national average. The unemployment in the remaining DMs was Alfred Nzo DM, 51.8%, followed by the O.R Tambo DM, 48.4%, Amatole DM, 46.8%; Chris Hani, 39.1%; and Ukhahlamba DM, 37.4% (Figure 3.10). The Buffalo City Metropolitan Area (35.8%) and NMBM (35.3%) also had high rates of unemployment that were above both the provincial and national averages.

In terms of employment the most important sector in all of the DMs and Metros is Community Services. In the Alfred Nzo and Amatole DMs the Community Services sector accounted for 45% of total employment. The figures for the O.R Tambo, Chris Hani, Cacadu, NMB, and Buffalo City Metro were 43%, 42%, 22%, 26%, and 32% respectively. The Trade an Agriculture sector are the next two most important sectors in terms of employment. The figures for the Trade sector were NMBM (20.7%), Buffalo City Metro (22.6%), Amatole (17%), O.R Tambo (17.1%), and Alfred Nzo (20%). The key employment sectors in the Cacadu DM were Community Services (~24%), Trade (~23%) and Agriculture (~22%). However, while the contribution towards employment in the Community Services and Trade sectors increased between 2002 and 2011, the contribution of the Agriculture sector declined significantly over the same period.

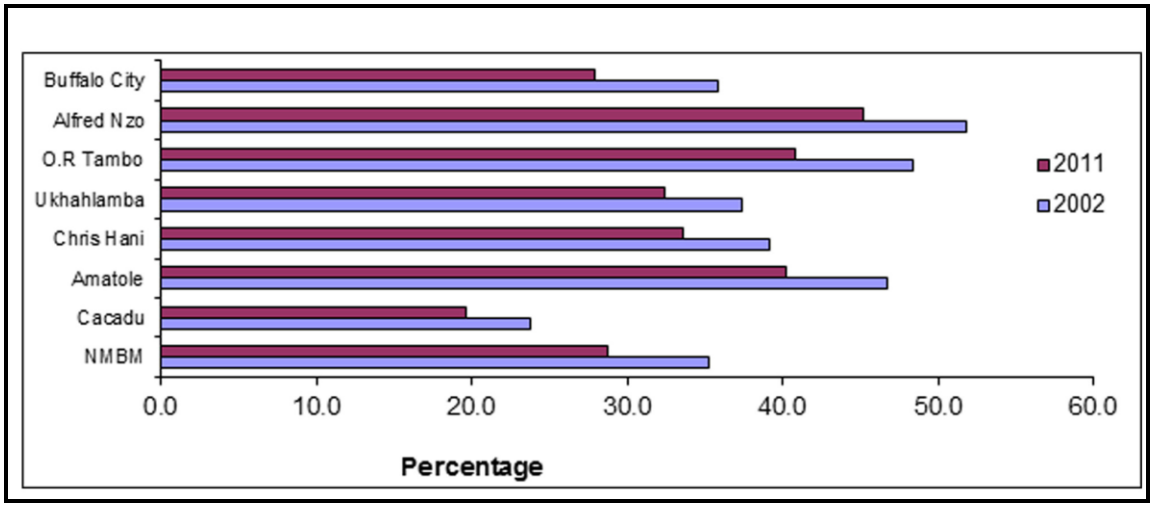



**Figure 3.10: Unemployment rate in District Municipalities**
Source: Eastern Cape, Socio-economic Review and Outlook, 2013.

The Manufacturing sector also accounted for sizable proportion of employment in the province. However, total employment in manufacturing significantly declined in the metros between 2002 and 2011. The share of agriculture in total employment also declined in all the metros and DMs for the same period. As indicated above the decline was significant in both the Cacadu and Ukhahlamba DMs, where it is relatively important economic activity. In Cacadu DM the contribution decreased by 10.8 %.

## 3.4 MUNICIPAL-LEVEL SOCIO-ECONOMIC CONTEXT

**Population**
As indicated in Table 3.3., the population of the SBDM increased by from 388 206 in 2001 to 450 584 in 2011, which represents an increase of ~ 16%. The population of the BCRLM increased marginally from 35 407 in 2001 to 36 002 in 2011 (~ 0.1%) over the same period. This represents an average annual increase of ~ 1.49 % and 0.17% for the SBDM and BCRLM respectively. The increase in the population in the both the SBDM was linked to an increase in the 15-64 and 65 and older age group, while the increase in the BCRLM was linked to the 65 and older group. There was a decrease in the less than 15 age group in both the SBDM and BCRLM. This is likely to reflect a situation where the majority of job seekers in the 15-64 age group are

single males who have not settled down and started a family in the area. As expected, the number of households in both the SBDM and BCRLM increased between 2001 and 2011. The size of the household sizes in both areas has decreased marginally, namely from 3.7 to 3.3 (SBDM) and 3.6 to 3.5 (BCRLM).

The majority of the population is in the BCRLM was Black African (59%), followed by Coloured (33%) and Whites (6.8 %)(Census, 2011). The dominant languages within the Municipality are isiXhosa (50.1%), Afrikaans (42.2%) and English (3.3%)(Census 2011).

The dependency ratio in both the SBDM and BCRLM decreased from 54.3 to 52.0 and 55.7 to 56.8 respectively. The decrease represents a positive socio-economic improvement by indicating that there are a decreasing number of people dependent the economically active 15-64 age group. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. It is also worth noting that the dependency ratios for both the SBDM and BCRLM were lower than the ratio for the Eastern Cape as whole, 66.0 in 2011. The dependency ratio for the BCRLM was however higher than the national average of 52.7.

In terms of percentage of formal dwellings, the number of formal dwellings in the SBDM increased from 63.2% in 2001 to 77.1% in 2011. In the BCRLM the number of formal dwellings increased from 90.0% to 95.9% for the same period. The increase in the number of formal dwellings in both the SBDM and is also reflected in the improvements in service delivery (see Table 3.2). The figures for the SBDM and BCRLM are also higher than the provincial figure of 63.2%.

**Employment**

The official unemployment rate in the SBDM and BCRLM decreased for the ten year period between 2001 and 2011. In the SBDM the rate fell from 35.4% to 24.9%, a decrease of 10.5%. In the BCRLM the unemployment rate decreased from a high 40.0% to 30.7%, a decrease of 9.3%. Youth unemployment in the both the SBDM and BCRLM also decreased over the same period. However, the youth unemployment rates in both the SBDM and BCRLM remain high at 31.4% and 40% respectively. This reflects the limited employment opportunities in the area, especially for the youth. However, the unemployment and youth unemployment levels in the SBDM and BCRLM are lower than the provincial level of 43.7%.

**Household income**

Based on the data from the 2011 Census, 12.2% of the households in the BCRLM have no formal income, 4.6% earn between 1 and R 4 800, 7.1% earn between R 4 801 and R 9 600, 24.8% earn between R 9 601 and R 19 500 and 24% earn between 19 601 and R 38 200 per annum (Census 2011). The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household. Based on this measure 72.7% of the households in the BCRLM population live below the poverty line. The low-income levels reflect the limited formal employment opportunities in the BCRLM. This is due the BCRLM s reliance on the agricultural sector. The low income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low income levels also result in reduced spending

in the local economy and less tax and rates revenue for the district and local municipality.

**Education**
The education levels in both the SBDM and BCRLM improved for the period 2001 t0 2011, with the percentage of the population over 20 years of age with no schooling in the SBDM decreasing from 15.3% to 7.5%. For the BCRLM the decrease was from a high of 19.8 % to 10.5%. The percentage of the population over the age of 20 with matric also increased in both the SBDM and BCRLM, from 15.4% to 20.3% in the SBDM and 11.7% to 18.9% in the BCRLM. Despite these increases the figures are significantly lower than the national (28.4%) average. Low education levels, specifically higher education, therefore remains a challenge in both the SBDM and BCRLM.

**Table 3.3: Overview of key demographic indicators for the SBDM and BCRLM**

| | SBDM | | BCRLM | |
|---|---|---|---|---|
| **ASPECT** | **2001** | **2011** | **2001** | **2011** |
| Population | 388 206 | 450 584 | 35 407 | 36 002 |
| Households | 100 308 | 125 632 | 9 595 | 9 671 |
| Household size (average) | 3.7 | 3.4 | 3.6 | 3.5 |
| % Population <15 years | 28.5 | 27.2 | 29.4 | 29.2 |
| % Population 15-64 | 64.8 | 65.8 | 64.2 | 63.8 |
| % Population 65+ | 6.7 | 7.0 | 6.3 | 7.0 |
| Dependency ratio per 100 (15-64) | 54.3 | 52.0 | 55.7 | 56.8 |
| Unemployment rate (official) - % of economically active population | 35.4 | 24.9 | 40.0 | 30.7 |
| Youth unemployment rate (official) - % of economically active population 15-34 | 43.7 | 31.4 | 49.7 | 40.00 |
| No schooling - % of population 20+ | 15.3 | 7.5 | 19.8 | 10.5 |
| Higher Education - % of population 20+ | 6.7 | 8.3 | 5.3 | 6.3 |
| Matric - % of population 20+ | 15.4 | 20.3 | 11.7 | 18.9 |

*Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet*

### 3.4.1 Municipal service levels

As indicated in Table 3.4, access municipal services as measured in terms of flush toilets, refuse removal, piped water and electricity, increased in both the SBDM and BCRLM for the period 2001 to 2011. The service levels in the SBDM and BCRLM are also higher than the provincial and national averages for each of the municipal service categories represented in Table 3.2. The improvement in service levels therefore represents a positive socio-economic improvement over the ten year period between 2001 and 2011.

**Table 3.4: Overview of access to basic services in the SBDM and BCRLM**

| Municipal Services | SBDM | | BCRLM | |
|---|---|---|---|---|
| | 2001 | 2011 | 2001 | 2011 |
| Formal Dwellings % | 77.1 | 85.7 | 90.0 | 95.9 |
| % households with access to flush toilet | 40.2 | 63.8 | 65.9 | 80.3 |
| % households with weekly municipal refuse removal | 68.3 | 78.7 | 65.9 | 80.3 |
| % households with piped water inside dwelling | 31.1 | 51.0 | 24.2 | 51.4 |
| % households which uses electricity for lighting | 72.0 | 87.3 | 65.1 | 86.9 |

*Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet*

## 3.5 LOCAL ECONOMY

The most important economic sectors in the SBDM in terms of contribution to local Gross Value Added-Regional (GVA-R) are Community Services (36%), Trade (18%) (which includes tourism), Finance (17%)(which includes Real Estate), Agriculture (7%), Manufacturing (7%) and Transport (7%)(Figure 3.11).

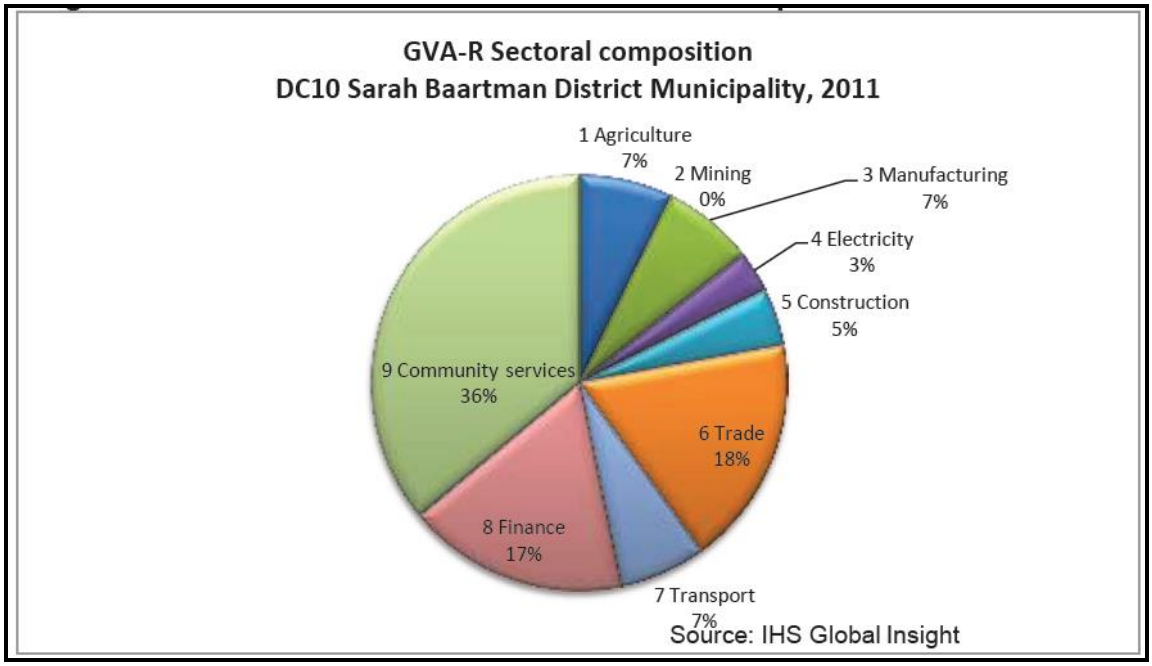



**Figure 3.11: Sarah Baartman DM GVA-R Sector composition**

Small-stock farming predominates in the dry Karoo interior. This is the centre of wool and mohair farming in the Eastern Cape. Karoo mutton is known for its high quality and is also exported. Cattle and dairy farming are dominant in the areas around Grahamstown, Cookhouse, Alexandria and Humansdorp. Stock production has seen a decline in the past decade, primarily as a result of game farm establishment and the expansion of the Addo National Elephant Park. Game reserves are now a major

industry within the district and contribute to the other prominent economic sector of the area, namely tourism.

The Langkloof valley is home to deciduous and stone fruit production. Major citrus farming areas are irrigated from the Sundays and Fish Rivers. Fruit is exported through Port Elizabeth. Commercial forestry is established around Tsitsikamma and Grahamstown. A small fishing industry operates from St Francis, centred on squid. Manufacturing, focused on agro-processing, is a relatively small sector, providing only 10% of value added and 7% of employment. Agro-processing is currently limited to food and dairy.

The tourism sector in the SBDM is well established and attractions include the Tsitsikamma National Park, Camdeboo National Park, Baviaanskloof Mega-Reserve (a World Heritage Site), Addo Elephant National Park and the coastal resorts of Jeffrey's Bay, St Francis Bay, Cape St Francis and Port Alfred. The towns in the Karoo, such as Graaff-Reinet, are also important tourist destinations. The IDP notes that the potential for growth in the tourism sector is significant. This will in turn have economic spin-offs in terms of retail, accommodation, hospitality etc.

The SBDM IDP notes that the agriculture and tourism contribute approximately R690 million and R680 million respectively to the Gross Geographic Product (GGP) of the SBDM. The IDP therefore identifies these two sectors as the sectors that have the greatest potential for economic development.

The IDP also notes that opportunities exist in the renewable energy sector. In this regard the IDP refers to the development of a number of wind generation initiatives in the SBDM, noting that eight of the thirteen approved wind farm developments in South Africa are located in the district. In addition, the Blue Crane Route region has been identified by the National Department of Environmental Affairs as one of three potential wind generation 'preferred locations' in the country.

The economy of the BCRLM is largely based on agriculture. The key economic activities include intensive farming operations (cash crops, lucerne, dairy etc.), extensive farming operations (cattle, sheep, goats and game farming) with the agricultural sector contributing 28% of all value added and accounting for 41% of formal employment.

The IDP notes that while the agriculture sector is a key sector its' role has declined in recent years. Manufacturing has also shown relatively weak growth over the past seven years and appears to have been hard hit by the recession of 2008. Construction growth has also been highly cyclical with a progressive decline over the past four years. In terms of growth sectors Trade (which includes retail and tourism) has shown consistently positive growth since 2009 and appears to have recovered rapidly after the recession. Transport has also shown consistently positive growth and rapid recovery after the recession. After a notable pre-recession property boom, finance (which includes real estate) is indicating positive growth once more. Community Services has also shown consistently positive growth since 2002 (SBDM IDP, 2015/2016 Review). The IDP also notes that while tourism spend has shown rapid growth over recent years is appears to have flattened out in recent years. In this regard there has been a decline in the number of international and domestic tourists since 2009. Despite the decline the tourism sector has been identified as an important growth sector. The renewable energy sector is also regarded as an important growth sector.

The BCRLM has also identified the need to broaden the local economy through the establishment of a strong industrial sector in smaller rural towns in order to create employment opportunities and make these towns more sustainable. The initiative to develop a stronger industrial sector is linked to the lack of value adding. In this regard the BCRLM IDP notes that the majority of the agricultural products are exported in their raw form with limited values adding. The IDP identifies the need to establish a local industrial cluster with the required facilities to address this issue.

## 3.6 OVERVIEW OF THE STUDY AREA

### 3.6.1 Introduction

The Highlands WF site is located ~17.2 km west of the town of Somerset East, within the BCLM. Somerset East is the largest of a small number of small urban settlements in this largely rural area. Other settlements include Pearston, Cookhouse and Bongeni. Pearston is located ~23 km to the north-west of the site. Access to the site is via the R63, which effectively forms the site's northern boundary (Figure 3.11), which is a tarred road linking Pearston, in the west, to Somerset East, in the east (Photograph 3.1). The R63 continues west of Pearston to link up with the R75 (Jansenville-Graaff-Reinet). To the east of Somerset East the R63 links up with the N10 at Cookhouse.

