ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED FRONTEER (PTY) LTD WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE IN THE EASTERN CAPE

Socio-Economic Impact Assessment Report

Report for Fronteer Wind Farm

Draft

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Report prepared for:

Savannah Environmental

P O Box 148

Sunninghill, Gauteng

2157

Report prepared by:

Urban-Econ Development Economists

109 Cape Road, Mill Park

Port Elizabeth Eastern Cape

6001

SPECIALIST EXPERTISE

Matthew Keeley

Profession: Senior Development Economist

Experience: 14 years

Key Skills: Local Economic Development Planning, Economic Property Market Analysis and Socio-Economic and Economic Impact Assessments

Brief Profile: Matthew Keeley is the Eastern Cape Regional Manager of Urban-Econ Development Economists and oversees all the company's provincial research projects. He has served in this position since 2010, and in this time managed in excess of 250 economic planning and research studies. Matthew obtained his Bachelor's degree majoring in Geography and Economics from Rhodes University; this was followed by an Honours degree in Economic Geography (Spatial Development), part of which was studied at University West, Sweden. He holds a Master of Science (MSc) through dissertation in Geography, with a focus on human settlement socio-economic planning.

Matthew's professional experience has involved the project management of a number of high-profile economic planning projects in the province, these include studies such as the Eastern Cape Provincial Industrial Strategy Implementation Plan, Nelson Mandela Bay Iconic Landmark Precinct Business Plan, Nelson Mandela Bay Stadium Property Precinct Plan, Kingdom of Lesotho Renewable Energy Master Plan Impact Analysis & NMBM Integrated Public Transport System (IPTS) SMME Strategy, to name just a few.

Education:

Rhodes University	Bachelor Degree in Geography and Economics
Rhodes University & University West (Sweden)	Honours Degree in Economic Geography (Spatial Development)
University of South Africa (UNISA)	Master of Science (MSc) in Geography

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1. INTRODUCTION

Savannah Environmental was commissioned by **Fronteer (Pty) Ltd** to undertake an Environmental Impact Assessment (EIA) for the proposed 213 MW Fronteer Wind Farm which is located between Makhanda (formerly known as Grahamstown) and Riebeek East in the Cookhouse Renewable Energy Development Zone Three (Cookhouse REDZ 3) located in the Eastern Cape Province. As part of the specialist studies, it was identified that a **Socio-Economic Impact Assessment (SEIA)** was required. Savannah Environmental subsequently appointed **Urban-Econ Development Economists** to conduct the SEIA process. This report seeks to assess the potential socio-economic impacts and has included recommendations to enhance the positive impacts and reduce the potential negative impacts of the project. This is done in order to enhance the foreseeable benefits of the development.

1.1 Brief Description of the Project

The proposed Fronteer Wind Farm will have a total installed capacity of 213 MW based on 38 turbines at a generation capacity range of 4.2 MW to 5.6 MW per turbine. The development will be situated approximately 12 km from Makhanda next to the R350 and R344 routes and adjacent to the planned wind farm development, Wind Garden (subject of a separate report). In addition, the following associated infrastructure is planned to be established as part of the development:

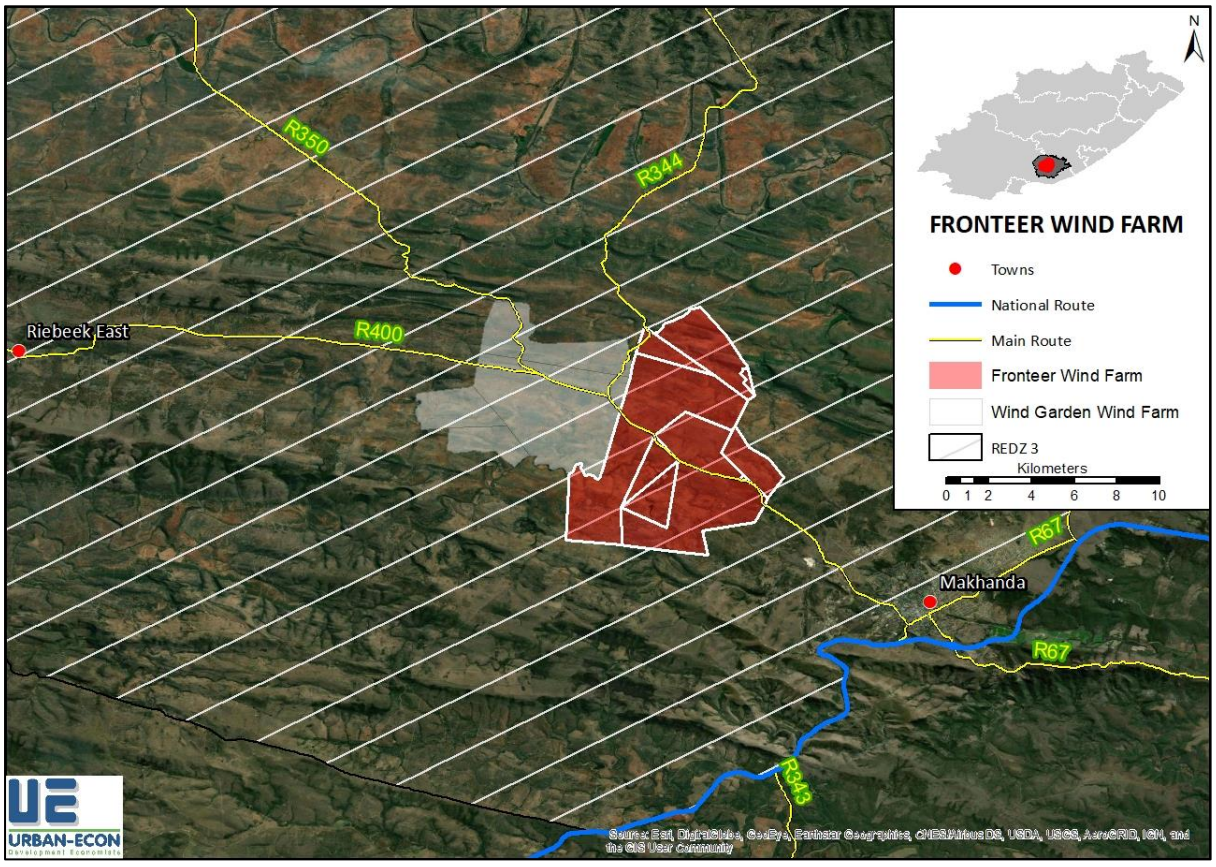
- Up to 38 wind turbines with a maximum hub height of up to 120m. The tip height of the turbines will be up to 200m.
- A 132kV switching station and a 132/33kV on-site collector substation to be connected via a 132kV overhead power line (twin turn dual circuit). The wind farm will be connected to the national grid through a connection from the 132/33kV collector substation via the 132kV power line which will connect to the 132kV switching station that will loop in and loop out of the existing Poseidon – Albany 132kV line.
- Concrete turbine foundations and turbine hardstands.
- Temporary laydown areas which will accommodate the boom erection, storage and assembly area.
- Cabling between the turbines, to be laid underground where practical.
- Access roads to the site and between project components with a width of approximately 4.5m.
- A temporary concrete batching plant.
- Staff accommodation (temporary).
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