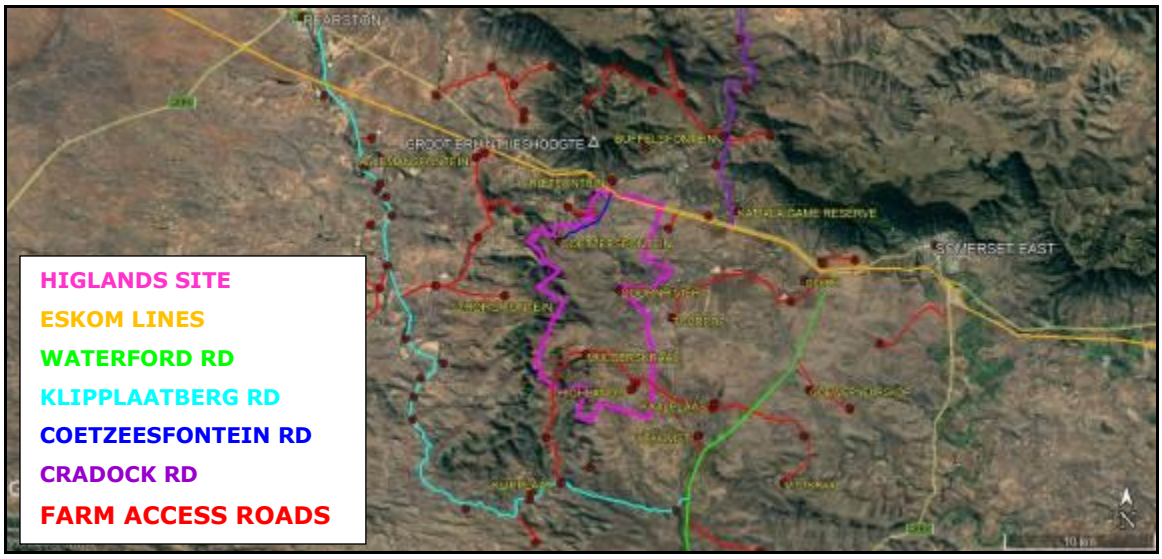



**Figure 3.11: Study area road network**

Apart from the R63, the road network in that serves the study area consists of a series of gravel roads that are all accessed off the R63. Farms comprising the North Phase – Rietfontein, Spaarwater and Coetzeesfontein - are accessed directly off the R63. Properties comprising the Central and South Phases are accessed off the Waterford Road, which links up with the R63 approximately 6 km west of Somerset East (Photograph 3.2). Alternative access from the R63 is provided by the Klipplaatberg Road which links up with the R63 on the eastern outskirts of Pearston. A servitude farm road via Klipplaat, Mulderskraal and Kaalplaas, linking the Klipplaatberg and Waterford Roads, is the only road which actually traverses the site.

The other farm roads are all dead-ends. This and the relatively poor state of the roads contribute to the isolated character and sense of place of the site.

**Photograph 3.1: View along R63 looking towards Somerset East near turnoff to Rietfontein**

**Photograph 3.2: Waterford Road turn-off from the R63**

The Cradock gravel road links up with the R63 approximately 5 km east of the site and provides access to the Kamala Game Reserve and Buffelsfontein Guest Farm located to the north of the R63. The road also provides clear views onto portions of the proposed WF site.

An Eskom corridor (66 kV and 132 kV line) runs parallel to the R63 in the vicinity of the WF site and traverses the northernmost portion of the site approximately 200m south of the R63 over a distance of approximately 3 km from east to west. The corridor swings north across the R63 approximately 450 m east of the intersection with the Coetzeesfontein farm road (Photograph 3.4) and continues westward north of the R63 up to the Bruinjieshoogte pass, before swinging south across the road again.

Apart from the road network, Eskom corridor and telecommunications infrastructure on Groot Bruintjieshoogte, there are no other significant service related infrastructure located in the study area.

**Photograph 3.3: View looking south west towards WF site from the Cradock gravel Road in vicinity of Buffelsfontein Guest Farm and Kamala Lodge**

**Photograph 3.4: Eskom 66 kV and 132 kV lines crossing the R63**

### 3.6.2 Land use and settlement pattern

The site is located in broken terrain associated with the transition to the Great Escarpment north of the site (of which Groot Bruintjieshoogte is a southern outlier). A minor, north-south aligned escarpment is located south of Bruintjieshoogte, effectively running across the western-most portion of the site and further south. The bulk of the site consists of hilly to undulating terrain (Photograph 3.5). East of the site towards the Waterford Road and beyond the terrain gradually levels out into a relatively flat, large plain (Photograoh 3.6). The drainage in the area drains into the Voël River and Little Fish Rivers located 10-15 km west and east (of the site) respectively. Few natural surface water features are located on the site and immediate surrounds.

**Photograph 3.5: Spaarwater farm yard (middle distance) located to the west of WF site viewed from Bruintjieshoogte Pass**

**Photograph 3.6: Flatter terrain on Rietfontein east of Spaarwater**

This topographical variation and associated differences in rainfall has resulted in mosaic of ecotones and a variety of habitats and associated veld types and fauna. Indigenous forest is associated with the south and west-facing portions of the escarpment(s). Karroid scrub (bossies-veld) dominates the higher-lying western portions of the site, transitioning eastwards into aloe grass-veld. Ephemeral drainage courses are lined with sweet-thorn woodland (Photograph 3.7).

The traditional and still dominant land use in the study area is commercial livestock farming. Unlike farms located along the Voël and Little Fish Rivers, the farms in the area cannot support water-intensive dairy or orchard cropping (e.g. citrus) operations. The mix of grass-veld and bossies-veld however allows for year-round grazing by beef cattle, sheep and goats. Many commercial farms farm or breed with a mix of beef cattle, dual-purpose sheep and angora goats (mohair) (Photographs 3.8-3.9).

**Photograph 3.7: Thornveld on Doornrivier**

**Photograph 3.8: Sheep grazing on Highlands Farm**

**Photograph 3.9: Stock pens on Spaarwater**

The grassveld consists of a mix of sweetveld and less palatable sour-veld. The farms are typically large - several thousand hectares in extent. Some farmers practice controlled burning (typically in 5-year cycles) in order to regenerate grass-veld succession. Unlike grass-veld, bossies-veld is much slower to regenerate from disturbances such as fires, often taking decades, and in the meantime posing an erosion-risk due to denudation. Some operations plant fodder crops for own use. These plantings are essentially limited in extent and confined to the vicinity of farm yards.

More recently, game farming has become an increasingly important activity in the area and is either combined with livestock farming or has in some cases replaced commercial livestock farming. The suitability to game farming is linked to the variety of game that the area can support (a function of the mosaic of ecotones), proximity to Port Elizabeth airport and location in a malaria free zone. Based on the findings of the sites visit the existing game farming operations are located within a continuous band within 5-10 km along the eastern boundary of the proposed Highlands WF site. The game farming includes operations based on Buffelsfontein, Kamala Game Reserve, Kaalplaas (East Cape Safaris), Klipplaat (Side by Side Safaris), and possibly more (e.g. Driefontein). These operations focus primarily on the overseas trophy-hunting market and attract high-end visitors to the area (Nolte, pers. comm). The game farms also provide benefit other sectors of the local economy in Somerset-East, including local suppliers (groceries, etc.), taxidermists and other operations.

Due to the broken topography and the extensive nature of farming activities, the settlement pattern in the study area is sparse and largely concentrated along major roads. Farms located in close proximity to the R63, Waterford Road or Klipplaat Road tend to be inhabited. Labourer's housing is typically located in the immediate periphery of farm yards. Large operations (such as Rietfontein) may have up to 10 resident farm worker households. More isolated farms (which make up the majority of farms on the WF site) are typically farmed as stock-posts inhabited by a small number of supervising staff. Most of the relevant owners own farming operations in other parts of the broader region, such as Graaff-Reinet, Cookhouse and Middleton, and deploy staff to the study area farms on an as-needed base. The study area is located sufficiently close to Somerset-East to enable owners to transport permanent and casual labour in and out on a daily basis.

Based on field interviews, permanent direct employment associated with site farms and those in the immediate vicinity, ranges from none or only supervisory staff, to 10 for a large commercial farming operation such as Rietfontein, and 24 for Kaalplaas/ East Cape Safaris.

As a result of the isolated location of the majority of the WF site from major roads, the farms are not affected by stock-theft, poaching and veld fires caused by humans, all key risks to livestock and game farming operations.

### 3.6.3 Site properties

The Highlands WF site is comprised of properties owned by five different land owners (Table 3.5). Four of the owners are commercial farmers farming while the fifth is National Government who leases the land to two sets of emerging farmers with long lease (30-year) contracts in the offing (Fani, Mr Linda, per. comm).

**Table 3.5: Site properties and ownership**

| OWNER | EFFECTIVE USER | PROPERTY | FARM NAME |
|---|---|---|---|
| Highlands Trust | Brown, Mr Bill | Highlands 361/ RE | Highlands |
| Zirk Jordaan Familie Trust | Jordaan, Mr Zirk | Rietfontein 102/ RE<br>Also Bruintjieshoogteberg 60/4 | Rietfontein |
| GKW Gebou Trust | Kemp, Mr Renier | Spaarwater 103/RE<br>104/6<br>Also Bruintjieshoogteberg 60/2 | Spaarwater |
| National Government | Fani, Mr Linda<br>Fani, Mr Simpewe | Coetzees Fontein 104/RE; 104/1; 104/2<br>Doorn Rivier 105/2<br>The Outspan 106/RE<br>Nels Kraal 143/RE<br>Kiepersol 146/1<br>Also 106/RE | Doornrivier |
| National Government | Nelani, Mr Thozi | Nelskom 144/RE<br>De Mullers Kraal 145 | Mulderskraal |
| Jakkie Nel Trust | Nel, Mr Jakkie | Lekker water 101/2<br>Coetzees Fontein 104/5<br>Also 104/3 | Coetzeesfontein |

Portions of three cadastral units belonging to three farms do not form part of the WF site (Figure 3.12). These are the portion of Rietfontein (Mr Zirk Jordaan) north of the R63, the western portion of Spaarwater (Mr Renier Kemp), and the western and southern portions of Coetzeesfontein (Mr Jakkie Nel). In the case of Rietfontein, the excluded portion is the inhabited portion of the property. In the case of Spaarwater and Coetzeesfontein, the excluded portion is largely comprised of steep terrain associated with the (western) escarpment.

Farmsteads are located on all six site farming operations, albeit with those on Rietfontein (Photograph 3.10) and Spaarwater located on the portions excluded from the WF site. The farmsteads located on Doornrivier (Fani Brothers; Photograph 3.11) and Mulderskraal (Mr Thozi Nelani) do not form part of the Highlands site. As such, only the farmsteads on Coetzeesfontein and Highlands (Photograph 3.12) are located on the WF site.

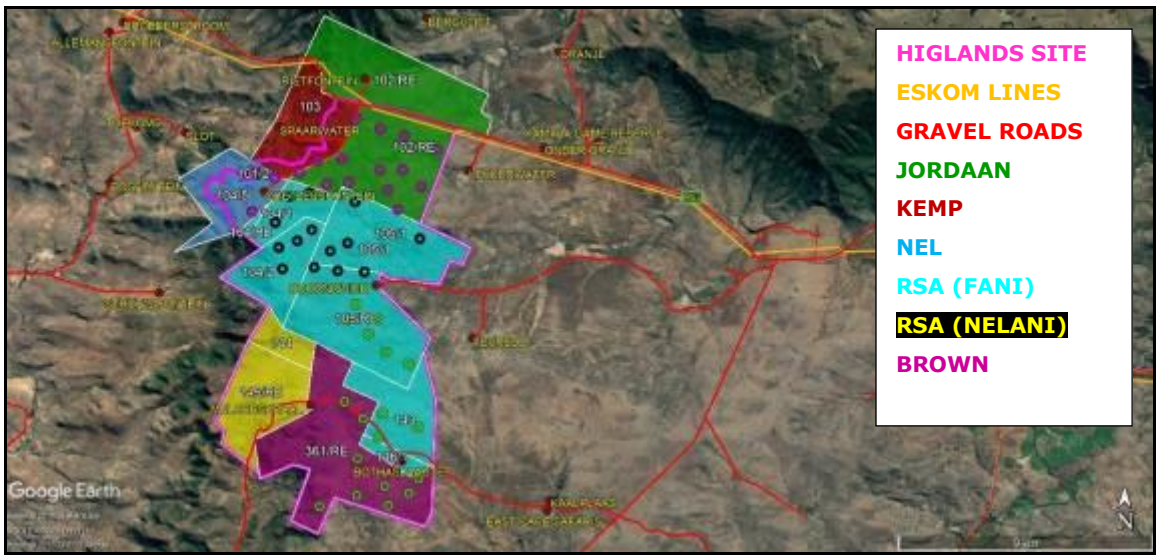



**Figure 3.12: Affected properties and land owners. Pink circles indicate turbines proposed for North Phase; black for Central Phase, and green for South Phase.**

**Photograph 3.10: Sheep and farmstead on portion of Rietfontein located north of the R63**

**Photograph 3.11: Currently uninhabited farm house on Doornrivier. Four worker households live permanently on the farm.**

**Photograph 3.12: One of two uninhabited farmsteads on Highlands Farm**

With the exception of Rietfontein (portion excluded from site), none of the site farms are inhabited by their owners or main tenants (Table 3.6).

**Table 3.5: Site properties land use**

| OWNER/ USER | FARM NAME | PRIMARY LAND USE | INHABITED | COMMENT |
|---|---|---|---|---|
| Brown, Mr Bill | Highlands | Extensive livestock farming | Yes | Inhabited by staff only |
| Jordaan, Mr Zirk | Rietfontein | Extensive livestock farming | Yes | Only non-site portion (N of R63) inhabited |
| Kemp, Mr Renier | Spaarwater | Extensive livestock farming | No | Owner resides in Graaff-Reinet |
| Fani, Mr Linda Fani, Mr Simpewe | Doornrivier | Extensive livestock farming | Yes | Inhabited by staff only |
| Nelani, Mr Thozi | Mulderskraal | Extensive livestock farming | Yes | Inhabited by Mr Nelani Jr |
| Nel, Mr Jakkie | Coetzeesfontein | Extensive livestock farming | Yes | Main farming operation based in Middleton |

With the exception of Spaarwater, supervisory staff-reside on all the remaining site properties (Photographs 3.13-14). Rietfontein currently employs 10 tenured households (Zirk Jordaan, pers. comm), and Doornfontein 4 (Fani, Mr Lina, pers. comm). Only skeleton staff-reside on Highlands and Coetzeesfontein, with owners transporting labour in on when required from farming operations based elsewhere (Brown, Nel, pers. comm).

**Photograph 3.13: Labourer's house on Highlands. Only one household lives on Highlands, in a supervisory capacity**

**Photograph 3.14: House on Mulderskraal occupied by the son of the tenant, Mr Nelani. Mr Nelani resides in Somerset-East.**

The relevant properties are all primarily used for extensive livestock farming based on a mix of beef cattle, sheep and angora goats. Carrying capacity varies across the WF site from around 9-14 hectares per Large Stock Unit and is a function of grass-veld occurrence and type. The grazing resource is sufficiently productive to allow for year-round grazing. Properties are therefore typically stocked year-round. Cropping activities are very limited and limited to small plantings of fodder for own use near farmsteads.

Hunting takes place on a number of properties that make up the WF site but is largely limited to biltong hunting by the owner or at the owner's invitation. No commercial hunting or tourism activities take place on the WF site properties. Due to the physical isolation of the site, stock theft, poaching and veld fire incidence are not currently considered problematic. The only exception is the portion (camps) of Rietfontein located directly adjacent to the R63 (Zirk Jordaan, pers. comm).

### 3.6.4 Location of proposed turbines

Three owners (Jordaan, Kemp, Nel) would be affected by turbines proposed for the North Phase, one by the Central Phase (National Government – portion leased to Fani Brothers), and two by the South Phase (National Government – portion leased to Fani Brothers; Brown) (Table 3.6). While turbines for both the Central and South Phases are proposed on Doornrivier, none are proposed on Mulderskraal (National Government – portion leased to Mr Thozi Nelani).

**Table 3.6: WEF infrastructure proposed for site farms**

| OWNER | FARM | TURBINES | SUBSTATION | POWER LINE ALTS |
|---|---|---|---|---|
| Jordaan, Mr Zirk | Rietfontein | 13 X North | North (A) | North – Both Alts<br>Central – Both Alts<br>South – Both Alts |
| Kemp, Mr Renier | Spaarwater | 2 X North | Not affected | South – Both Alts (Buffer only)<br>Central – Both Alts (Buffer only) |
| Nel, Mr Jakkie | Coetzeesfontein | 2 X North | Not affected | Not affected |
| National Government (Fani Brothers) | Doornrivier | 14 X Central<br>6 X South | Central (B)<br>South Alt 1 (C1) | South – Both Alts<br>Central – Both Alts |
| Brown, Mr Bill | Highlands | 9 X South | South Alt 2 (C2) | South – Both Alts |
| National Government (Nelani, Mr Thozi) | Mulderskraal | None | Not affected | Not affected |

Turbines associated with one or more Phase would be located within what is considered distances of High (0-2.5km) or Medium-High (2.5-5 km) visibility[20] in relation to site farmsteads (Table 3.7).

**Table 3.7: Distances of site property farmsteads from proposed turbines**

| OWNER/ USER | FARM YARDS | TURBINE NORTH | TURBINE CENTRAL | TURBINE SOUTH |
|---|---|---|---|---|
| Brown, Mr Bill | Highlands | 9.2 km | 7.1 km | 600 m |
| Jordaan, Mr Zirk | Rietfontein | 1.4 km | 4.3 km | 7.8 km |
| Kemp, Mr Renier | Spaarwater | 1.8 km | 2.5 km | 6.56 km |
| Fani, Mr Linda<br>Fani, Mr Simpewe | Doornrivier | 2.7 km | 600 m | 950 m |
| Nelani, Mr Thozi | Mulderskraal | 7 km | 4.7 km | 1.2 km |
| Nel, Mr Jakkie | Coetzeesfontein | 650 m | 1.1 km | 5.1 km |

Turbines proposed for the North Phase are located <2.5 km from the farmsteads on Rietfontein, Spaarwater and Coetzeesfontein, and <5 km from the farmstead on Doornrivier. With regard to the Central Phase, Spaarwater, Doornrivier and Coetzeesfontein are located within 0.25 km of the nearest turbines, and Rietfontein and Mulderskraal within 5 km. Farmsteads located within 0.25 km of turbine for the South Phase are Highlands, Mulderskraal and Doornrivier, while all other site farmsteads are located more than 5 km from the nearest wind turbines.

Based on the findings of the site visit, none of the affected owners raised any issues or concerns regarding the proposed turbine placements. In general, the turbines are

[20] The Draft VIA (Lawson and Oberholzer, 2018: 15) uses the following methodology for defining degrees of visibility of turbines based on distance alone:

- High visibility: Prominent feature within the observer's viewframe 0-2.5km;
- Mod-high visibility: Relatively prominent within observer's viewframe 2.5-5km;
- Moderate visibility: Only prominent with clear visibility as part of the wider landscape 5-10km;
- Marginal visibility: Seen in very clear visibility as a minor element in the landscape 10-20km.

proposed on higher-lying, less easily accessible portions of the affected properties and do not impact on areas of high quality grazing (Photographs 3.15-3.17). The owners of Rietfontein, Spaarwater and Coetzeesfontein are satisfied that the turbine placements would only affect the portions of their properties included in the site. None of the relevant owners consider the affected portions of their properties visually sensitive or are otherwise concerned about any adverse impacts on sense of place resulting from the proposed placements (Brown, Linda Fani, Zirk Jordaan, Kemp, Nel, pers. comm).

**Photograph 3.15: Portion of Rietfontein affected by turbines associated with North Phase.**

**Photograph 3.16: View north-west from access road to Doornrivier onto area associated with Central Phase (on hills)**

**Photograph 3.17: View west from Highlands farm yard onto area associated with South Phase (on hills)**

### 3.6.5 Location of substations

Substations associated with the WF are proposed on Rietfontein (North Phase), Doornrivier (Central and South Alternative 1) and Highlands (South Alternative 2). None of the relevant locations are located in significant proximity to farmsteads. In addition, none of the proposed substations are located in areas considered to be of agriculture value to the relevant owners (Jordaan, Linda Fani, Brown, pers. comm). The power line alternatives would essentially affect the same properties proposed to accommodate substations.

### 3.6.6 Location of grid connections

***North Phase***

Both Alternative 1 and 2 proposed for the North Phase are located on the portion of Rietfontein 102/RE south of the R63 (Figure 3.13). While Alternative 1 (~2.5 km) is slightly shorter than Alternative 2 (~3.2 km), both are acceptable to the land owner (Zirk Jordaan, pers. comm). Both alternative traverse open veld and do not affect farmsteads. Portions of Rietfontein along the R63 are already affected by the Eskom 66 kV and 132 kV corridor. The existing 132 kV line traverses the R63 ~450 m east of the Rietfontein access road and the access road itself ~700 m south of the Rietfontein farm yard. The North Phase Alternatives would access the Eskom line ~900 m south of the farm yard.

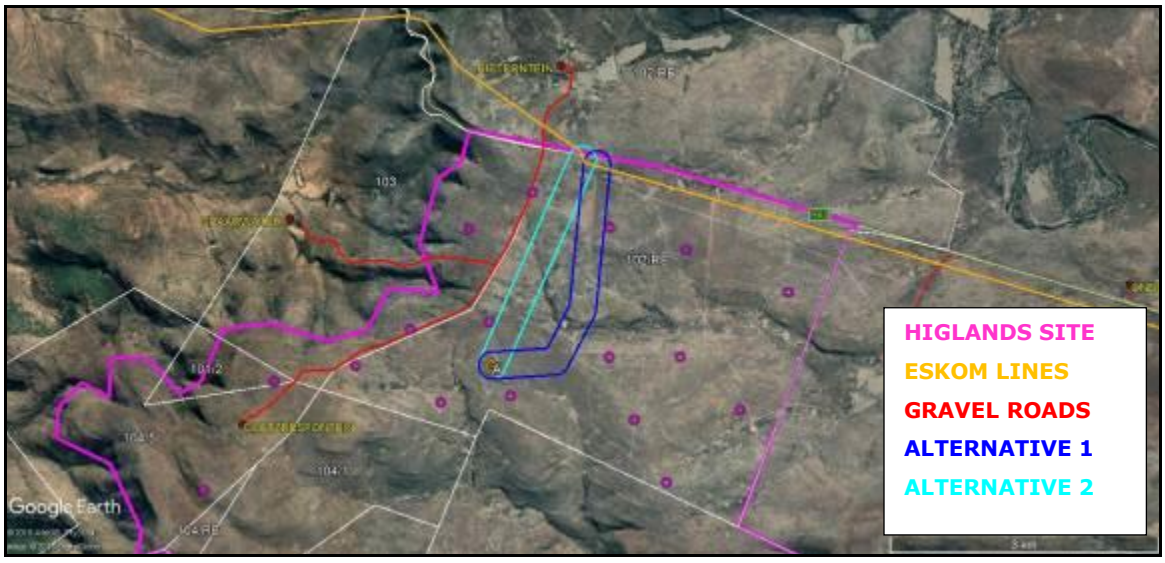



**Figure 3.13: North Phase-Turbines (pink circles), on-site substation (star) and power line alternatives**

***Central Phase***

The two Central Phase power line alternatives (Alternative 1 and 2) affect Mr Jordaan (Rietfontein) and the Fani Brothers who farm on land leases from National Government (Doornrivier) (Figure 3.14). In addition, the buffer of Alternative 2 would marginally affect a third landowner, Mr Kemp (Spaarwater). While Alternative 1 (~4.5 km) is marginally longer than Alternative 2 (~5 km), both alternatives are acceptable to all the affected land owners. Both alternative traverse open veld and are not located in significant proximity to any farmsteads. As indicated above, the portion of Rietfontein adjacent to the R63 is already affected by an existing Eskom corridor.

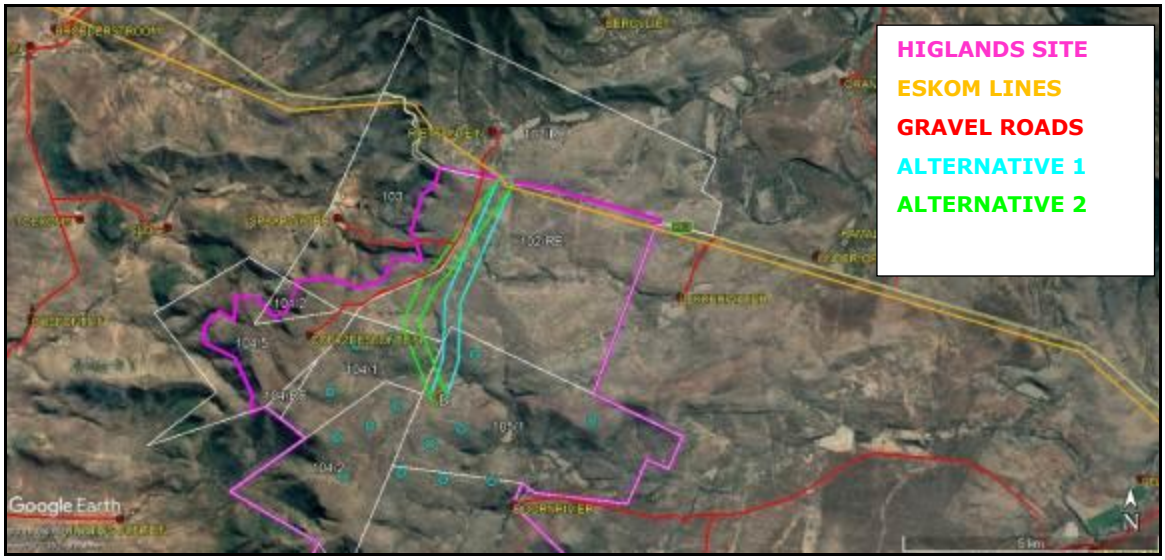



**Figure 3.14: Central Phase-Turbines (light blue circles), on-site substation (star) and power line alternatives**

***South Phase***

The initial ~7 km portion of both Alternative 1 and 2 for the South Phase up to the proposed substation location is shared (Figure 3.15). North of the Central substation, the alignments are identical to those followed by Alternatives 1 and 2 of the Central Phase, i.e. with Alternative 1 marginally shorter (~500 m) than Alternative 2. South of the Central substation, the South Phase Alternatives (single alignment) traverse additional portions of Doornrivier as well as the northernmost portion of Highlands. Neither alternative is located in significant proximity to any farmsteads. As indicated above, the portion of Rietfontein adjacent to the R63 is already affected by the existing Eskom corridor. As only veld would be affected by both Alternatives, both are acceptable to all the affected land owners.

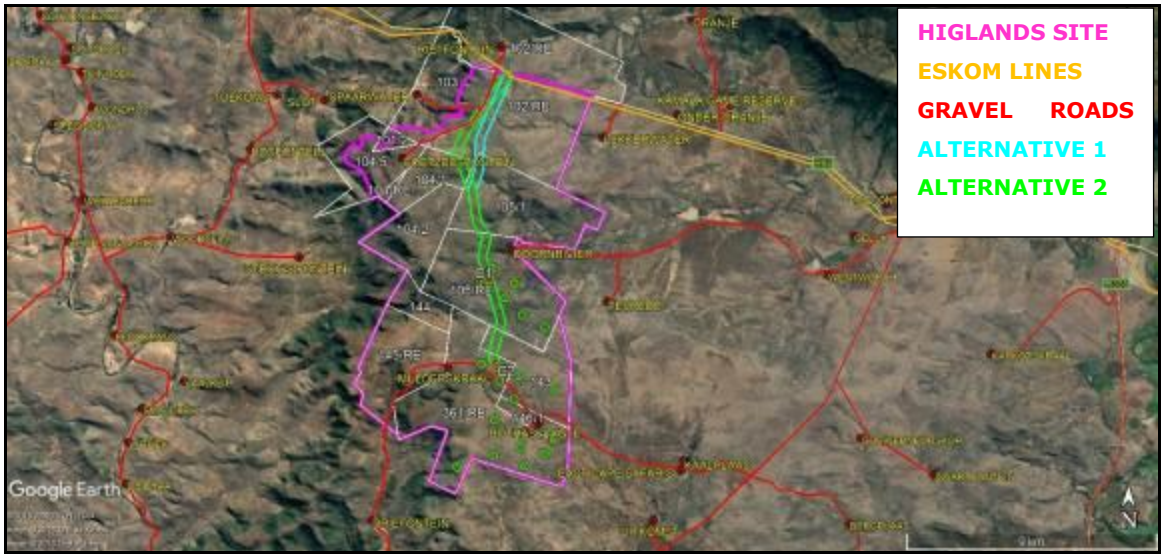



**Figure 3.15: South Phase-Turbines (light green circles), on-site substation Alternatives (Stars C1 and C2) and power line alternatives**

In summary, according to the criteria applied by the Visual Specialist[21], none of the proposed powerline alternatives are located within High visibility range (<500 m) (Table 3.7). Only the farmsteads on Rietfontein (all Alternatives for all Phases) and Doornfontein (Alternative 1 and 2 for the South Phase) are located within Moderate-High range (<1 km). Neither of the relevant owners/ occupants raised any issues or concerns with regard to the location of the proposed power line alignments. Given that the impacts associated with each of the alternative are essentially identical, no preferred alternatives were identified by the relevant owners.

**Table 3.7: Distances of site property farm yards from proposed power line Alternatives (buffers)**

| OWNER/ USER | FARM YARDS | NORTH 1 | N 2 | CENTRAL 1 | C 2 | SOUTH 1 | S 2 |
|---|---|---|---|---|---|---|---|
| Brown, Mr Bill | Highlands | 10.5 km | 10.5 km | 8.8 km | 8.8 km | 2.5 km | 2.5 km |
| Jordaan, Mr Zirk | Rietfontein | 1 km | 950 m | 900 m | 900 m | 900 m | 900 m |
| Kemp, Mr Renier | Spaarwater | 2.6 km | 2.6 km | 2.5 km | 2.1 km | 2.6 km | 2 km |
| Fani, Mr Linda Fani, Mr Simpewe | Doornrivier | 3.9 km | 3.9 km | 2.4 km | 2.4 km | 800 m | 800 m |
| Nelani, Mr Thozi | Mulderskraal | 8.1 km | 8.1 km | 6.2 km | 6.2 km | 1.5 km | 1.5 km |
| Nel, Mr Jakkie | Coetzeesfon-tein | 2.7 km | 2.7 km | 2.6 km | 1.8 km | 1.9 km | 2.7 km |

### 3.6.7 Proposed access roads

Riefontein, Spaarwater and Coetzeesfontein Farms are accessed directly off the R63. Spaarwater and Coetzeesfontein are only accessible via a narrow farm road which terminates at Coetzeesfontein. Access control is by means of locked gates. This road is proposed as access road for the North Phase of the WEF. None of the relevant farmsteads are located in meaningful proximity to the road

Doornrivier is accessed via a farm road off the Waterford Road. The road also provides access to farms such as Geluk and Tevrede and terminates at Doornrivier farmstead. Access control is by means of locked gates. This road is proposed as access road for the Central Phase. Apart from Doornrivier the road does not traverse any farm yards. The road is however located in proximity to the Geluk farm yard.

Highlands and Mulderskraal are accessed via a farm road which provides access to both the Klipplaatberg gravel road (via Klipplaat) and the Waterford gravel road (via Kaalplaas). Access control is by means of locked gates. This road is proposed as

[21] The Draft VIA (Lawson and Oberholzer, 2018: 15) uses the following methodology for defining degrees of visibility of the relevant grid connection infrastructure based on distance alone:

- High visibility: Prominent feature within the observer's viewframe 0-500m;
- Mod-high visibility: Relatively prominent within observer's viewframe 500m-1km;
- Moderate visibility: Only prominent with clear visibility as part of the wider landscape 1-2km;
- Marginal visibility: Seen in very clear visibility as a minor element in the landscape 2-4km+.

access road (from the Waterford Road side) for the South Phase. The proposed route would traverse the farmyard on Kaalplaas between the farmstead and the East Cape Safaris lodge complex and would pass within 30 m of a farm worker dwelling located on the Bothaslaagte portion of Doornrivier. The relevant farm worker, Mr Jan X, has been living in the structure on Bothaslaagte for 37 years (Jan X, pers. comm) (Photograph 3.18).

**Photograph 3.18: Mr Jan X in front of his house on Bothaslaagte**

### 3.6.8 Adjacent properties

In as far as could be established the properties on which the WF is located and properties located to the west of the site are used for traditional commercial livestock farming purposes, while those located to the east of the site are used for a mix of livestock farming and game farming. Some properties located to the west of the site are also owned by WF site owners. None of the properties located to the west of the site are accessed via the site or proposed site access roads. All of these properties benefit from the view shadows created by the (western) escarpment. The wind turbines are therefore unlikely to be visible from the properties located to the west of the site.

The area located to the east of the site is however visually exposed to the proposed WF. A number of game farming operations are located to the east of the site within a 5-10 km radius of the nearest turbines. These operations extend from the north-east to the south-south-west of the site. The owners have indicated that their operations are sensitive to the visual impacts and associated change in the areas sense of place associated with the proposed WF.

Interspersed with game farming properties are commercial livestock farms, a number of which are permanently inhabited. The properties located to the east of the site, such as Tevrede and Uitkomst, are generally more visually exposed than those located to the west. All of them are primarily accessed off the Waterford gravel road.

In addition, site access roads proposed for the Central and South Phases would directly affect Geluk, Wentworth and Tevrede (Central), and Kaalplaas/ East Cape Safaris (South).

In as far as could be established, commercial game farming is carried out on (from north to south) Buffelsfontein, Kamala Game Reserve, Kaalplaas (East Cape Safaris) and Klipplaat (Side by Side Safaris). Only the owners of Buffelsfontein, Kamala and East Cape Safaris could be contacted for comment. The owners of Klipplaat (Side by Side) declined to comment at this stage (Mr. Fleming Jensen, communicated via Mr. Grant Abrahamson, pers. comm). A number of other properties in the vicinity of the site (e.g. Mistkraal and Driefontein) also appear to support commercial game hunting operations. The owners of these properties could not be reached for comment. However, the concerns identified by the owners of Kamala and East Cape Safaris are likely to be relevant and apply to the other game-based operations in the study area.

An overlay of a draft viewshed map produced by the VIA specialist in the Draft VIA (Lawson and Oberholzer, 2018) indicates that proposed turbines (North, Central and South Phase) are located within high to moderate visibility range of significant portions of both the Kamala and East Cape Safaris properties (Figure 3.16). The extent and precise location of land owned (or hunted) by Side by Side Safaris is unknown, apart from for Klipplaat farmstead and the Side by Side Lodge. The owner of Buffelsfontein has indicated that he had no issues with the proposed turbines, as the key portions of his property would either be in the view shadow or too distant to experience significant impacts (Tollie Jordaan, pers. comm).