The site for the proposed Fronteer Wind Farm occupies the central areas of Makana Local Municipality in the Sarah Baartman District of the Eastern Cape (refer to Map 1.1). The

closest adjacent town is that of Makhanda to the south-east (12km) and Riebeek East to the west (29km). The Nelson Mandela Bay Metro is located approximately 136 km in a south-westerly direction from the proposed development site. The project site comprises the following eight (8) farm portions:

- Remainder of Farm Table Hill Farm No 187
- Portion 2 of Table Hill Farm No 187
- Portion 3 of the Farm Table Hill Farm No 187
- Remainder of the Farm Hounshow No 131
- Portion 1 of Farm Draai Farm No 184
- Portion 1 of Farm No 132
- Portion 1 of Farm Burnt Kraal No 189
- Portion 1 of Farm Table Hill No 187

Map 1.1: Site locality



Source: Urban-Econ GIS Unit (2020)

1.2 Scope and Purpose of the Project

The purpose of the SEIA is to determine and assess the potential socio-economic impacts of the proposed project activities and to compare its effects with the "no-go" alternative. The SEIA report addresses the regulations as set out in the Environmental Impact

Assessment Regulations of 2014, as amended (Chapter 4, Part 2: Basic Assessment; Appendix 6, Specialist Reports) (The Republic of South Africa, 1998; 2014).

Considering that the project will be developed in Cookhouse REDZ, the requirement for the assessment of the socio-economic impacts associated with these developments are reduced to a basic assessment level, objectives of which are as follows:

- Provision of a baseline description of the study area, specifically focusing on the socio-economic environment of the locality where the proposed development is to be implemented
- Identify and analyse positive and negative socio-economic impacts (direct, indirect, and cumulative) associated with each of the project components during the development and operational phases
- Quantify the positive and negative impacts where possible
- Develop mitigation measures to address possible negative effects and enhancement measures to increase the benefits derived from the project

1.3 Delineation of the Study Area

Study area delineation depends on the type of economic activity that is analysed and the perceived spread of economic impacts that are expected to be generated from the project during both the construction and operation phases. The municipal area where the site is located (Makana LM) is likely to experience some direct, indirect and induced impacts resulting from the activities on the site; however, it is unlikely that a local economy can be sufficiently diversified to supply all materials and services and support construction and operational activities from start to finish. Economic impacts therefore tend to extend far beyond municipal boundaries and spread throughout the entire national economy.

1.3.1 Primary, secondary, and tertiary study area

As indicated earlier, the footprint of the proposed Fronteer Wind Farm will stretch across eight farm portions. The potential zone of influence of the proposed project, will not be limited to these farm portions but, will extend beyond the boundaries of the project site due to the potential socio-economic impacts. As such, the following zones of influences are delineated for the purpose of the analysis:

- Primary zone of influence: For the purpose of the analysis of the impact on property values and the tourism industry, as well as the assessment of potential local economic impacts that could ensue from the project, the primary zone of influence is determined to be Makana Municipality.
- Secondary and tertiary zones of influence: Economic benefits and impacts will not be limited to the site or the nearby towns only. Most of the goods and services that will be purchased for the construction and will be required for operation of the wind farm will be secured from outside the primary zone of influence and specifically