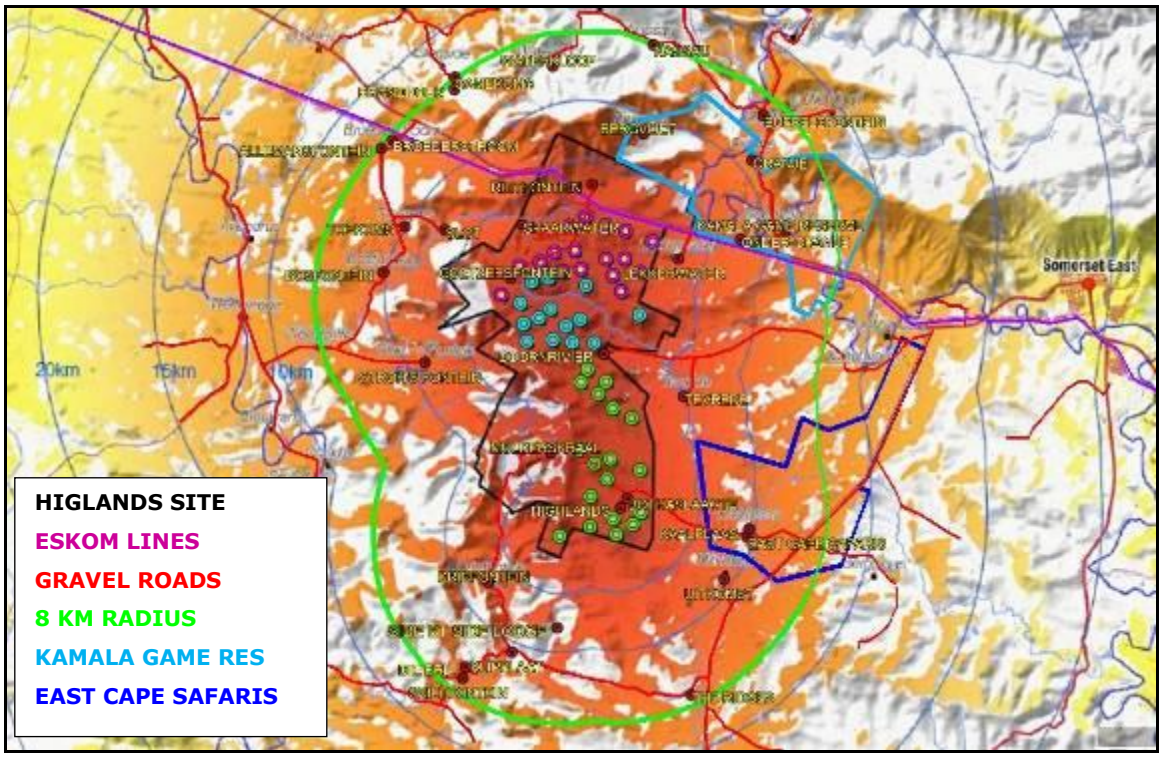



**Figure 3.16: Turbines for all three Phases (circles) in relation to key adjacent properties[22]**

[22] Base map from Draft VIA (Lawson and Oberholzer, 2018). Turbine visibility diminishing in severity from dark red to light yellow, and view shadows indicated as unshaded

***East Cape Safaris***

East Cape Safaris is located on Kaalplaas Farm, which is owned by three siblings, of which Mr Grant Abrahamson is one. Of the owners, only Mr Abrahamson and his family live on Kaalplaas. He is currently in the process of acquiring sole ownership of the property.

Over the past two decades Mr Abrahamson has transformed the farming activities from beef farming to game farming, supplemented by cattle farming. East Cape Safaris caters almost exclusively for overseas hunters. The farm offers hunters 24 species. The focus is on providing hunters with the opportunity of shooting a rare or record-setting antelope specimen in an 'African veld' setting. No large carnivores are hunted. Some of the game is bred on Kaalplaas – including rare Sable antelope. All of the hunts are guided by professional hunters. Approximately 40% of hunting parties are accompanied by non-shooting companions (spouses, etc.). Eco-walks and excursions into 'African veld' are therefore also offered (Sarine Abrahamson, pers. comm). East Cape Safaris also accommodates photo safaris that are managed by Ikamva[23].

A large, up-market guest complex (East Cape Safaris Lodge) is located on Kaalplaas ~350 m south of the Kaalplaas farmstead. Both the farmstead and lodge are located within 200 m of the proposed access road for the Central Phase. Essentially all of the ~3000 ha Kaalplaas property is used for commercial hunting. East Cape Safari has agreements with Kamala and other games farms in the vicinity of Somerset East. East Cape Safaris currently accommodates approximately 100 hunting guests per year, each typically spending up to 10 days on the property. The stays are inclusive of meals and accommodation. All game taken is charged by head and type in addition to the basic day rate. Additional day fees are also payable to accompanying freelance professional hunters. According to Mr Abrahamson, it is not unheard of for hunters to spend up to 40 000 US$ per person over a 10-day period. East Cape Safaris currently provides permanent employment to 24 households – in contrast to the 3 households it supported when the property was solely used for cattle farming. Most of the staff reside in Somerset-East, and is transported in daily (Grant Abrahamson, pers. comm). The owner of East Cape Safaris expressed grave concerns with regard to potential visual and sense of place impacts associated with the proposed Highlands WEF turbines (Photograph 3.19). The concerns were related to potential visual impacts both during the daytime (turbines) and night-time (flickering lights) which would impact on the current 'African veld' experience offered to guests. In addition, construction traffic associated with the South Phase is likely to impact on Kaalplaas/ East Cape in terms of sense of place (for guests) and may also impact on access (Grant Abrahamson, pers. comm) (Photograph 3.20).

[23] http://www.eastcapesafaris.co.za/.

**Photograph 3.19: View looking west across Kaalplaas towards site (hills in background) from entrance road to Kaalplaas**

**Photograph 3.20: Entrance to Kaalplaas/ East Cape Safaris off the Waterford Gravel Road (MN50171), which is a public road. The road is proposed as access road for South Phase**

***Side by Side Safaris***

Side by Side Safaris' operations are located on and around the Farm Klipplaat which is located to the south of the Highlands WF site. However, it was not possible to confirm the actual dimensions of the property and as such the boundary could not be mapped on the Visual Impact Assessment (VIA) maps below. The location of the Side by Side lodge is however shown on the maps.

Based on information on the Side by Side Safaris website[24], the operation is owned by three members of the Jensen family, all resident on the property (Klipplaat). The family also own Diana Taxidermy. Klipplaat offers a range of habitats and associated species, from afro-montane forest and bushveld to riparian and plains species. The website indicates that the farm hosts around 90 different species and sub species, plus colour variants on 'several thousand acres of land', plus bird hunting and game viewing on the side. Mammal game includes both endemics and indigenous species, but also rare exotics such as Barbary Sheep, Nubian Ibex, Nile Lechwe, Scimitar-horned Oryx, Arabian Oryx, Mouflon, Père David's Deer, Livingstone's Eland and Indian Blackbuck. As with East Cape, the costs are linked to head and type – with Cape Buffalo (€ 17 000) the most expensive species on offer to hunters. Based on the website the focus is on providing hunters with carefully-managed quarry of record-breaking trophy potential, throughout the year.

As in the case with East Cape Safaris the focus is on overseas hunters in search of a variety of rare or record-breaking trophy species and a 'once in a lifetime experience'. An up-market Lodge (Side by Side Lodge) is located on Klipplaat, providing accommodation, meals and a spa facility. Diana Taxidermy, also located on Klipplaat, provides a taxidermist service for Side by Side and other customers from around the globe[25]. Side by Side also offers weapons rental and ammunition sales, and a direct helicopter shuttle service (5 model options) from and to Port Elizabeth airport.

Given the nature of the operations there has been a significant investment the facilities on the site and international marketing of the product. The operations (Side by Side and Diana) also create permanent employment opportunities (e.g. trackers, professional hunters, taxidermists etc.)[26]. Given the nature of the hunting operation and the focus on high end overseas market it is reasonable to assume that the change to the areas sense of place linked to the proposed WF would have the potential to impact on operations.

### 3.6.9 Relationship to adjacent receptors

As discussed above, the proposed powerline infrastructure (all Alternatives, all Phases) would be contained to the WEF site. The Alternatives would all link into an existing Eskom corridor just south of the R63, essentially at the point where the existing corridor traverses the R63, thus affecting an already transformed area. No significant social impacts on adjacent and near-adjacent receptors are anticipated with regard to any of the power line Alternatives.

As further discussed, potential impacts on access roads would range from minimal for the North Phase (dead-end road used exclusively by farm owners, no farm yards

[24] http://sidebysidesafaris.com/

[25] http://www.dianataxidermy.com/

[26] The number of employees was not available on the websites

affected), to moderate for the Central Phase (sole access road to farms like Tevrede and Geluk affected, but road avoids farm yards apart from site farm Doornrivier), to potentially significant for the South Phase (access road passes through Kaalplaas/ East Cape Safaris farm yard sensitive to sense of place and other disturbances, as well as within 30 m of a labourer's house on Bothaslaagte (now part of Doornrivier).

The remainder of the section deals with exposure to turbines. Focus is on established visually sensitive receptors, such as known game farming operations.

***North Phase Turbines***

Based on information from the Draft VIA, turbines associated with the North Phase would be mainly visible to adjacent and near-adjacent properties located to the north and east of the site (Figure 3.17). The focus of the discussion is therefore on these properties.

One adjacent farm, Lekkerwater, is located to the north of the site falls within 2.5 km of the nearest turbine. Lekkerwater is owned by Mr Zirk Jordaan and is farmed as part of Rietfontein. A number of other farmsteads to the north and east are located within 5 km of the site. These include those on (clockwise from north) Bergvliet, Onder-Oranje (Kamala), Tevrede, Stroh's Fontein and Bosfontein. With the exception of Stroh's Fontein and Bosfontein (largely within view shadow), large portions of these properties are also within the 2.5 – 5 km range, and less screened by topography.

Approximately half of Kamala Game Reserve located to the north and east of the site would be located within 2.5-5 km (High Visibility) range, with the remainder within 5-10 km range (Moderate). Kamala Lodge is located ~ 5km from the nearest proposed turbine. A sizeable portion of Buffelsfontein Guest Farm located to the east of the site is also located within 5-10 km. The Kamala Game Reserve is exposed to sections of the WEF due to its higher elevation.

A small portion of Kaalplaas (East Cape Safaris) falls within 5-10 km, but the bulk of the property is located beyond 10 km. The East Cape Safaris Lodge on Kaalplaas in located ~ 12 km from the nearest turbine. The lodge is however located in a view shadow area. Klipplaat (Side by Side Safaris) largely benefits from view shadows and distance. The lodge is located ~ 12 km from the nearest turbine and is also located within a view shadow area. The game farming operations on Kamala Game Reserve are therefore the most visually affected by the turbines associated with the Northern Phase.

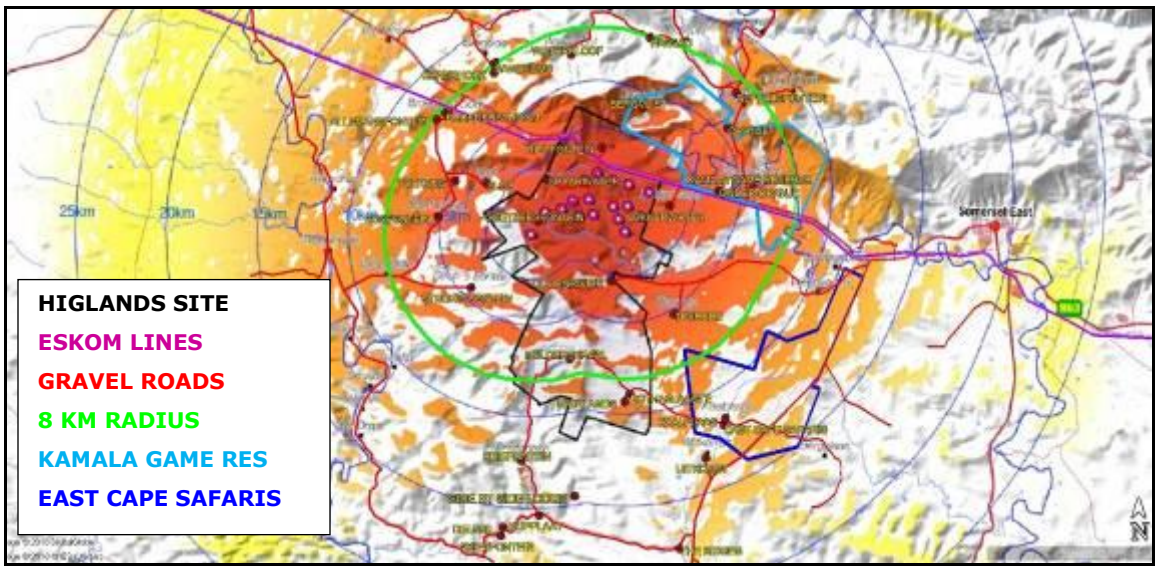



**Figure 3.17: Turbines (pink circles) proposed for North Phase in relation to key adjacent properties [27]**

With regard to road receptors, the R63 would be most directly affected, with the nearest North turbine proposed ~500 m from the road and another 8 within 2.5 km of the road. The relevant portion of the R63 is already affected by the Eskom line corridor and is not visible from Bruintjieshoogte Pass to the east. The nearest turbine would be located approximately 5 km from the Cradock Road which provides access to Buffelsfontein Guest Farm and Kamala. Due the Cradock Road's higher elevation, the North development area would be clearly visible from the road. Turbines would be located >10 km of the Waterford Road and would be less visible due the increased distance.

***Central Phase Turbines***

Like the North Phase, turbines proposed with the Central Phase would be mainly visible to adjacent and near-adjacent properties located to the north and east of the site (Figure 3.18). No non-site farmsteads are located within 2.5 km of proposed turbines. Farmsteads on adjacent and near-adjacent Tevrede, Stroh's Fontein (within view shadow) and Slot would be within a 5 km range.

While only a small portion of Kamala falls within 5 km of the Central Phase development area, the bulk of the property is located within 5-10 km, with High to Moderate visibility onto the site. Kamala Lodge is located ~ 7km from the nearest proposed turbine. A larger portion of Kaalplaas falls within the 5-10 km range, but a substantial portion falls within the view shadow. Most of the visually exposed areas on Kaalplaas are also located beyond 10 km of the nearest proposed turbines. The East Cape Safaris Lodge on Kaalplaas in located ~ 10 km from the nearest turbine. The lodge is however located in a view shadow area. Klipplaat (Side by Side Safaris) largely benefits from view shadows and distance. The lodge is located ~ 10 km from the nearest turbine and is also located within a view shadow area. Other sections of Klipplaat also benefit from intervening distance and topography (view shadows) to screen it from proposed Central Phase turbines.

[27]Base map from Draft VIA (Lawson and Oberholzer, 2018). Turbine visibility diminishing in severity from dark red to light yellow, and view shadows indicated as unshaded.

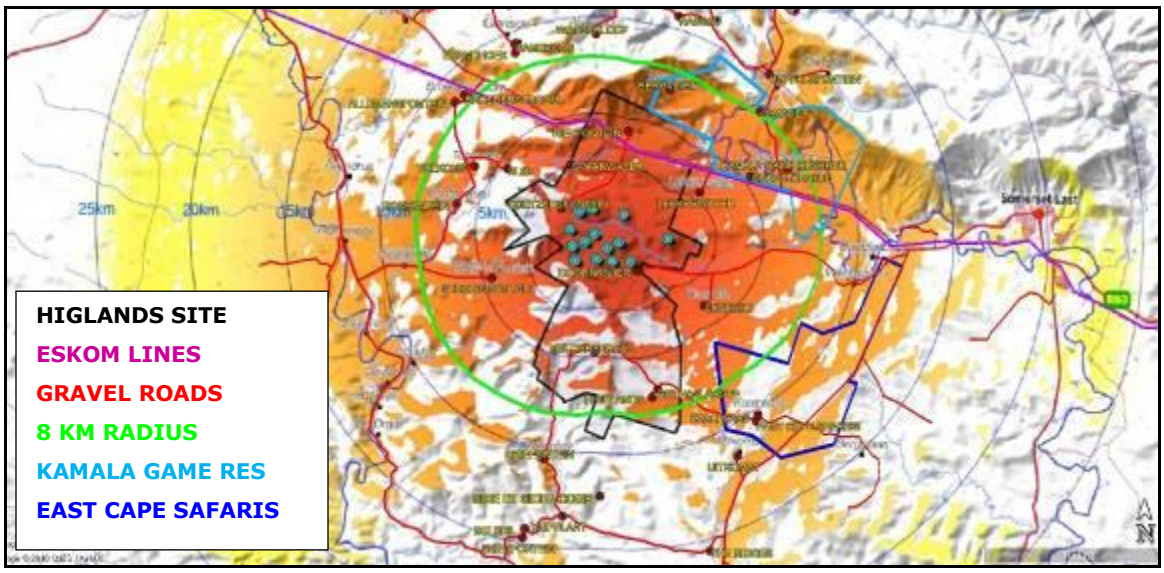



**Figure 3.18: Turbines (blue circles) proposed for Central Phase in relation to key adjacent properties.**

As in the case with the North Phase, turbines would be mainly visible from the R63 and Cradock Road. The nearest turbine would however be located further away from the R63, namely ~3.5 km. Due to the topography the Central Phase development area would only be marginally visible from Bruintjieshoogte Pass. The development area would however be clearly visible from the southern portion of the Cradock gravel Road. Turbines would be located >10 km of the Waterford Road and are therefore likely to be less visible.

***South Phase Turbines***

Turbines proposed with the South Phase would be mainly visible to adjacent and near-adjacent properties located to the north, east and south of the site (Figure 3.19). The farmstead on Tevrede is the only non-site farmstead located within 2.5 km from the nearest proposed turbine. In addition, turbines are proposed within 2.5-5 km of the farmsteads on Kaalplaas, Uitkomst, and Driefontein, and within the same range for the lodges on Kaalplaas (East Cape Safaris lodge) and Klipplaat (Side by Side Safaris). The lodges on Kaalplaas and Klipplaat are located within a view shadow area. However, the majority of the remaining farm areas are visually exposed to the turbines located in the South Phase development area.

While the exact extent of Klipplaat (Side by Side Safaris) and Driefontein (also appears to be used for commercial hunting) are unknown, visually exposed portions of these properties appear to be located within 2.5 km of the proposed development area, with further portions located <5 km. To the north a large portion of Kamala is located within 8-10 km of the South development area. Kamala Lodge is located ~10.3km from the nearest proposed turbine. The game farming operations on Kaalplaas and Klipplaat are therefore most visually affected by the turbines associated with the South Phase.

The R63 would be visually exposed, but the nearest turbine is would be 7 km from the road. Similarly, the Cradock Road would be visually exposed. However the nearest wind turbine would be located 9 km away. A significant section of Waterford

Road, which provides access to East Cape and Side by Side, is located within 5-10 km of the nearest turbine.

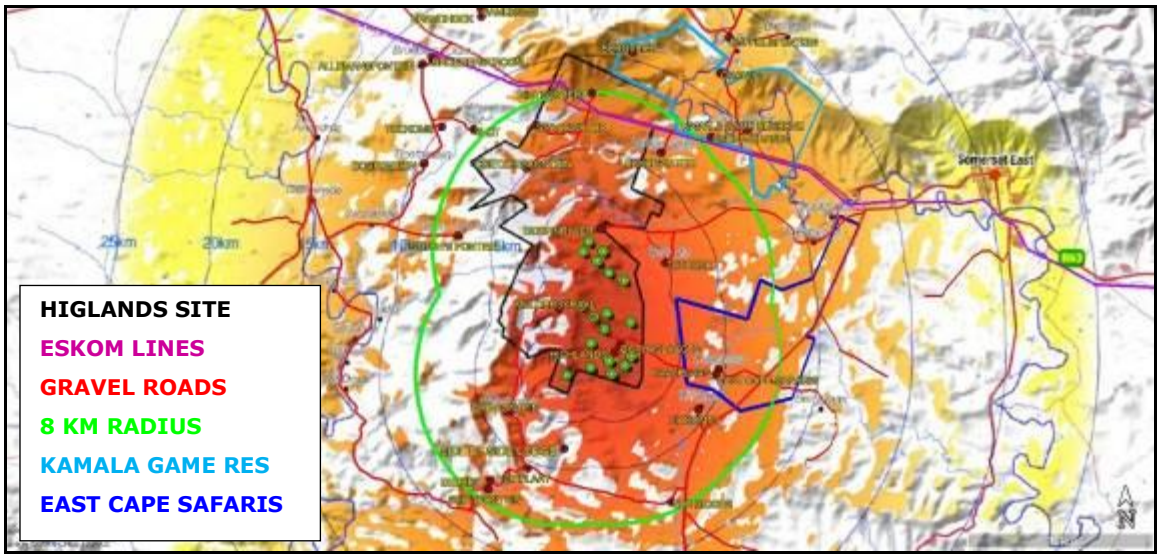



**Figure 3.19: Turbines (green circles) proposed for South Phase in relation to key adjacent properties.**

### 3.6.10 Other Renewable Energy Facilities

The proposed Highlands WEF site is located within 35 km of only one other renewable energy facility (REF) site, namely the Pearston Solar Energy Facility (Figure 3.19). A number of operational and proposed WEFs are located 35km and beyond to the east and south-east of the site (Cookhouse, Bedford, Middleton).

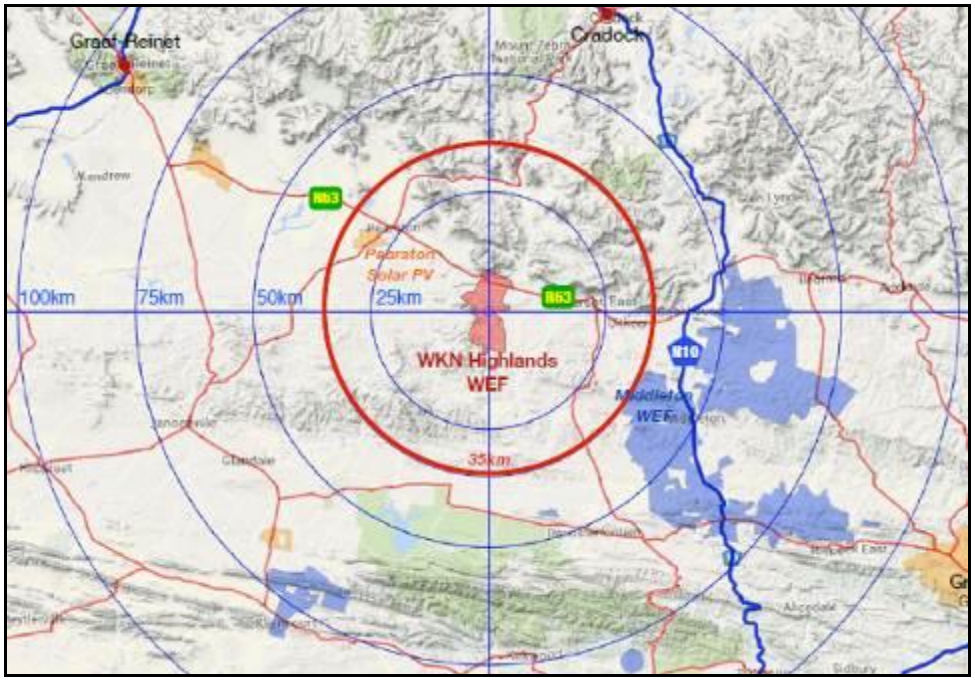



**Figure 3.19: WEF site in relation to other operational or proposed WEFs (Source: Draft VIA, Lawson and Oberholzer, 2018).**

The DEA GIS Viewer indicates that the Pearston SEF was approved by DEA, but that an application for amendment has been submitted, the outcome of which under review (https://dea.maps.arcgis.com/apps/webappviewer).

**Photograph 3.21: Cookhouse WEF viewed from N10**

# 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;
- Experience with similar projects.

The assessment section is divided into the following sections:

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

As indicated above, based on input from the Visual and Heritage specialists the original proposed layout was revised. The changes included relocation of a number of wind turbines, substations and internal roads and cabling. The Visual Impact Assessment specialists (Lawson and Oberholzer) have indicated that the revised layout of wind turbines will not impact on the overall findings of the Visual Impact Assessment. The changes to the proposed layout will therefore have no bearing on the findings of the SIA. The findings of the SIA therefore apply to the revised wind turbine layout and changes in terms of substation locations and access roads.

## 4.2 ASSESSMENT OF POLICY AND PLANNING FIT

Legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents.

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 Resource Plan (IRP) for South Africa (2010-2030);
- 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);
- Eastern Cape Provincial Growth and Development Strategy (2004-2014);
- Sarah Baartman District Municipality Integrated Development Plan (2015/2016 Review);
- Sarah Baartman District Municipality Spatial Development Framework (2013)[28];
- Northern Cape Spatial Development Framework;
- Blue Crane Route Local Municipality Integrated Development Plan (2015/2016 Review).

The findings of the review indicate that renewable energy is strongly supported at a national, provincial and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Eastern Cape Provincial Growth and Development Plan (ECPGDP), the Sarah Baartman District Municipality SDF and IDP, and the Blue Crane Local Municipality IDP.

The section below provides a summary of relevant provincial and local policies and planning documents that support renewable energy. The summary also refers to the sections that have a bearing on the siting of renewable energy facilities, specifically wind farms.

***Eastern Cape Provincial Growth and Development Plan***
The PGDP states that the, "…economic and logistics infrastructure – energy, roads, rail, ports, and air transport among others – is a necessary condition for economic growth and development."

***Sarah Baartman District Municipality IDP***
The SBDM IDP notes that opportunities exist in the renewable energy sector. The IDP also notes that the Blue Crane Route region has been identified by the National Department of Environmental Affairs as one of three potential wind generation 'preferred locations' in the country. The IDP also refers to potential for creating new generation green jobs and local income streams rooted in renewable energy.

The IDP also highlights the importance of the tourism sector and link between tourism in the region and the areas exceptional and diverse natural assets and the opportunities to develop the rural tourism economy based on eco-tourism initiatives.

***Sarah Baartman District Municipality SDF***
The SDF notes that the introduction of alternative energy generation infrastructure and the associated land use change will provide both economic opportunities but may also have a negative impact on the ecotourism of the district. The SDF also notes that game reserves and farming are playing a bigger role in the economy.

Based on the information contained in two high level land use maps for the SBDM the location of the proposed Highlands WF does not appear to conflict with the land

[28] The Sarah Baartman District Municipality was previously called the Cacadu District Municipality.

use planning objectives contained in the SDF. However, the area to the north of the site and the R63 is identified as Tourism Focus Area.

***Blue Crane Local Municipality IDP***
The IDP notes that there are significant opportunities for wind energy in the area. The Sarah Baartman Rural Economic Development Initiative (REDI) identifies renewable energy and tourism as areas of opportunity. The LED strategy also identifies renewable energy and tourism as key opportunities for stimulating local economic development in BCRLM.

**Conclusion**
In conclusion, based on the review of key planning documents that pertain to the study area it is clear that the development of renewable energy (including wind farms) in the SBDM and BCRLM is supported. However, there is a need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the areas tourism potential. In this regard the area to the north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF.

## 4.3 CONSTRUCTION PHASE SOCIAL IMPACTS

The key social 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;
- 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 WF projects the construction phase for a 140 MW WF 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 WF 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. The majority of these employment opportunities are also likely to

accrue to Historically Disadvantaged (HD) members from the local SBDM and BCRLM community. As indicated above, the levels of unemployment in the SBDM and BCRLM are relatively high. The towns that are likely to benefit are Somerset East, Pearson and Cookhouse. 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 SBDM and BCRLM.

The potential benefits for local communities is confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and DBSA (30 June 2017). The study found that employment opportunities created during the construction phase of the projects implemented to date had created 40% job years[29] more for South African citizens than anticipated. The construction phase associated with the 57 projects developed to date achieved 64% more job years than planned. The study also found that significantly more people from local communities were employed during construction than was initially planned. In this regard the expectation for local community participation was 6 772 job years. To date 16 376 job years have been realised (i.e. 142% greater than initially planned). Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 80%, 41% and 52% of total job opportunities created by IPPs to date.

The study also found that the share of black citizens employed during construction (80%) 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 (77%) 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 50% and 67% for construction and operations respectively – at least 4 times more than 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 140 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 proximity of the site to Port Elizabeth there is likely to be a pool of suitably qualified companies that can provide key services, such as locally based construction and engineering companies.

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, especially those industries involved in the production of steel and metal products, as well as the boat building and electrical industries. These types of industries are all located in the Nelson Mandela Bay Metropolitan Municipality (NMBMM). The proposed Highlands WF will therefore create opportunities for engineering and construction companies in Port Elizabeth and Utinhage. The implementation of the enhancement measures listed would enhance these opportunities.

[29] 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 140 MW WF will be in the region of R 69 million (2016 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. Given that the construction workers will be based in local towns in the area, such as Somerset East, Pearston and Cookhouse, a percentage of the wage bill will 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.

The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other 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 SBDM and BCRLM.

Interviews with representatives from the SBDM and BCRLM undertaken as part of an SIA for a proposed WF located to the south of the Highlands WF indicated support initiatives that created opportunities for economic development and job creation[30].

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

| **Impact Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Creation of employment and business opportunities during the construction phase | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Positive | Medium | M | High |
| **With Mitigation/ Enhancement** | H | L | H | Positive | Medium | H | High |
| Can the impact be reversed? | | | Yes: By not implementing the project | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

[30] Mr Mouduwa (Tourism Manager SBDM), Mr Magxwalisa (LED Manager SBDM), and Ms Samela (IDP Manager, BCRLM) were interviewed in 2017 as part of the SIA for the proposed Spitskop West WF.

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

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

**Employment**
- Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area;
- Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;
- Before the construction phase commences the proponent should meet with representatives from the BCRLM and BCRLM to establish the existence of a skills database for the area. If such as 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;
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

**Business**
- The proponent should liaise with the SBDM and BCRLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.
- The SBDM and BCRLM, 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;
- 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 Independent Power Producers Procurement Programme (IPPPP) (June 2017), in terms 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 6 772 job years. To date 16 376 job years have been realised (i.e. 142% greater than initially planned). 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 Somerset East, Cookhouse and Pearston.

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 Somerset East, Cookhouse and Pearson. The non-local skilled workers (38) are likely to be accommodated in local guest houses and guest farms in the area. 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 relatively low number of permanent workers residing 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 Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential impacts on family structures and social networks associated with the presence of construction workers | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes: By not implementing the project | | | | |
| Will impact cause irreplaceable loss or resources? | | | Unlikely at a community level | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

- Where possible the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;
- The proponent should consider the 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 SBDM and BCRLM, 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;

- 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 relatively small size of the project (140 MW), the limited employment opportunities (~250) and short duration of the construction phase (20-24 months). In addition, the economic opportunities in Somerset East, Cookhouse and Pearston are limited. The risks associated with job seekers being attracted to and staying on in the area is therefore likely to be low.

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

| **Impact Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential impacts on family structures, social networks and community services associated with the influx of job seekers | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | L | Negative | Low | Low | Medium |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | Low | Medium |
| Can the impact be reversed? | | | Yes: By not implementing the project | | | | |
| Will impact cause irreplaceable loss or resources? | | | Unlikely at a community level | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Assessment of No Go option**
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, the potential influx of job seekers to the area as a result of the proposed WEF is likely to 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 on 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 threat. 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 owner of Rietfontein (Mr Zirk Jordaan) indicated that the on-site road network should be rationalised as far as possible to avoid unnecessary impacts on grazing. In addition, all unnecessary disturbances should be avoided during the construction phase, including off-road traffic. Mr Jordaan indicated that the construction of the Cookhouse WF had resulted in unnecessary damage to the veld and grazing land. Appropriate measures must be taken to ensure that the impacts are minimised.

The owner of East Cape Safaris (Mr Grant Abrahamson) raised concerns regarding the proposed South Phase access road (Waterford Gravel Road). The proposed

access road (an existing servitude) traverses the Kaalplaas/ East Cape Safaris farmyard. The East Cape Safaris Lodge is located within 150 m of the proposed relevant road. The movement of heavy construction vehicles within close proximity to the lodge and through the farmyard will create noise and dust impacts for the owners and visitors. In this regard East Cape Safaris caters for high-end overseas customers throughout the year and is vulnerable to any disturbances to sense of place and nuisance impacts (dust, noise, inconvenience). Mr Abrahamson indicated that access across Kaalplaas would not be acceptable. However, Waterford Gravel Road (MN50171) is a public road and it would not be possible to prevent the developers from using this road if the project is approved.

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

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

| **Impact Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes: By repairing damage and compensating for stock losses etc. | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**Recommended mitigation measures**
Key mitigation measures include:

- The proponent should enter into an agreement with 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 WF 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 Environmental Management Programme (EMP) 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;
- 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 to crops, livestock, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened. Grass fires would pose a threat to grazing and livestock, which in turn, would have a significant impact on the livelihoods of local farmers who are affected. Grass fires could also pose a risk to game farms in the area. The potential fire risk of grass fires is highest towards the end of the winter months (October-November). This period also coincides with dry, windy conditions in the area.

**Table 4.5: Assessment of impact of increased risk of fires**

| **Impact Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes: By repairing damage and compensating for damages and losses | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**Recommended mitigation measures**
The mitigation measures include:

- The proponent should enter into an agreement with the local farmers in the area whereby losses associated with fires that can be proven to be associated with the construction activities for the WF 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 high 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;
- 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. The project components are likely to be transported to the site via the N10 and R63. The N10 has been identified as an important tourist route. In addition, as indicated above, owner of East Cape Safaris (Mr Grant Abrahamson) indicated that access across Kaalplaas would not be acceptable. However, as indicated above, the Waterford Gravel Road (MN50171) is a public road and it would not be possible to prevent the developers from using this road if the project is approved.

The transport of components of the WF to the site therefore has the potential to impact on other road users travelling along these roads, including tourists. Measures will need to be taken to ensure that the potential impact on motorist using these roads 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 Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes, by rehabilitating disturbed areas | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

- As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods;
- The contractor should inform local farmers and representatives from the SBDM and BCRLM 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[31], 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;
- 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.

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

- EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times;
- EMP 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.

The compaction of soils associated with movement of heavy vehicles and other construction related activities does pose a potential threat to grazing on the affected farms. However, mechanical ploughing and scarifying can mitigate the damage caused by compaction. Minimising the footprint of construction related activities could also mitigate the damage to farmland, and ensuring that disturbed areas are actively rehabilitated upon completion of the construction phase.

As indicated above, the owner of Rietfontein (Mr Zirk Jordaan) indicated that the construction of the Cookhouse WF had resulted in unnecessary damage to the veld and grazing land. Appropriate measures must be taken to ensure that the impacts are minimised.

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

| **Impact Phase: Construction** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: 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 WEFs and power lines will damage farmlands and result in a loss of farmlands for grazing. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes, by rehabilitating disturbed areas | | | | |
| Will impact cause irreplaceable loss or resources? | | | No, however, disturbed areas will need to be rehabilitated | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Assessment of No-Go option**

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 soil and vegetation study. In this regard areas of high potential agricultural and sensitive vegetation soils should be avoided;
- The developer should consult with affected property owners in order to enable them to factor construction activities into their farming schedules;
- The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner in the finalisation process and inputs provided should be implemented in the layout as best as possible;
- 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 Environmental Control Officer (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;
- EMP 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.
- 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 social 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;
- Benefits for affected landowners.