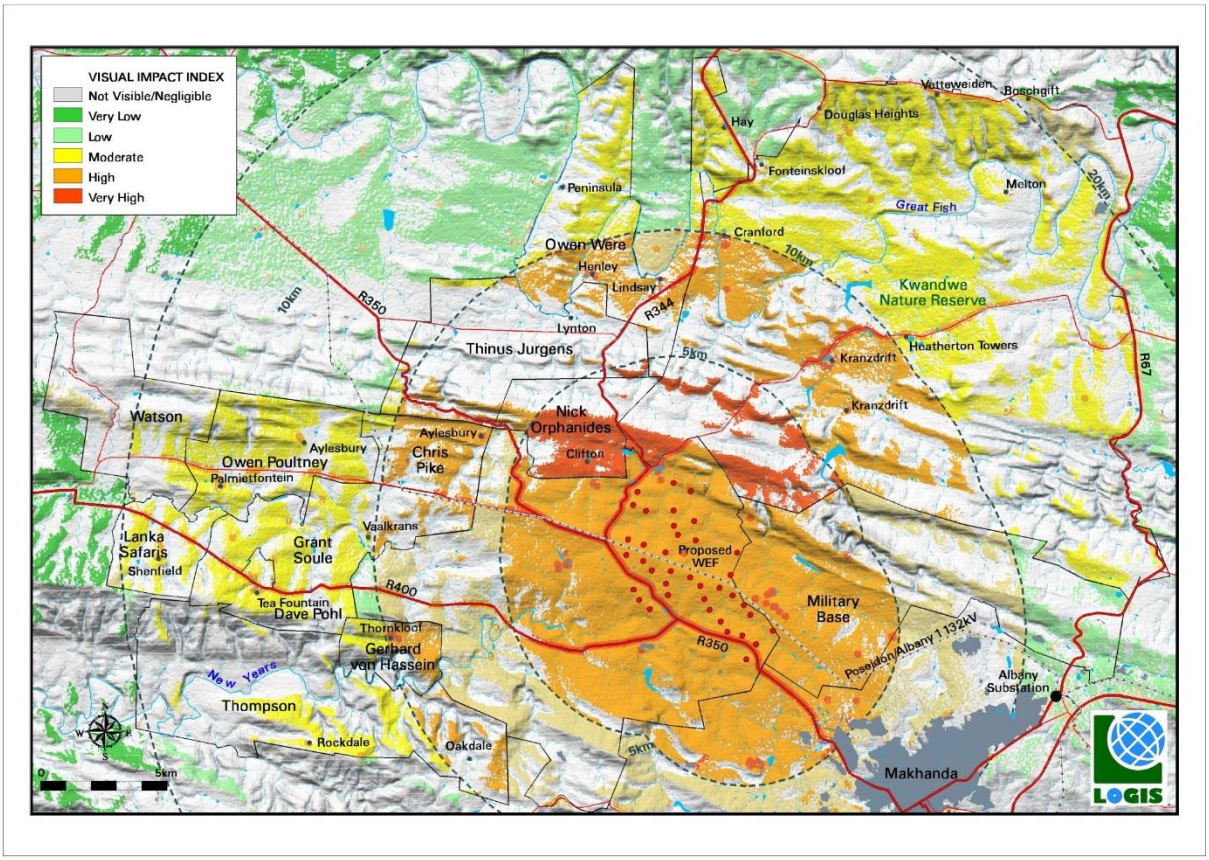
from areas such a Nelson Mandela Bay and the broader Eastern Cape. Therefore, the Eastern Cape and the rest of South Africa are defined as the secondary and tertiary zones of influence of the proposed project from an economic perspective.

1.3.2 Visually affected study area

The visual effects that will be experienced during the construction and operation of the wind farm are intrinsically linked to some of the socio-economic impacts that are considered in this report (such as sense of place, property and tourism impacts etc.).

In order to determine, and where possible quantify, the secondary economic impacts that can potentially be induced by the proposed Fronteer Wind Farm, a visually affected zone was delineated utilising the outputs from the Viewshed Analysis from the Visual Impact Assessment (LOGIS, 2020) (This area was restricted to the potential visual exposure that was determined by the visual specialist on the project team). This area is illustrated in Map 1.2 below.

Map 1.2: Viewshed analysis of the proposed Fronteer Wind Farm.



Source: LOGIS (2020)

1.4 Methodological Approach

1.4.1 Economic impact assessment method

Socio-Economic Impact Assessment studies are undertaken to determine, evaluate, and where possible, quantify the effects of an intervention. This intervention could be the expansion to an existing activity within the economy or the development of a new activity (i.e. the development of the Fronteer Wind Farm).

Socio-economic impacts generated by an intervention can be disaggregated in terms of the initial or direct impacts that occur when the intervention begins. Such impacts in turn trigger secondary and further flow-on rounds of impacts thereby creating a multiplier effect. This multiplier effect can be either positive or negative. In pure economic terms these impacts are expressed as indirect and induced effects, where:

- Indirect effects relate to the changes in economic indicators that are triggered along the upstream industries that supply goods and services to the intervention.
- Induced effects refer to the changes in economic indicators that are stimulated by changes in consumption expenditure of households that were directly or indirectly affected by the intervention.

In addition to the above, two additional types of socio-economic impacts can be distinguished. These include:

- Secondary impacts that are caused by the intervention, but that are further removed in distance or take a greater amount of time to materialise but, are still reasonably foreseeable. Secondary impacts generally relate to changes in land use patterns, economic performance, changes to the character of a community and property values in the vicinity of the interventions location.
- Cumulative effects are the results of incremental consequences of the intervention when added with other past, present, and anticipated future interventions. Cumulative effects consider the manner in which the impacts of a project may affect or be affected by other projects. Such effects are generally difficult to identify as they require a complete knowledge of local conditions and development plans, and accordingly are sometimes even more difficult to quantify.

Projection of the initial impacts and multiplier effects are usually done by employing an input-output model or a General Equilibrium Model. The use of these models in socio-economic impact assessments allows for the quantification of potential impacts in terms of a number of economic indicators such as production, Gross Value Added (GVA), employment and income. The scale of these impacts is dependent on the size and diversification of the economy under analysis which in turn determines the leakage. Secondary and cumulative effects can be identified through an expert opinion technique, consultations, development matrices and interviews. Such impacts can be difficult to

quantify. Overall, a socio-economic impact analysis that includes the assessment of primary impacts, multiplier effects, secondary impacts and cumulative effects provides a comprehensive assessment of potential impacts. It furthermore assists in ranking the intervention using a methodology prescribed by the Department of Environment, Forestry and Fisheries (DEFF) (Chapter 4, Part 2: Basic Assessment; Appendix 6, Specialist Reports) (The Republic of South Africa, 1998; 2014).

The socio-economic impact assessment made use of the economic models based on the Eastern Cape Social Accounting Matrix (SAM) developed in 2006 and forecast to represent 2020 figures. The SAM is a comprehensive, economy-wide database that contains information about the flow of resources that takes place between the different economic agents, in this case the Eastern Cape economy. The selection of this model in the assessment is attributed to the expected spatial distribution of procurement during both the construction and operation phases of the project.

1.4.2 Impact assessment model

All impacts identified were assessed in terms of the extent, duration, magnitude, probability and significance. The following approach was used to assess each of these aspects of the impact:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- » The magnitude, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment
    - 2 is minor and will not result in an impact on processes
    - 4 is low and will cause a slight impact on processes
    - 6 is moderate and will result in processes continuing but in a modified way
    - 8 is high (processes are altered to the extent that they temporarily cease)
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very

improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- the significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the status, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

- S=(E+D+M)P where:
- S = Significance weighting
- E = Extent
- D = Duration
- M = Magnitude
- P = Probability

The significance weightings for each potential impact are as follows:

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

1.5 Data Collection

As part of the data collection process for the socio-economic impact assessment of the Fronteer Wind Farm the following activities were undertaken:

1.5.1 Review of planning documents

In order to document the socio-economic context of the study area within the Makana Municipality, a number of important documents or sources of information were reviewed, referenced, and used to inform the SEIA. These documents included:

- Sarah Baartman District Integrated Development Plan (IDP) 2019
- Sarah Baartman District Local Economic Development (LED) Strategy 2019
- Sarah Baartman District Spatial Development Framework (SDF) 2013
- Makana Local Municipality IDP 2019
- Makana Local Municipality LED Strategy 2009

1.5.2 Literature review

In order to substantiate the findings of the socio-economic impact assessment a number of secondary research documents have been considered as they relate to the proposed wind energy facility.

These documents include academic journals and studies available through online publication or print media. It is intended that these documents substantiate the baseline profile, provide for benchmarking in the industry, while at the same time provide context to the project.

Case studies were utilised to determine impacts of existing wind farms on the Eastern Cape tourism and property landscape. The areas that were considered included: Cookhouse, Jeffrey's Bay/Oyster Bay and Makhanda.

Interviews with selected real estate agents and accommodation owners in selected areas were conducted electronically and a list of engagements are located in the respective sections.

1.5.3 Interviews with stakeholders

Targeted and structured one-on-one interviews were undertaken as part of the SEIA to collect information from two key groups that are likely to be affected by the proposed wind farm. The first being the landowners whose property will be directly impacted by the development of the wind farm, and the second being the surrounding landowners who may be indirectly impacted by the development of the wind farm.

These interviews were primarily conducted electronically or telephonically between May 2020 and December 2020. These interviews formed the basis of the primary data collection and assisted with the gathering of baseline information as well as establishing the stakeholder's perceptions, interests, and concerns. A list of individuals contacted as well as the data collection tool can be found in Appendix A.

2. POLICY AND PLANNING ENVIRONMENT & NEEDS AND DESIRABILITY

This chapter examines the key legislation and polices relevant to the proposed development and includes a review of pertinent national, provincial and local polices that have a direct bearing on the development. Following this the chapter outlines the needs and desirability of such a development accordingly.

2.1 Policy and Planning Environment

The overall aim of this review process is to provide insight into the government's priorities and plans in terms of renewable energies. This assists in determining the relevance of the project with regard to the development objectives of the various spheres of government as well as in identifying potential developmental conflicts that the project might create. A brief review of the most relevant documents is provided in Table 2.1.

Table 2.1: Brief Overview of relevant polices

Policy	Key Policy Objectives	Source
National Policy: South Africa		
National Development Plan 2030	• Creating jobs and livelihoods • Expanding infrastructure • Transitioning to a low-carbon economy • Transforming urban and rural spaces • Improving education and training • Providing quality health care • Building a capable state • Transforming society and uniting the nation • Fighting corruption and enhancing accountability	(NPC, 2011)
New Growth Path Framework 2011	• Infrastructure investment • Main economic sectors as employment sectors • Seizing the potential of new economies • Investing in social capital and public services • Fostering rural development and regional integration	(Department of Economic Development, 2011)
Renewable Energy Vision 2030 South Africa	• Renewable energy as an exceptional source of flexible supply within the context of uncertain energy demand • Comprehensive renewable energy base will support a resilient South African future • A sustainable energy mix that excludes undue risks for the environment of society	(World Wildlife Fund, 2014)
Integrated Resource Plan 2019	The IRP (2019) has indicated that South Africa should continue to track a diversified energy mix which lessens reliance on a few primary energy sources. The IRP document expects a total of 9 980 MW of additional wind capacity to be introduced in South Africa by 2030. The wind IPPs constitute the largest single renewables technology procured to date under the Renewable Energy Independent Power Producer Procurement Programme. Allocations to safeguard the development of wind energy projects aligned with the Integrated Resource Plan (IRP) 2010 should continue to be pursued:	(Department of Energy, 2019)