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

### 4.4.1 Development of renewable energy infrastructure

The establishment of renewable energy infrastructure, such as the proposed Highlands WF, 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 carbon dioxide ($CO_2$) 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 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 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).

***Benefits associated with REIPPPP***

The overview of the IPPPP (2017) indicates that the REIPPPP has attracted R48.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and IS2). This is more than double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 48% (R31.5 billion) of the total equity shareholding (R66.7 billion) was held by South African's across BW1 to BW4, 1S2 and 1S2. This equates to substantially more than the 40% requirement. Foreign equity amounts to R 35.8 billion and contributes 52% to total equity. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 31% of projects that have reached financial close, which is slightly above the 30% target.

The total projected procurement spend for during the construction phase was R75 billion, more than the projected operations procurement spend over the 20 years operational life (R72 billion). The combined (construction and operations) procurement value for BW1 to BW4, 1S2 and IS2 is projected as R147.6 billion, of

which R50.1 billion has been spent to date. For construction, of the R46.4 billion already spent to date, R36.6 billion is from the 57 projects which have already been completed. These 51 projects had planned to spend R36.6 billion. The actual procurement construction costs have therefore exceeded the planned costs by 9% for completed projects. Of the R46.6 billion spent on procurement during construction, R41.1 billion has reportedly been procured from BBBEE suppliers, achieving 89% of total procured. Actual BBBEE spend during construction for BW1 and BW2 alone was R25.5 billion. The R41.1 billion spent on BBBEE during construction already exceeded the R34.8 billion that had originally been anticipated by IPPs.

The report notes that for a programme of this magnitude, with construction procurement spend alone estimated at R75 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 32 532 job years[32] have been created for South African citizens, of which 29 046 were in construction and 3 486 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 80%, 41% and 52% 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 11% of projects that have reached financial close. This is well above the 5% target.

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 WF, 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.

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

**Table 4.8: Implementation of clean, renewable energy infrastructure**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Development of infrastructure to generate clean, renewable energy | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | M | Positive | Medium | M | High |
| **With Mitigation/ Enhancement** | M | H | M | Positive | High | H | High |
| Can the impact be reversed? | | | Yes, by removing infrastructure | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

- Implement a skills development and training programme aimed at maximizing the number of employment opportunities for local community members;
- Maximise opportunities for local content, procurement and community shareholding;
- Establish 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 140 MW WF 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 of the 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 SBDM and BCRLM. The operational phase will also require regular maintenance which will also create employment opportunities.

A percentage of permanent employees who are not locally based may purchase houses in one of the local towns in the area, such as Somerset East or Cookhouse, others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would 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 (2017) 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 75 billion. The combined (construction and operations) procurement value is projected as R147.6 billion of which R50.1 billion has been spent to date. 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.

The establishment of WFs, such as the Highlands WF, also supports the development of a green energy manufacturing sector in South Africa. Manufacturing segments with high employment potential in the long term would include suppliers of components for wind farms, such as Gestamp in Atlantis. 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, 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 establishment of WFs, such as the Highlands WF, would therefore contribute to achieving this critical mass.

The study also found that there was also significant potential for local involvement in the wind sector. 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 4.9: Impact assessment of employment and business creation opportunities**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Creation of employment and business opportunities associated with the operational phase | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | L | Positive | Medium | M | High |
| **With Mitigation/ Enhancement** | M | M | M | Positive | Medium | H | High |
| Can the impact be reversed? | | | Yes, by removing project | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, measures will be provided in the Assessment Report | | | | |

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

**Recommended enhancement measures**
The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. 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 SBDM and BCRLM, 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 socio-economic development (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;
- Support for SMME's.

The minimum compliance threshold for SED contributions is 1% of revenue with 1.5% the targeted level over the 20 year project operational life. The current portfolio of projects has committed on average 2.2%, which is 125% higher than the minimum threshold level. The 57 projects that are currently operational have contributed R407.7 million to SED. The province with the highest SED contribution has been the Northern Cape, followed by the Eastern and Western Cape respectively (IPPP Overview, 2016).

The 2017 IPPP Overview notes that to date (across 7 bid windows) a total contribution of R20.6 billion has been committed to SED initiatives. Assuming an even, annual revenue spread, the average contribution per year would be R 1.03 billion. Of the total commitment, R16.5 billion is specifically allocated for local communities where the IPPs operate. With every new IPP on the grid, revenues and the respective SED contributions will increase.

The 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. This is also supported by review of the benefits associated with the West Coast One WF in the Western Cape. The social spend associated with the West Coast One WF has created a number of benefits for local communities in the Saldanha Bay Local Municipality, specifically vulnerable communities and households in the low-middle income suburb of Louwville in Vredenburg. Aurora Power which operates West Coast One has teamed up with ELRU (Early Learning Resource Unit) to support Early Childhood Education (ECD) programmes in the area as part of it socio-economic development (SED) contribution.

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 Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | H | M | Positive | Medium | L | High |
| **With Mitigation/ Enhancement[33]** | M | H | H | Positive | High | H | High |
| Can the impact be reversed? | | | Yes, by not implementing project | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**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 SBDM and BCRLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the SBDM and BCRLM 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 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 SIA 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,

[33] Assumes effective management of Community Trust

feed etc. The additional income from the WF 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 Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: 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. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | L | Positive | Low | L | High |
| **With Mitigation/ Enhancement** | M | M | M | Positive | Medium | H | High |
| Can the impact be reversed? | | | Yes, by not implementing agreements | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**Recommended enhancement measures**
Implement agreements with affected landowners.

### 4.4.5 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 raised as a concern by a number of key stakeholders interviewed, specifically owners of game farms in the area. The visual impacts were also linked to impact property values. The impact on property values is discussed in more detail in Section 4.4.5.

The findings of the Visual Impact Assessment (VIA) undertaken by Quinton Lawson, Architect in association with Bernard Oberholzer (June 2018) the landscape integrity of the area is enhanced by scenic or rural intactness of the landscape, as well as absence of other visual intrusions. The proposed wind farm would partly alter the character of the landscape, although farming could continue. In terms of visual sensitivity, the low escarpment along the western edge is a scenic feature, particularly when seen from the R63 and *Bruintjieshoogte* Pass. Cultural landscapes, mainly the farmsteads in the surroundings, generally form part of a separate heritage study, but are important in that they may be visually sensitive. The section on visual absorption capacity of the area (the potential of the landscape to screen the wind farms from view) notes that the upland site is gently undulating, and therefore visually exposed, i.e. has low visual absorption capacity.

The duration of the visual impact is expected to be long term as the project life is expected to extend beyond 20 years. In terms of significance ratings the VIA notes that the magnitude of the visual impact for the Northern Phase is expected to be

**Medium-High Negative** with mitigation for Operational Phase. For the Central and South Phase the significance is **Medium Negative** with mitigation.

The Findings and Recommendations section notes that the layout of the proposed turbines in all 3 wind farms succeeds in avoiding practically all the major visual constraints for this area, occupying the least sensitive parts of the site. In conclusion, the VIA states "It is the opinion of the Visual Specialists that the preferred Highlands wind farm layouts do not present a potential fatal flaw in visual terms. Mitigations have been implemented through various iterations and refinements to the layout. Additional visual mitigations have been recommended".

***Comment on findings of the VIA***

Based on the findings of the SIA, none of the landowners on whose farms the proposed WF is located raised any concerns regarding visual impacts. However, the adjacent landowners involved in game farming raised significant concerns about the visual impacts associated with wind farms and the potential impact on their operations.

Landowners involved in livestock farming were less concerned about the visual impacts. This highlights the nature of social impacts, namely that they can differ from person to person.

The visual impacts associated with the proposed WF and the impact on the areas undisturbed sense of place were identified as key concerns by the owners of Kamala Game Reserve (Hein Badenhorst) and East Cape Safaris (Grant Abrahamson). The concerns were not only linked to day time impacts, but also night time impacts associated with aviation lights and the impact on the dark, undisturbed night time sky. While the owners of Side by Side Safaris declined to comment, it would be reasonable to assume that they share similar concerns. The same concerns are also likely to apply to other properties involved in game farming, such as Driefontein which supports trophy hunting. The potential visual impact on adjacent landowners, specifically the game farming operations located to the north (Kamala), east (Buffeslfontien and East Cape Safaris) and south (Side by Side Safaris) is discussed in Section 3.6.9. As indicated by Draft VIA maps, all three Phases would impact on the current, established game farming operations located from the north-east to the south-west. Kamala Game Reserve would be most significantly affected by the North and Central Phases, East Cape Safaris by the Central and South Phases, and Side by Side Safaris by the South Phase.

All of the operations cater for up-market overseas visitors and the existing "African veld" sense of place represents a key component of their marketing strategy for overseas hunters and visitors. The establishment of a wind farm on their western boundary would impact on the areas sense of place, which in turn, may impact on the ability to attract overseas visitors. This would in turn have a potential impact on their operations. The impact on their operations would in turn impact on other local sectors of the economy in the area that benefit from the game farming sector. As indicated in the SBDM IDP, the game farming sector has become an increasingly important sector in the area.

Given the difference in opinion with regard to the significance of the visual impact associated with wind turbines, two assessment tables have been provided. The first table is based on the findings of the VIA. The second assessment table reflects the position of the stakeholders who indicated that the proposed wind turbines would not have high negative impact. The findings of the VIA therefore need to be viewed

within the context of the findings of the Policy and Landuse Planning Review (Section 4.3), which found that the development of renewable energy (including wind farms) in the SBDM and BCRLM is supported. However, at the same time the review also highlights the importance of the game farming sector and the need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the areas tourism potential and scenic assets. The potential impact on tourism is discussed below (Section 4.4.6).

**Table 4.12: Assessment of visual impact on rural sense of place**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| **With Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Table 4.13: Assessment of visual impact based on comments from stakeholders who did not identify major concerns**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | L | Negative | Low | M | Medium |
| **With Mitigation/ Enhancement** | M | M | L | Negative | Low | M | Medium |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

- 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 and adjacent game farming operations

The potential impact of the proposed WF on property values and current operations was raised as a concern, specifically by game farmers located to the east of the site. As indicated in Section 2.5, a literature review was undertaken as part of the SIA. It should be noted that the review does not constitute a property evaluation study and merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas. The assessment rating is based on the findings of the review.

In total five articles were identified and reviewed namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159;
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012;
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;
- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

The literature reviewed was based on an attempt by the authors of the SIA to identify what 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.

***Comment on findings of the literature review***

The most comprehensive study appears to the study by Gibbons (2014), which found that "averaging over wind farms of all sizes" the price reduction was 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. While the focus of the Gibbons study was on residential properties it does indicate that the larger the distance the less the impact. The findings of the Urbis (2016) study indicate that "wind farms may not significantly impact rural properties used for agricultural purposes".

However, it should be noted that game farming and hunting operations and their requirements in terms of undisturbed landscapes differ significantly from those associated with more traditional livestock farming. As indicated above, landowners involved in game farming raised significant concerns about the visual impacts associated with wind farms and the potential impact on their operations and property values, while landowners involved in livestock farming were less concerned. The findings of the VIA indicate that all three Phases would impact on the current, established game farming operations located to the north, east and south of the site. Kamala Game Reserve would be most significantly affected by the North and Central Phases, East Cape Safaris by the Central and South Phases, and Side by Side Safaris by the South Phase.

The current, relatively undisturbed character of the area represents a key component of their marketing strategy for overseas hunters and visitors. The majority of operations cater for up-market overseas visitors and considerable investments have been made in terms of establishing luxury lodges, breeding and purchase of a wide variety of game species and marketing. The establishment of a wind farm on their western boundary would impact on the areas sense of place, which in turn, may impact on the ability to attract overseas visitors. This would in turn have a potential impact on the financial viability of their operations. The impact on their operations would in turn impact on other local sectors of the economy in the area that benefit from the game farming sector and result in both direct and indirect job losses. Depending on the location of the proposed wind turbines it may not be possible to effectively mitigate the visual impact of the proposed Highlands WF on the adjacent game farming operations located to the north, east and south of the site.

The potential impact on established game farming operations was also raised as key concern during the EIA process for the proposed Spitskop East and Spitskop West WFs, which are located to the south and south east of the proposed Highlands WF. The issue is therefore not unique to the Highlands WF. The manager of the Ezulu Private Nature Reserve (Ms Carol Royale) which caters for up-market, overseas hunters and tourists, was interviewed in 2017 as part of the SIA for the Spitskop West WF. Ms Royale indicated that Amakhala Emoyeni WEF had not negatively impacted on visitor numbers. The closest wind turbines associated with the Amakhala Emoyeni WEF are located ~ 8 km from the northern boundary of the Ezulu Private Nature Reserve and are visible from high points in the reserve. The wind turbines are not visible from any of the lodges. In the case of the Kamala Game Reserve, East Cape Safaris Side by Side Safaris, the wind turbines associated with the different phases on are located within 5-10 km and are therefore a similar distance as those associated with the Amakhala Emoyeni WEF and the Ezulu Private Nature Reserve. The findings of the VIA with reference to the potentially affected hunting and game farming operations are summarised below.

***North Phase Turbines***
Based on the findings of the VIA approximately half of Kamala Game Reserve located to the north and east of the site would be located within 2.5-5 km (High Visibility) range, with the remainder within 5-10 km range (Moderate). The Kamala Lodge is located ~ 5km from the nearest proposed turbine. A sizeable portion of Buffelsfontein Guest Farm located to the east of the site is also located within 5-10 km. The Kamala Game Reserve is exposed to sections of the WEF due to its higher elevation.

A small portion of Kaalplaas (East Cape Safaris) falls within 5-10 km, but the bulk of the property is located beyond 10 km. The East Cape Safaris Lodge on Kaalplaas is located ~ 12 km from the nearest turbine. The lodge is however located in a view shadow area. Klipplaat (Side by Side Safaris) benefits from view shadows and distance. The lodge is located ~ 12 km from the nearest turbine and is also located within a view shadow area. The game farming operations on Kamala Game Reserve are therefore the most visually affected by the turbines associated with the Northern Phase.

***Central Phase Turbines***
While only a small portion of Kamala falls within 5 km of the Central Phase development area, the bulk of the property is located within 5-10 km, with High to Moderate visibility onto the site. Kamala Lodge is located ~ 7km from the nearest proposed turbine. A larger portion of Kaalplaas falls within the 5-10 km range, but a substantial portion falls within the view shadow. Most of the visually exposed areas on Kaalplaas are also located beyond 10 km of the nearest proposed turbines. The East Cape Safaris Lodge on Kaalplaas in located ~ 10 km from the nearest turbine and is located in a view shadow area. Klipplaat (Side by Side Safaris) largely benefits from view shadows and distance. The lodge is located ~ 10 km from the nearest turbine and is also located within a view shadow area. Other sections of Klipplaat also benefit from intervening distance and topography (view shadows) to screen it from proposed Central Phase turbines.

***South Phase Turbines***
Turbines proposed with the South Phase would be mainly visible to adjacent and near-adjacent properties located to the north, east and south of the site. The turbines will be located within 2.5-5 km of the lodges on Kaalplaas (East Cape Safaris lodge) and Klipplaat (Side by Side Safaris). The lodges on Kaalplaas and Klipplaat are however located within a view shadow area. However, the majority of the remaining farm areas are visually exposed to the turbines located in the South Phase development area.

Based on the findings of the VIA it would appear that the Kamala Game Reserve Lodge would be the most exposed to the wind turbines. This is due to its elevated location. The lodges on Kaalplaas (East Cape Safaris) and Klipplaat (Side by Side Safaris) are located in view shadow areas.

Therefore, while the findings of the literature review indicate that the potential impact of WFs on rural property values is likely to be low, the value of the current game farming operations in the vicinity of the site are strongly linked to areas current, relatively undisturbed sense of place and African Veld character. This character is likely to be negatively impacted by the establishment of the proposed WF. This is likely to have a negative impact on the current operations, which in turn is likely to have a potential negative impact on property values of the affected properties. Based on the findings of the SIA the significance of this impact is rated at

Medium Negative[34]. However, as indicated above, the proposed Highlands WF is located in the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of wind energy facilities.

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

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential impact on property values and current operations linked to the visual impact associated with the proposed WF and the potential impact on the areas rural sense of place. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| **With Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

Based on the findings of the SIA game farming, hunting and tourism related to game farms is a growing sector in the area. The SBDM IDP notes that game reserves are now a major industry within the district and contribute to the other prominent economic sector of the area, namely tourism. The SBDM IDP notes that the agriculture and tourism contribute approximately R690 million and R680 million respectively to the Gross Geographic Product (GGP) of the SBDM. The IDP therefore identifies these two sectors as the sectors that have the greatest potential for economic development. The IDP notes that the potential for growth in the tourism sector is significant. This will in turn have economic spin-offs in terms of retail, accommodation, hospitality etc. However, the proposed Highlands WF is located in the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of wind energy facilities. As indicated in Section 4.9, Cumulative Impact on Local Economy, the establishment of renewable energy facilities will create significant socio-economic benefits and opportunities for the area. These benefits

[34] The SIA is not in a position to assess the potential quantitative impact on property values and operations. This would require a specialist property evaluation assessment.

would need to be taken into account when considering the impact on game farming and hunting operations.

The potential impact of the proposed Highlands on tourism was raised as a concern by a number of property owners located to the east of the site. The concerns were largely linked to the visual impacts associated with wind turbines and impact that this would have on visitors and their decision to either visit the area and or return to the area.