Policy	Key Policy Objectives	Source
	• Ensure energy security and supply • Reduce environmental impacts • Endorse job creation and localisation • Lessen cost of energy • Reduce water consumption • Diversify supply sources • Promote energy efficiency • Promote energy access Additionally, the IRP (2019) indicates that: • Wind energy will be 22.5% of the energy mix compared to solar at 11% by 2030	
The Constitution of South Africa 1996	"Everyone has the right to an environment that is not harmful to their health or well-being" (S24) The environment should be protected for the benefit of present and future generations, through reasonable legislative and other measures that: • Prevent pollution and ecological degradation • Promote conservation • Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	(Republic of South Africa, 1996)
White Paper on Energy Policy of the Republic of South Africa 1998	Seeks to ensure that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options Aims to create energy security by diversifying the energy supply and energy carriers	(Department of Minerals and Energy, 1998)
White Paper on the Renewable Energy Policy of RSA 2003	Pledges government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications	(Department of Minerals and Energy, 2003)
Provincial Policy: Eastern Cape		
The Eastern Cape Industrial Development Strategy 2011	Sets out a number of strategic goals which include positive economic growth, ensuring that economic growth leads to labour absorption and ensuring that existing jobs are retained. In pursuit of these goals the Industrial Development Strategy identifies the need for: • Research and development (R&D) and innovation • Skills development • Improving infrastructure and logistics • Providing developmental finance • Promoting investment, trade, and exports • Developing institutional structures The achievement of these strategic goals is planned through the development of several key sectors including: • Tourism • Chemicals and Petrochemicals • Agriculture and agroprocessing • Capital goods • Green industries • Automotive	(Department of Economic Development, Environmental Affairs and Tourism, 2011)

Policy	Key Policy Objectives	Source
	The Industrial Development Strategy also seeks to develop an industrial base for the manufacturing of components required for the production of solar cells, solar panels and certain components of wind turbines.	
The Eastern Cape Sustainable Energy Strategy 2012	Seeks to lay out the province's strategic direction in terms of the renewable energy industry. The focus of the strategy is to encourage sustainable, affordable, and environmentally friendly energy production by creating an enabling environment for energy production and sustainable technology, skills, and industry development. This is to be achieved through several initiatives including: • An intensive training programme among relevant decision makers with respect to renewable energy project approvals • The establishment of an implementation task team to provide potential investors with a one-stop-shop for renewable energy information in the province • Development of a provincial locational perspective of renewable energy • Lobbying Eskom to expedite and strengthen the transmission capacity of the former Transkei area • Lobbying the Department of Energy to set out a long-term programme for the procurement of renewable energy generation Through the implementation of these initiatives the Eastern Cape Province seeks to become a leading and preferred destination for renewable energy investment in South Africa.	(Department of Economic Development, Environmental Affairs and Tourism, 2012)
Eastern Cape Provincial Economic Strategy (PEDS) 2016	The Eastern Cape PEDS seeks to create a clear, long-term vision and strategy for the growth and development of the Eastern Cape by building on the strength and opportunities of the province, while at the same time addressing its weaknesses and threats. In pursuit of this goal, PEDS identifies six high potential economic sectors that can catalyse growth in the province. These sectors are: • Agri-industry • Sustainable energy • Ocean economy • Automotive • Light manufacturing • Tourism	(Department of Economic Development, Environmental Affairs and Tourism, 2016)

Policy	Key Policy Objectives	Source
	With respect to sustainable energy, PEDS notes that it is imperative that the province aligns all its energy opportunities so as to: • Create the optimal institutional environment for the location of sustainable energy projects in the Eastern Cape • Harness the maximum possible value chain, localisation and industrialisation opportunities from sustainable energy projects • Ensure adequate and aligned skills development • Link innovation, entrepreneurial and small business opportunities to sustainable energy projects • Link black industrialist opportunities to sustainable energy projects.	
District & Local Municipal Policy: Sarah Baartman DM & Makana LM		
Sarah Baartman District SDF 2013	The Sarah Baartman SDF observes that the district's economy is dependent on the natural resources of the area (tourism and production). As such, spatial planning initiatives need to support the implementation of the district's Socio-Economic and Enterprise Development Strategy (SEEDS) by: • Implementing effective spatial planning land use management • Ensuring that the SDP identifies areas for renewable energy production • Recognizing that game reserves and farming are playing a greater role in the economy • Undertaking urban regeneration projects • Identifying where infrastructure upgrading is required. • Providing the spatial framework for the district's Area Based Plan (ABP) The Sarah Baartman SDF further 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 (in the form of potential changes to the visual and cultural landscapes). This is an important consideration as part of the proposed site falls in an area identified by the SDF as the N2 development corridor which plans to link to area to regional projects such as the Wild Coast N2 Toll Road.	(Sarah Baartman DM, 2013)
Sarah Baartman District IDP 2019	The Sarah Baartman IDP identifies the green economy (including, but not limited to renewable energy and ecosystem services) as a focal point of economic development in the district, noting that such investments are likely to have significant economic spinoffs for the region. To achieve this, the IDP proposes investing in	(Sarah Baartman DM, 2019)

Policy	Key Policy Objectives	Source
	natural capital so as to create a new generation of green and blue economy jobs rooted in renewable energy.	
Makana Municipality IDP 2019	The Makana Municipality has identified alternative energy production as a key aspect in securing energy for future development of the municipality. The municipality has also stated their desire to produce a policy which will enable the evaluation of renewable energy generation infrastructure to be developed in a manner that will limit the potential negative impacts thereof. Furthermore, the IDP also indicates the presence of existing wind energy facilities in securing energy and developing a sustainable future (key principle).	(Makana LM, 2019)
Makana LED Strategy	The Makana LED notes that "All economic activity that takes place in Makana must be founded on principles of long-term sustainability (environmental and economic). Accelerated development and sustainability are not mutually exclusive but should rather be considered complimentary." The strategy states that provision of environmentally friendly infrastructure is key to the development of the municipality. This infrastructure includes the use of wind energy (wind farms) to provide electricity to the municipality.	(Makana LM, 2009)

The review of the policy environment suggests that utilisation, application and investment in renewable energy sources in South Africa is considered to be an integral means of reducing the carbon footprint of the country, diversifying the national economy, reducing poverty and creating much-needed additional sources of energy. Any project contributing to the above-mentioned objectives can therefore be considered strategically important to South Africa.

From a provincial and municipal policy perspective the facilitation of renewable energy projects and interventions that relate to the broader green economy are seen as a priority in terms of the policies and strategies developed. The Eastern Cape Provincial Industrial Development Strategy makes particular reference to the need to develop green industries which includes renewable energies. Likewise, the Makana Municipality has noted the importance of wind energy in its IDP and is actively seeking to promote such developments.

2.2 Needs and Desirability

South Africa is currently experiencing electricity supply challenges, which in turn is leading to periodic periods of load shedding. The impact of load shedding has had massive impacts on the economy and society at large. Furthermore, impacts of COVID-19, reduced business confidence and national sub-investment downgrades have all had impacts on the economy of the country. This section outlines the need and desirability of such a development based on the above-mentioned aspects.

2.2.1 South African electricity supply

South Africa's energy mix is largely focused on the use of non-renewable fossil fuels. The Department of Energy (DoE) notes that 83% of electricity production in South Africa is supplied by coal followed distantly by 6% pumped storage, 5% gas, 4% nuclear, 2% hydroelectric and 0,2% wind (DoE, 2019). It is noted by the DoE that renewables are the future of energy generation in South Africa especially as the costs of generating electricity through traditional means increases (DoE, 2019).

South Africa is also considered to be the world's 14th largest emitter of greenhouse gases (McSweeney & Timperley, 2018). The CO_2 emissions are principally due to a heavy reliance on coal to produce energy. South Africa has also pledged (through the Paris Accord) to reduce emissions and cap the amount of greenhouse gasses that would be emitted. This commitment was aligned to the national planning policy which promoted the utilisation of renewable resources to generate energy (McSweeney & Timperley, 2018).

Globally, there has been an increasing shift towards the responsible utilisation of non-renewable energy sources and towards sustainable and non-polluting methods of energy production. The Renewables 2019 Global Status Report (GSR 2019) noted that there has been an increase of utilisation of renewable energy around the world and there has been a steady increase in the amount of MW produced by sustainable sources (Ren21, 2019). Global renewable power capacity grew to around 2 378 GW in 2018. For the fourth year in a row, additions of renewable power generation capacity outpaced net installations of fossil fuel and nuclear power combined. Around 100 GW of solar photovoltaics (PV) was installed – accounting for 55% of renewable capacity additions – followed by wind power (28%) and hydropower (11%). Overall, renewable energy has grown to account for more than 33% of the world's total installed power generating capacity (Ren21, 2019).

South Africa is regarded as a prime candidate for increased use of renewable energy with abundant natural resources of sun and wind. The further development of renewable energy will align to the current shift in international trends and align well with the available resources of the country. The cost of renewables, notably solar and wind, has fallen significantly in South Africa. Solar PV and wind costs have fallen 80% and 60%, respectively, in just four years (McSweeney & Timperley, 2018). New renewable capacity is now "considerably cheaper" than coal plants proposed or under construction (McSweeney & Timperley, 2018).

Additionally, the supply of electricity in South Africa is currently exceptionally constrained. Load shedding in South Africa began in 2007 as a result of insufficient electricity generating capacity by the government owned national power utility, Eskom. The advent of load shedding has brought numerous direct economic impacts, indirect economic impacts and social impacts to South Africa. These are outlined in the table below:

Table 2.2: The consequences of power interruptions

Direct Economic Impacts	**Indirect Economic Impacts**	**Social Impacts**
Loss of business and manufacturing production	Cost of postponed income	Loss of leisure time
Restart costs	Loss of market share	Risks to health and safety
Equipment damage	Limitations to expansion and growth of production	
Raw material spoilage	Loss of competitive advantages	
Cost of backup systems	Loss of investor confidence	

Source: Goldberg, 2015

These costs are associated with losses to productivity and limitation of growth for companies and as a result limit the growth of the country (Goldberg, 2015). Load shedding thus threatens jobs, economic recovery, and the livelihood of many South Africans around the country.