A review of international literature in the impact of wind farms was undertaken as part of the SIA (Section 2.6). The key findings are summarised below. Three articles were reviewed, namely:

- Atchison, (April, 2012). Tourism Impact of Wind Farms: Submitted to Renewables Inquiry Scottish Government. University of Edinburgh
- Glasgow Caledonian University (2008). The economic impacts of wind farms on Scottish tourism. A report prepared for the Scottish Government
- Regeneris Consulting (2014). Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector

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

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

The study by Regeneris Consulting (2014) found that there was no evidence that wind farms would deter tourists from traveling along designated visitor or tourists routes. The study indicated that small minorities of visitors would be encouraged, whilst others would be discouraged. Overall, however, there was no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere. The study also found that in more sensitive locations 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. This is likely to apply to the visitors to the adjacent game farms.

Based on the findings of the literature review there is limited evidence to suggest that the proposed Highlands WF would impact on the tourism in the SBDM and BCLM at a regional level. The findings also indicate that wind farms do not impact on tourist routes. At a regional level the impact is rated **Low Negative**. However, as indicated above the proposed WF is likely to have a localised impact on the game farming operations in the immediate vicinity of the site. In this regard the area to north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF. The significance of this impact is rated **Moderate Negative**.

**Table 4.15: Impact on tourism in the region**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential impact of the WF on local tourism | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | L | Negative | Low | L | High |
| **With Mitigation/ Enhancement** | M | M | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Table 4.15: Impact on adjacent tourism operations associated with adjacent game farming and hunting**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Potential impact of the WF on adjacent tourism operations associated with game farming and hunting | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| **With Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | Medium |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**Recommended mitigation measures**

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

## 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[35]. 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 140 MW WF 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 4.16: Impacts associated with decommissioning**

| **Impact Phase: Decommissioning** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | M | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Assessment of No-Go option**

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

[35] 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.

**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;
- 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 POTENTIAL HEALTH IMPACTS

The potential health impacts typically associated with WEFs include, noise, 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 minimization of adverse health impacts for the population as a whole (WHO, 2004).

## 4.7 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.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one 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.

There Cookhouse WF is located ~ 35 km to the east of the site. The potential for cumulative impacts associated with combined visibility (whether two or more wind energy facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind energy facilities along a single journey, e.g. road or walking trail) is therefore reasonable. This should however be viewed within the context of the two WFs fall within an REDZ.

The findings of the VIA (June 2018) note that the development of the proposed wind farms and grid connections, when seen together with the existing wind farms and power lines in the vicinity, would result in cumulative visual impacts resulting in further change to the largely rural character to the area. In addition to the Highlands wind farms and powerline grid connections, there are existing Eskom powerlines parallel with the R63 Route, an approved solar PV farm near Pearston and a proposed Middleton wind farm south of Cookhouse on the N10 National Route, both within 35 kilometres of the Highlands site. The VIA also notes that the fact that the proposed Highlands wind farms fall within the gazetted Cookhouse Renewable Energy Development Zone (REDZ) means that it forms part of a renewable energy node. In conclusion the VIA states the "Given that the renewable energy projects mentioned above are not within viewing distance of each other and that they form part of REDZ, the cumulative visual impact significance is considered to be **Low (Negative)** in the local context".

As indicated above, while certain stakeholders are opposed to the proposed WF, others either support the development and or do not have an objection to the establishment of a WF on the proposed site. This will also have implications for the perceptions of different people towards to the nature and significance of the cumulative impacts associated with wind farms on sense of place. However, the potential impact of wind energy facilities 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.

**Table 4.17: Cumulative impacts on sense of place and the landscape[36]**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: Cumulative visual impact associated with the establishment of a WEF on the areas rural sense of place and character of the landscape | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | M | L | Negative | Low | M | Medium |
| **With Mitigation/ Enhancement** | M | M | L | Negative | Low | M | Medium |
| Can the impact be reversed? | | | Yes, by removing turbines | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

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

## 4.8 CUMULATIVE IMPACT ON LOCAL SERVICES AND ACCOMMODATION

The establishment of the proposed 140 MW Highlands WF and the other renewable energy facilities in the SBDM and BCRLM 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 WF. 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 will 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 towns such as Somerset East, Bedford and Cookhouse. The LED Manager for the BCRLM interviewed as part of the Spitskop West WF SIA indicated that rental prices in Somerset East and Cookhouse had been driven up during the construction phase of the Amakhala Emoyeni Wind Farm.

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

[36] Based on findings of the VIA

benefits will create opportunities for investment in local towns, such as Somerset East and Cookhouse, 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 SBDM and BCRLM in consultation with the Eastern Cape Provincial Government, 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 SBDM and BCRLM.

**Table 4.18: Cumulative impacts on local services**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: The establishment of a number of renewable energy facilities has the potential to place pressure on local services, specifically medical, education and accommodation | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| **With Mitigation/ Enhancement** | M | L | L | Negative | Low | L | High |
| Can the impact be reversed? | | | Yes, by implementing effective mitigation | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, measures will be provided in the Assessment Report | | | | |

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

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

## 4.9 CUMULATIVE IMPACT ON LOCAL ECONOMY

In addition to the potential negative impacts, the establishment of the proposed 140 MW WF and other renewable energy facilities 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 large 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.

The Overview of the IPPP (2017) confirms the benefits associated with renewable energy projects for local and regional economies. The total projected procurement spend for BW1 to BW4, 1S2 and 1S2 during the construction phase was R75 billion, while the operational procurement over 20 years is estimated to be in the region of R72 billion. The reports note that the construction spend of R75 billion has resulted in a substantial stimulus for establishing local manufacturing capacity. Actual local content spend reported for IPPs that have started construction amounts to R38.1 billion against a corresponding project value (as realised to date) of R75.8 billion. This means 50% of the project value has been locally procured, exceeding the 45% commitment from IPPs and the thresholds for BW1 – BW4 (25%-45%). The report also notes that the REIPPPP has prompted several technology and component manufacturers to establish local manufacturing facilities.

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

**Table 4.19: Cumulative impacts on local economy**

| **Impact Phase: Operational** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: The establishment of a number of renewable energy facilities in the region will create employment, skills development and training opportunities, creation of downstream business opportunities. | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** | M | H | M | Positive | Medium | L | High |
| **With Mitigation/ Enhancement** | M | H | M | Positive | High | M | High |
| Can the impact be reversed? | | | Yes, by not implementing project | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

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

**Recommended mitigation measures**
The proposed establishment of suitably sited renewable energy facilities within the SBDM and BCRLM should be supported.

## 4.10 ASSESSMENT OF NO-DEVELOPMENT OPTION

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-Development option 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 WF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Eastern Cape and other parts of South Africa. Foregoing the proposed establishment of WFs would therefore not necessarily compromise the development of renewable energy facilities in the Eastern Cape Province and or South Africa. However, the socio-economic benefits for local communities in the SBDM and BCRLM would be forfeited. These impacts would however need to be considered within the context of the potential impact on the adjacent game farming and hunting operations.

**Table 4.20: Assessment of no-development option**

| **Impact Phase: No Development Option** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Potential impact description**: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy and a lost opportunity for the MLM | | | | | | | |
| | **Extent** | **Duration** | **Intensity** | **Status** | **Significance** | **Probability** | **Confidence** |
| **Without Mitigation/ Enhancement** [37] | M | H | L | Negative | Medium | M | High |
| **With Mitigation/ Enhancement** | M | H | L | Negative | Medium | M | High |
| Can the impact be reversed? | | | N/A | | | | |
| Will impact cause irreplaceable loss or resources? | | | No | | | | |
| Can impact be avoided, managed, enhanced and or mitigated? | | | Yes, see below | | | | |

**Recommended enhancement measures**
The proposed establishment of suitably sited renewable energy facilities within the SBDM and BCRLM should be supported.

[37] Assumes that the proposed WEF is not developed

# SECTION 5: KEY FINDINGS AND RECOMMENDATIONS

## 5.1 INTRODUCTION

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

- A review of the issues identified during the Scoping Process;
- 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;
- The experience of the authors with other wind energy projects in South Africa

As indicated above, based on input from the Visual and Heritage specialists the original proposed layout was revised. The changes included relocation of a number of wind turbines, substations and internal roads and cabling. The Visual Impact Assessment specialists (Lawson and Oberholzer) have indicated that the revised layout of wind turbines will not impact on the overall findings of the Visual Impact Assessment. The changes to the proposed layout will therefore have no bearing on the findings of the SIA. The findings of the SIA therefore apply to the revised wind turbine layout and changes in terms of substation locations and access roads.

## 5.1 SUMMARY OF KEY FINDINGS

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

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

### 5.1.1 Policy and planning issues

As indicated in Section 1.6, legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents.

The findings of the review indicated that renewable energy is strongly supported at a national, provincial and local level. The development of and investment in renewable energy is supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Eastern Cape Provincial Growth and Development Plan (ECPGDP), the Sarah Baartman District Municipality Integrated Development Plan (IDP) and the Blue

Crane Route Local Municipality Integrated Development Plan (IDP). The proposed Highlands WF is also located in the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of wind energy facilities.

However, there is a need to ensure that the siting of renewable energy facilities (including wind farms) does not impact on the areas tourism potential. In this regard the area to north of the site and the R63 is identified as Tourist Focus Area in the SBDM SDF.

### 5.1.1 Construction phase impacts

The key social issues associated with the construction phase include:

**Potential positive impacts**

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

The construction phase for a single 140 MW WF 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 the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Cookhouse, Somerset East and Pearston. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. 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 is confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and DBSA (30 June 2017). The study found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more job years[38] for South African citizens than anticipated. 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 140 MW WF will be in the region of R 2.5 billion (2018 Rand value). The total wage bill will be in the region of R69 million (2018 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 a Somerset East and Cookhouse. 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;

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

- 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;
- Impact of heavy vehicles, including damage to roads, safety and dust;
- Impact on farming activities.

The findings of the SIA 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 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** | Medium (+) | Medium (+) |
| **Presence of construction workers and potential impacts on family structures and social networks** | Medium (-) | 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** | Medium (-) | Low (-) |
| **Increased fire risk** | Medium (-) | Low (-) |
| **Impact of heavy vehicles and construction activities** | Medium (-) | Low (-) |
| **Impact on farming activities** | Medium (-) | Low (-) |

### 5.1.2 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;
- Benefits for affected landowners.

***Development of renewable energy infrastructure***
The establishment of renewable energy infrastructure, such as the proposed Highlands WF, 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 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.

In terms of investment, the REIPPPP has attracted R48.8 billion in foreign investment and financing in the seven bid windows (BW1 – BW4, 1S2 and IS2). This is more than double the inward FDI attracted into South Africa during 2015 (R22.6 billion). In terms of local equity shareholding, 48% (R31.5 billion) of the total equity shareholding (R66.7 billion) was held by South African's across BW1 to BW4, 1S2 and IS2. As far as Broad Based Black Economic Empowerment is concerned, Black South Africans own, on average, 31% of projects that have reached financial close. The combined (construction and operations) procurement value for BW1 to BW4, 1S2 and IS2 is projected as R147.6 billion, of which R47.4 billion has been spent to date. In terms of employment, a total of 32 532 job years[39] have been created for South African citizens, of which 29 046 were in construction and 3 486 in operations.

The establishment of renewable energy facilities, such as the Highlands WF, 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 140 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 (2018 Rand value). The majority of the low and semi-skilled beneficiaries are likely to be historically disadvantaged (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 Somerset East and Cookhouse.

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

Procurement during the operation phase will also create opportunities for the local economy and businesses. In this regard the overview of the IPPPP (2017) notes that the procurement spend over the 20 year operation phase for BW1 to BW4, 1S2 and IS2 will be in the region of R 75 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 SMME's.

The 2017 IPPP Overview notes that to date (across 7 bid windows) a total contribution of R20.6 billion has been committed to Socio-economic Development (SED) initiatives linked to Community Trusts. Of this total commitment, R16.5 billion has been specifically allocated to local communities where the IPPs operate. 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 Paternoster and St Helena Bay can be regarded in the same category of 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.

***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 findings of the VIA indicate that the duration of the visual impact is expected to be long term as the project life is expected to extend beyond 20 years. In terms of

significance ratings the VIA notes that the magnitude of the visual impact for the Northern Phase is expected to be **Medium-High Negative** with mitigation for Operational Phase. For the Central and South Phase the significance is **Medium Negative** with mitigation.

Based on the findings of the SIA, none of the landowners on whose farms the proposed WF is located raised any concerns regarding visual impacts. However, the adjacent landowners involved in game farming raised significant concerns about the visual impacts associated with wind farms and the potential impact on their operations. The concerns were not only linked to day time impacts, but also night time impacts associated with aviation lights and the impact on the dark, undisturbed night time sky. Based on the findings of the VIA all three Phases would impact on the current, established game farming operations located from the north-east to the south-west. Kamala Game Reserve would be most significantly affected by the North and Central Phases, East Cape Safaris by the Central and South Phases, and Side by Side Safaris by the South Phase.

***Impact on property values and existing operations***

The most comprehensive study appears to the study by Gibbons (2014), which found that "averaging over wind farms of all sizes" the price reduction was 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. While the focus of the focus of the Gibbons study was on residential properties it does indicated that the larger the distance the less the impact. The findings of the Urbis (2016) study indicate that "wind farms may not significantly impact rural properties used for agricultural purposes".

However, while the findings of the literature review indicate that the potential impact of WFs on rural property values is likely to be low, the value of the current game farming operations in the vicinity of the site are strongly linked to areas current, relatively undisturbed sense of place and African Veld character. This character could potentially be impacted by the establishment of the proposed WF. While the wind turbines associated with the Highlands WF may not be visible from some of the lodges on the affected farms, they are likely to be visible from sections of the affected farms. This is may have a negative impact on the current operations, which in turn is may have a negative impact on property values of the affected properties. Based on the findings of the SIA the significance of this impact is rated at **Medium Negative**[40]. However, as indicated above, the proposed Highlands WF is located in the Cookhouse Wind REDZ. The area has therefore been identified as suitable for the establishment of wind energy facilities. The establishment of renewable energy facilities will create significant socio-economic benefits and opportunities for the area. These benefits need to be considered when assessing the potential impact on adjacent game farming and hunting operations.

***Impact on tourism***

Based on the findings of the literature review there is limited evidence to suggest that the proposed Highlands WF would impact on the tourism in the SBDM and BCLM. The findings also indicate that wind farms do not impact on tourist routes. At a regional level the impact is rated **Low Negative**. However, the proposed WF may have a localised impact on the game farming operations in the immediate vicinity of the site. The significance of this impact is rated **Moderate Negative**. The potential localised impact would however need to be considered within the context of the

[40] The SIA is not in a position to assess the potential quantitative impact on property values. This would require a specialist property evaluation assessment.

Highlands WF location within the Cookhouse Wind REDZ and the significant socio-economic benefits associated with the establishment of renewable energy facilities.

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** | Medium (+) | Moderate (+) |
| **Establishment of Community Trust** | Medium (+) | High (+) |
| **Benefits for local affected landowners** | Low (+) | Medium (+) |
| **Visual impact and impact on sense of place[41]** | Medium-High (-)<br>Low (-) | Medium (-)<br>Low (-) |
| **Impact on property values and adjacent operations** | Medium (-) | Medium (-) |
| **Impact on tourism[42]** | Low (-)<br>Medium (-) | Low (-)<br>Medium (-) |

### 5.1.3 Assessment of cumulative impacts

***Cumulative impact on sense of place***
The findings of the VIA (June 2018) note that the development of the proposed wind farms and grid connections, when seen together with the existing wind farms and power lines in the vicinity, would result in cumulative visual impacts resulting in further change to the largely rural character to the area. In addition to the Highlands wind farms and powerline grid connections, there are existing Eskom powerlines parallel with the R63 Route, an approved solar PV farm near Pearston and a proposed Middleton wind farm south of Cookhouse on the N10 National Route, both within 35 kilometres of the Highlands site. The VIA also notes that the fact that the proposed Highlands wind farms fall within the gazetted Cookhouse Renewable Energy Development Zone (REDZ) means that it forms part of a renewable energy node. In conclusion the VIA states the "Given that the renewable energy projects mentioned above are not within viewing distance of each other and that they form part of REDZ, the cumulative visual impact significance is considered to be **Low (Negative)** in the local context".

As indicated above, while certain stakeholders are opposed to the proposed WF, others either support the development and or do not have an objection to the establishment of a WF on the proposed site. This will also have implications for the perceptions of different people towards to the nature and significance of the cumulative impacts associated with wind farms on sense of place. However, the potential impact of wind energy facilities 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

[41] Ratings reflect findings of VIA (Medium-High Negative) and findings of stakeholders interviewed that do not regard wind farm as a having a negative visual impact (Low Negative).
[42] The rating applies to the impact on tourism in the broader area (Low Negative) and adjacent game farming and hunting operations (Medium).

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 WF and the other renewable energy facilities in the SBDM and BCRLM 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 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 WF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the SBDM and BCRLM, 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. This benefit is rated as **High Positive** with enhancement.

### 5.1.4 Potential health impacts

The potential health impacts typically associated with WEFs include, noise, shadow flicker and electromagnetic radiation. As indicated above, 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 in fact will have positive health benefits (WHO, 2004). Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WEF is of **Low Negative** significance.

### 5.1.5 Assessment of no-development option

The No-Development option 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-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed Highlands WF 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 WF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Eastern Cape and other parts of South Africa. Foregoing the proposed establishment of WFs would therefore not necessarily compromise the development of renewable energy facilities in the

Eastern Cape Province and or South Africa. However, the socio-economic benefits for local communities in the SBDM and BCRLM would be forfeited.

### 5.1.6 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[43]. 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 WF as scrap metal should be allocated to the rehabilitation of the site.

## 5.2 CONCLUSIONS AND RECOMMENDATIONS

**Conclusions**
The findings of the SIA indicate that the development of the proposed Highlands WF 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 SIA also indicate that the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives.