Local research done through government agencies has also noted the need for change in the electricity industry. NERSA (NERSA, 2020) has examined the electricity supply industry challenges and possible solutions for those challenges and has maintained that continued price increases for electricity is unsustainable as it reduces demand. The increase in electricity prices has led to an increase in export of unbeneficiated ore which is likely to increase as the electricity price increases (NERSA, 2020). It has also been noted that there has been a reduction in export volumes of minerals which is likely a result of the increased price of electricity and unstable electricity supply. It has also been noted that the negative trend in exports mimic the GDP growth trends, which seems to be inversely proportional to electricity prices (NERSA, 2020). NERSA has also noted that electricity price is a significant cost driver for some sectors. The increase in electricity cost has a greater impact on some sectors such as the metals, steel and mining industry and less of an impact on other industries such as the transport industry.

New energy trends have also been noted by NERSA (NERSA, 2020). Their position is that the obligation to supply the majority of domestic, commercial, and small industries energy (day load) should be removed from the Eskom and be supplied by renewable energy IPP sources (NERSA, 2020).

It can thus be deduced that at a national level any additional energy production which is sustainable, and renewable would improve energy security, further South Africa's goals towards international agreements, provide employment and assist in improving investor confidence in the country.

2.2.2 Likely impact of COVID-19 on the South African economy

As stated above, the impact COVID-19 has yet to be fully quantified as the pandemic is still ongoing at the time of drafting this report. Predictions from various sources indicate that the impact of COVID-19 on the global economy may be similar or slightly worse than the global financial crisis of 2007-2008. Indeed, at this point the large declines in bank equity prices since mid-January 2020 suggest that investors are concerned about profitability and prospects for the banking sector (Adrian and Natalucci, 2020). For example, measures of bank capitalisation based on market prices are now worse than during the 2008 global financial crisis in many countries. The concern is that banks and other financial intermediaries may act as an amplifier should the crisis deepen further (Adrian and Natalucci, 2020).

Emerging markets risk bearing the heaviest burden in this time of distress. In fact, emerging markets have experienced the sharpest portfolio flow reversal on record—about $100 billion or 0.4 percent of their GDP—posing stark challenges to more vulnerable countries (Adrian and Natalucci, 2020). South Africa has not been spared this burden which, has been exacerbated as a result of the sub-investment downgrade by credit ratings agencies in 2017 and 2020.

At a local level, sources expect the GDP of South Africa to contract between 4%-8% (e-SEK, 2020; van Wyk, 2020) with a revenue shortfall of between R 70 and R 100 billion. The budget deficit is expected to accelerate from an initial forecast of 6.8% of GDP to more than 10% (van Wyk, 2020). Additionally, it is likely that the recession South Africa currently finds itself in will continue for the rest of 2020.

Once this shock to the economic and social system has been dealt with at a national and international level, there will be a need to strengthen and develop the South African economy. One of the necessary components of a functional economy will be the provision of a stable electricity supply. The South African energy provision system is currently and has in the past decade been, notoriously unreliable which has had a major impact on investor confidence and the overall development of the country.

2.2.3 National sub-investment downgrades

On March 27th, 2020 Moody's Investor Service (Moody's) downgraded South Africa's long-term foreign-currency and local-currency issuer ratings to Ba1 from Baa3 (Junk Status). Moody's is the third and last of the major credit rating agencies to downgrade South Africa to junk status after Standard & Poor's and Fitch's both downgraded South Africa in 2017 (Duvenage, 2020).

While these sub-investment ratings are worrying for the country, it is difficult to understand and predict what will happen to the currency in the short and medium term and currency fluctuations may occur. This is largely as a result of global dynamics that are

currently in play, in particular the appetite for safe haven assets which is a far more powerful force than any of the local challenges that are emerging (Duvenage, 2020).

One of the known impacts of the downgrade was that South Africa fell out of the World Government Bond Index (WGBI) and other popular bond indexes, an index that measures the performance of fixed-rate, local currency, investment-grade sovereign bonds. The sub-investment rating means that South Africa has dropped out of some of the widely used global bond indexes and forced international funds which track these indexes to sell South African bonds. It is estimated that between $22-$28 billion in capital has already flowed out of local markets since 2018 with the recent downgrade account for between $1,5 and $8 billion (Duvenage 2020; McGregor 2020).

This will likely result in a rise in government debt-servicing costs which could bring strain to the already frail economic system with revenue shortfalls and contraction in GDP (Duvenage, 2020; McGregor, 2020).

Furthermore, on the 29th April 2020, Standard & Poors Global Ratings further downgraded South Africa's sovereign credit rating into non-investment grade citing the impact of COVID-19 on South Africa's public finances and economic growth as one of the reasons for its ratings action (Swart & Goncalves, 2020). The downgrade casts further doubt over South Africa's ability to recover post COVID-19.

Some other impacts expected from the downgrade, include the deterioration of South Africa's credit reputation, less access to conventional credit markets; deterioration in consumer and business confidence leading to a potential contraction in private investment and consumption demand; South Africa losing its status in various bond indices whereby some bond investors with mandate limitations are prohibited from buying the country's bonds; and a large forex outflow as foreign investors dump South African debt (Swart & Goncalves, 2020).