The Highlands WF site is also located within a REDZ. The area has therefore been identified as suitable for the establishment of renewable energy facilities. However, a key concern identified during the SIA relates to the visual impacts associated with the wind turbines and the potential impact on existing, established game farming and hunting operations in the area, specifically the area to the north, east and south of the site. The majority of these operations cater for up-market overseas visitors and the existing "African veld" sense of place represents a key component of their marketing strategy. The establishment of a wind farm on their western boundary would impact on the areas current sense of place, which in turn, may negatively impact on their operations and property values. The potential impacts will be largely be confined to four to five existing game farming operations. The potential localised

[43] 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.

impact would therefore need to be considered within the context of the location of the Highlands WF within the Cookhouse Wind REDZ and the significant socio-economic benefits associated with the establishment of renewable energy facilities.

**Recommendations**

- The applicants should meet with the affected landowners located to the north, east and south of the site to discuss the possibility relocating wind turbines that have the highest potential visual impact;

# ANNEXURE A

## INTERVIEWS

- Abrahamson, Mr Anthony (2018-07-05). East Cape Safaris/ Kaalplaas Farm.
- Abrahamson, Mr Grant (2018-07-05). East Cape Safaris/ Kaalplaas Farm.
- Abrahamson, Ms Sarine (2018-07-05). East Cape Safaris/ Kaalplaas Farm.
- Badenhorst, Mr Hein (telephonic 2018-07-03; 2018-07-12; 2018-07-18). Kamala Nature Reserve.
- Brown, Mr Bill (2018-07-04). Highlands Farm.
- Fani, Mr Linda (2018-07-05). Rents Doornrivier Farm from National Government.
- Fani, Mr Simphewe (telephonic 2018-07-04). Rents Doornrivier Farm from National Government.
- Jan X, Mr. (2018-07-04). 37-year resident farm laborer on Bothaslaagte Farm.
- Jordaan, Mr Tollie (telephonic 2018-07-02). Buffelsfontein Guest Farm.
- Jordaan, Mr Zirk (2018-07-05). Rietfontein Farm.
- Kemp, Mr Renier (2018-07-04). Spaarwater Farm.
- Nelani, Mr Tozi (telephonic 2018-07-03). Rents Mulderskraal Farm from National Government.
- Nel, Mr Jakkie (2018-07-05). Coetzeeskraal Farm.
- Nolte, Ms Riana (Informal chat 2018-07-05). Owner Avondrust Guest House, Somerset East.

Interviews undertaken as part of Spitskop West WF SIA in 2017

- Ms Samela, IDP Manager, Blue Crane Route LM, 22/02/2017;
- Ms Carol Royale, Manager Ezulu Private Game Reserve, 22/02/2017;
- Mr Thandubuhule Mguduwa, Tourism Manager, Sarah Baartman DM, 23/02/2017;
- Mr Duma Magxwalia, LED Manager, Sarah Baartman DM, 23/02/2017.

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# ANNEXURE B

## ASSESSMENT METHODOLOGY

The evaluation method for determining significance of impacts is shown below.[44]

Note that an adjustment was made, which involved changing the consequence column to the significance column, due to the fact that probability should not necessarily determine significance, as, for example, catastrophic events would be highly significant, even though the probability of such an event occurring is low.

Definitions of or criteria for environmental impact parameters

The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

**Extent (spatial scale):**

***Ranking criteria***

| L | M | H |
|---|---|---|
| Impact is localized within site boundary | Widespread impact beyond site boundary; Local | Impact widespread far beyond site boundary; Regional/national |

Take into consideration:
Access to resources; amenity
Threats to lifestyles, traditions and values
Cumulative impacts, including possible changes to land uses at and around the site.

**Duration:**

***Ranking criteria***

| L | M | H |
|---|---|---|
| Quickly reversible, less than project life, short term (0-5 years) | Reversible over time; medium term to life of project (5-15 years) | Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources |

Take into consideration:
Cost – benefit economically and socially (e.g. long or short term costs/benefits)

[44] (Adapted from T Hacking, AATS – Envirolink, 1998: An innovative approach to structuring environmental impact assessment reports. In: IAIA SA 1998 Conference Papers and Notes

**Intensity (severity):**

| Type of Criteria | Negative | | | Positive | | |
|---|---|---|---|---|---|---|
| | H- | M- | L- | L+ | M+ | H+ |
| Qualitative | Substantial deterioration, death, illness or injury, loss of habitat/ diversity or resource, severe alteration or disturbance of important processes. | Moderate deterioration, discomfort, Partial loss of habitat/ biodiversity/ resource or slight or alteration | Minor deterioration, nuisance or irritation, minor change in species/habitat/ diversity or resource, no or very little quality deterioration. | Minor improvement, restoration, improved management | Moderate improvement, restoration, improved management, substitution | Substantial improvement, substitution |
| Qualitative | Measurable deterioration Recommended level will often be violated (e.g. pollution) | Measurable deterioration Recommended level will occasionally be violated | No measurable change; Recommended level will never be violated | No measurable change; Within or better than recommended level. | Measurable improvement | Measurable improvement |
| Community response | Vigorous | Widespread complaints | Sporadic complaints | No observed reaction | Some support | Favourable publicity |

Take into consideration:
Cost – benefit economically and socially (e.g. high nett cost = substantial deterioration)
Impacts on human-induced climate change
Impacts on future management (e.g. easy/practical to manage with change or recommendation)

**Probability of occurrence:**

***Ranking criteria***

| L | M | H |
|---|---|---|
| Unlikely; low likelihood; Seldom No known risk or vulnerability to natural or induced hazards. | Possible, distinct possibility, frequent Low to medium risk or vulnerability to natural or induced hazards. | Definite (regardless of prevention measures), highly likely, continuous High risk or vulnerability to natural or induced hazards. |

The specialist study must attempt to quantify the magnitude of impacts and outline the rationale used. Where appropriate, international standards are to be used as a measure of the level of impact.

**Status of the impact:**
Describe whether the impact is positive, negative or neutral for each parameter. The ranking criteria are described in negative terms. Where positive impacts are identified, use the opposite, positive descriptions for criteria. Based on a synthesis of the information contained in (a) to (e) above, the specialist will be required to assess the significance of potential impacts in terms of the following criteria:

| EXTENT | | 1 | 2 |
|---|---|---|---|
| DURATION | 1 | 2 | 2 |
| | 2 | 2 | 3 |
| | 3 | 2 | 3 |

| EXTENT | | 1 | 2 |
|---|---|---|---|
| DURATION | 1 | 1 | 1 |
| | 2 | 1 | 2 |
| | 3 | 2 | 2 |

| EXTENT | | 1 | 2 |
|---|---|---|---|
| DURATION | 1 | 1 | 1 |
| | 2 | 1 | 2 |
| | 3 | 1 | 2 |

| Consequence of Impact | | |
|---|---|---|
| 1 | High | High |
| 2 | High | Medium |
| 3 | High | Low |

| SIGNIFICANCE ASSESSMENT | | | |
|---|---|---|---|
| CONSEQUENCE | | 1 | 2 |
| PROBABILITY | 1 | High | Medium |
| | 2 | High | Medium |
| | 3 | Medium | Low |

| Probability Lookup | |
|---|---|
| High | 1 |
| Medium | 2 |
| Low | 3 |
| Consequence Lookup | |

| | |
|---|---|
| **High** | **1** |
| **Medium** | **2** |
| **Low** | **3** |

# ANNEXURE C: CV

## Tony Barbour
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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 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 D: DECLARATION

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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**DETAILS OF SPECIALIST AND DECLARATION OF INTEREST**

| | (For official use only) |
|---|---|
| File Reference Number: | 12/12/20/ or 12/9/11/L |
| NEAS Reference Number: | DEA/EIA |
| Date Received: | |

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

**PROJECT TITLE**

Highlands Wind Energy Facilities and associated infrastructure including grid connection infrastructure

| | | | |
|---|---|---|---|
| Specialist: | Tony Barbour Environmental Consulting and Research | | |
| Contact person: | Tony barbour | | |
| Postal address: | 10 First Avenue, Claremont | | |
| Postal code: | 7708 | Cell: | 0826008266 |
| Telephone: | 021 761 2355 | Fax: | 021 761 2355 |
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| Professional affiliation(s) (if any) | | | |

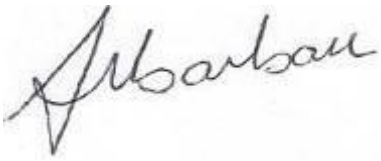
| | | | |
|---|---|---|---|
| Project Consultant: | Arcus Consultancy Services South Africa (Pty) Ltd | | |
| Contact person: | Anja Albertyn | | |
| Postal address: | Office 220, Cube Workspace, Long Street cnr Hans Strijdom Avenue, Cape Town | | |
| Postal code: | 8001 | Cell: | 0762658933 |
| Telephone: | 0214121529 | Fax: | |
| E-mail: | highlands@arcusconsulting.co.za | | |

The specialist declaration of independence in terms of the Regulations_

I, Tony Barbour , declare that --

General declaration:

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



Signature of the specialist:

Tony Barbour Environmental Consulting and Research

Name of company (if applicable):

20 July 2018

Date:

# ANNEXURE E

## IMPACT ON TOURISM: LITERATURE REVIEW

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The findings of the research therefore contradicted the argument that tourists would inevitably view the turbines as having a detrimental impact on the attractiveness of

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

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

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

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

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

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

Africa, tourism is therefore regarded as a key sector. Likewise, the natural environment is identified as a key tourist asset.

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

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

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

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

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

The key findings of the study indicate that visitor responses and reactions to wind farms are subjective and depend on the individual's own judgements and interpretation of the relative value of wind farms and their aesthetics. In this regard a key factor is the reaction of individual tourists to the impact of wind farms in the landscape. This is potentially very important to the performance of tourism in many

parts of Wales, where surveys have shown that beautiful and unspoiled countryside is an important reason for the visit and a key contributor to visitor enjoyment.

However, the study notes that previous studies have shown that while individuals vary widely in their reaction to wind farms, a clear majority do not react negatively to them in the landscape and will not change their destination choice on account of the presence of wind farms. In this regard there are a number of factors which could influence people's perceptions of wind farms. These are likely to include their views on renewable energy and the effectiveness of wind farms as a means of energy production. The research suggests that these wider perceptions play a role in how tourists weigh up the positive and negative aspects of wind farm development.

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

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

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

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

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

The study also found that there was no evidence that wind farms would deter tourists from traveling along designated visitor or tourists routes. The study indicated that small minorities of visitors would be encouraged, whilst others would be

discouraged. Overall, however, there was no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere.

# ANNEXURE F

## IMPACT ON PROPERTY VALUES: LITERATURE REVIEW

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

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

In total five articles were identified and reviewed namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159;
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012;
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;
- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

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

### *Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre*

The paper notes that there has been a rapid expansion of wind farm developments in the UK, like other areas in Europe and parts of the US, since the mid-1990s. While renewable energy technology clearly provides potential global environmental benefits in terms of reduced $CO_2$ emissions and slower depletion of natural energy resources, like most power generation and transmission infrastructure, the plant, access services and transmission equipment associated with renewable electricity generation

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

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

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

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

and to near zero between 8-14km, which is at the limit of likely visibility. Evidence from comparisons with places close to wind farms, but where wind farms are less visible suggests that the price reductions are directly attributable to turbine visibility. As might be expected, large visible wind farms have much bigger impacts that extend over a wider area.

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

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

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

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

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

The study sought to determine what sample size is required to undertake an analysis of sales data within a 2 kilometre radius of a wind farm. Adopting a confidence level

of 95%, a minimum sample of 97 transactions would be required to arrive at a result accurate within 10%. This increases to a sample size of 385 transactions to arrive at a result accurate within 5%.

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

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

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

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

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

The study undertaken by Urbis (2016) includes a review of relevant literature, and refers to research undertaken by Hoen (2009 & 2013), noting that Hoen found no statistical evidence that home values near wind turbines were affected in the post-

construction or post-announcement/ pre-construction periods. Hoen (2009 & 2013) also concluded that if there was an effect, it is possible that the impact is sporadic, affecting only particular types of homes or in markets where consumer preferences were ill-disposed to wind farms. However, other studies found mixed results. Research by Heintzelman and Tuttle (2012) found that when testing across three different US counties, that in some instances there was a negative relationship between proximity to wind turbines and property values; however, it was not consistent and there was no identifiable factor driving the difference. The authors of the report note that the lack of consistency between the results may point to a qualitative factor associated with the wind farm itself, or a difference in consumer preferences between counties when it comes to co-location with wind farms. This would make it difficult to draw conclusive implications about compensating all landholders in close proximity to wind farms.

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

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

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

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

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

minority of transactions that showed a fall in value, other factors may have been involved.

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

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

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

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

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

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

of productivity resulting from wind farms. Therefore they are unlikely to negatively impact the value of such properties.

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

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

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

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

The paper notes that the extensively promoted expansion of renewable energy technologies is mostly justified by referring to the advantages and benign attributes associated with them. In the case of wind power, these attributes are, e.g., a "green" and $CO_2$-free energy generation without fuel costs as well as reasonable land consumption (Ackermann and Söder, 2002; Manwell, et al., 2009, pp.443-447; BWE, 2012). However, the paper notes that there are also negative impacts associated with wind farms, including changes to landscapes and vistas. The negative externalities associated with wind farm sites have led to public concerns relating to the impact on the environment and landscape. The authors indicate that at the time of preparing the paper there were, to their knowledge, only four peer-reviewed papers on the topic of impacts on property values., namely, Sims and Dent, 2007; Sims et al., 2008; Laposa and Mueller, 2010; Heintzelman and Tuttle, 2011.

Sims and Dent (2007) investigated the impact of a wind farm near Cornwall, UK, on house prices, using a hedonic pricing approach and comparative sales analysis. Applying straightforward OLS regression, they found some correlation between the distance to a wind farm and property values. Due to data limitations, the overall model results had a fairly weak explanatory power. Sims et al. (2008) modelled the impact of wind farm proximity to houses for a region near Cornwall, UK. There was

some evidence to suggest that noise and flicker effects as well as visibility may influence property value in a wind farm's vicinity. The hedonic analysis, in which standard OLS regression techniques were used, showed no significant impacts caused by the wind farm.

Laposa and Müller (2010) examined the impact of wind farm project announcements on property values for northern Colorado, US. Including observations before and after the announcement of the wind farm project, they applied a hedonic pricing model using standard OLS regression. The results obtained indicate a significant impact of the project announcement at the 10% level. However, they conclude that this impact is likely more attributable to the beginning of the national housing crisis rather than the announcement itself. Heintzelman and Tuttle (2011) study exploring the impacts of new wind facilities on property values in northern New York, US found that nearby wind facilities can significantly reduce property values. Decreasing the distance to the wind farm to one mile indicated a property price devaluation of between 7.73% and 14.87%. In addition, they controlled for omitted variables and endogeneity biases by applying a repeat-sales analysis.

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

The study focused on property sales within an area of 119 $km^2$ in the north of the federal state of North Rhine-Westphalia, including parts of the city of Rheine and the city of Neuenkirchen. Both cities, at least two districts in the case of Rheine (Mesum and Hauenhorst), are in the immediate proximity of the wind farm site. This northern region of North Rhine-Westphalia can be defined as a semi-urban region mainly characterized by medium- and small-sized towns. In 2011, a population of 26 900 lived within a radius of about 5.5 km around the site. The area is therefore more densely populated that the study area.

The distance of the wind turbines from affected properties ranged from 945 m to 5.5 km. To measure the visibility of the wind farm site, the study calculated viewsheds for each property. A precise measurement of the view crucially depends on capturing all features in the landscape that are visible from the observer's point of view. The view of a certain feature in the landscape might be hindered by heights, slopes, vegetation, or buildings. In order to calculate viewsheds as precisely as possible, a digital surface model was applied with an accuracy of one meter. The digital surface model included height level information of the terrain, the vegetation, and buildings. The study also looked at aural impacts (noise) of wind turbines. The research indicated that increases of the dB-level above the average ambient noise level in urban or semi-urban regions are only measureable within the immediate vicinity of a turbine of about 350 m (Hau, 2006; Rogers et al., 2006; Harrison, 2011). The

shortest distance to a property is 945 m. As such aural impacts were not considered by the study.

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

***Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University***

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

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

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

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

***Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory***

The paper notes that previous research on the effects of wind energy facilities on surrounding home values has been limited by small samples of relevant home-sale data and the inability to account adequately for confounding home-value factors and spatial dependence in the data. The authors note that this study helps fill those gaps by collecting data from more than 50 000 home sales among 27 counties in nine states of the USA. The homes were located within 10 miles of 67 different wind facilities, and 1 198 sales were within 1 mile (1.6 km) (331 of which were within a half mile (0.8km)) of a turbine. This total represents 2 % of the total survey and, as indicated above, has been raised an issue by commentators.

The approach was aimed at answering the following questions:

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

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

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

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

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

Based on the results, the study found that it is *highly unlikely* that the actual average effect for homes that sold in the sample areas within 1 mile (1.6km) of an existing turbine is larger than +/-4.9%. In other words, the average value of these homes could be as much as 4.9% higher than it would have been without the presence of wind turbines, as much as 4.9% lower, the same (i.e., zero effect), or anywhere in between. Similarly, it is highly unlikely that the average actual effect for homes sold in the sample area within a half mile of an existing turbine is larger than +/-9.0%. In other words, the average value of these homes could be as much as 9% higher than it would have been without the presence of wind turbines, as much as 9% lower, the same (i.e., zero effect), or anywhere in between. The study notes that, regardless of these potential maximum effects, the core results of the study consistently show no sizable statistically significant impact of wind turbines on nearby property values.