In terms of direct impacts on the construction of the proposed wind farm is that of currency fluctuations. With an unstable local currency, there may be unexpected and unplanned costs involved when importing technology for the project. The development and utilisation of local supply chains could go a long way in minimising the risks associated with currency fluctuations.

2.2.4 Assessment of business confidence levels in South Africa

The SACCI Business Confidence Index (BCI) declined by 2.9 index points from 95.1 index points in January 2019 to 92.2 index points in January 2020. This was followed by a slight increase in BCI to 92.7 in February 2020. However, BCI levels dropped significantly to 89.9 making it the lowest level since August 2019. This was due to lower sales of new vehicles, a weaker rand exchange rate and lower share prices highlighting the impact of Coronavirus Disease 2019 (COVID-19) on the country's trading partners and on the

domestic economy. Additionally, the local demand of goods and services declined due to the national lockdown imposed by the Government in order to reduce the spread of the COVID-19 (SACCI, 2020a) (SACCI, 2020b).

A 0.9 index points drop in business confidence was experienced between December 2019 (92.6 index points) and January 2020 (92.2 index points). Followed by a 0.5 index point increase in February 2020 and a 2.8 index points drop in March 2020. This resulted from unfavourable economic conditions facilitated by the external COVID-19 health shock and its impact which resulted in a restricted business climate and a restricted South African economy. The following indicators should be taken into consideration when analysing the business environment as they negatively contributed to the BCI:

- Lower merchandise export volumes
- Fewer new vehicles sold
- Lower real value of building plans passed
- Higher inflation
- Share prices
- The US-dollar price of precious metals
- Rand exchange rate (SACCI, 2020a) (SACCI, 2020b).

However, there were positive contributors to the BCI, including:

- Energy supply
- Manufacturing
- Imports
- Real financing cost (SACCI, 2020a) (SACCI, 2020b).

Thus, the business confidence levels in South Africa have been uncertain owing to the abovementioned conditions. Overall, the SACCI BCI trended downwards from 104.7 to 89.9 index points between March 2013 and March 2020. This was equivalent to -2.2% Compound Annual Growth Rate (CAGR; SACCI, 2020a) (SACCI, 2020b). Furthermore, business confidence levels in the country plunged to their lowest levels in more than two decades in the first quarter of 2020 and could weaken even further due the effects of the COVID-19 and oil price drops. These issues affect both the local and global economies (SAPOA, 2020). It should be noted that the BCI does not factor in the full potential economic impact of COVID-19 and only showcases the recent trends of COVID-19 which still need to be fully quantified.

The further development of renewable energy would likely lead to improved supply of electricity for the development of the economy. This is likely to improve business confidence in the country as sustainable energy supply is one of the key concerns of business moving forward. International investors have also noted, with concern, that the lack of availability of a consistent energy system does not lend itself to growth of Foreign Direct Investment (FDI) (Santander, 2020). The development of renewable energy systems is seen by local and foreign business owners as the future of energy generation and may increase business confidence both locally and internationally (Kovaleski, 2019).

2.3 Synthesis

The review of the policy and planning legislation outlines that the proposed wind farm development strongly aligns to the policies at a national, provincial and local level. The needs and desirability section outlines the importance of such a development to the economy and society at large of the country.

3. SOCIO-ECONOMIC PROFILE OF THE STUDY AREA

This chapter documents various aspects of the primary study area including, population and household numbers, income levels and employment. In addition, the chapter also reviews the economic structure and performance of the study area.

The intention of this review is to provide an overview of the socio-economic context of the area so as to better understand the dynamics of the area and to inform the SEIA process.

3.1 Population, Income and Employment Profile

The Makana Municipality falls within the Sarah Baartman District Municipality and collectively account for 19% of the population, and 18% of the households in the district. The Makana Municipality is the second most populous local municipality after the Kouga Local Municipality in the district.

Population growth between 2008 and 2018 was 1,3% year-on-year for the Makana Local Municipality which compared favourably to the Sarah Baartman District (1%) and Eastern Cape (0,2%) over the same period.

Table 3.1: Overview of the primary & secondary study areas population structure

Indicator	Eastern Cape	Sarah Baartman District	Makana Local Municipality
Area (km^2)	168 966	58 243	4 376
Population	6 522 734	463 934	86 682
Number of Households	1 659 171	128 423	22 694
Population density (km^2)	38,6	8	19,8
Average household size	3,9	3,6	3,8
Annual population growth (2008-2018)	0,24%	1%	1,27%
Average monthly household income	R 9 139	R 10 758	R 12 406

Source: Quantec Standardised Regional (2020); Stats SA (2011) forecast to 2020

The disposable average monthly income of households in the Makana Local Municipality was R 12 406 which was 15% higher than the average for Sarah Baartman District Municipality (R 10 758) and 36% higher than the average for the Eastern Cape. The number of households with no formal income in Makana is 13% which is similar to the average for the district at 12,7% but, lower than the provincial level of 15%.

Table 3.2: Employment profile of the study areas

Indicator	Eastern Cape	Sarah Baartman District	Makana Local Municipality
Employed	1 228 511	152 437	24 218

Unemployment Rate	32,8%	19,1%	28,8%
Not Economically Active	1 986 792	110 127	24 620
Labour force participation rate	47,9%	63,1%	58%

Source: Quantec Standardised Regional (2020)

The review of the employment profile of Makana indicates that almost a third of the economically active population within the municipality is formally unemployed (see Table 3.2). The unemployment rate and labour force participation rate in the Makana Local Municipality were also notably worse than that of the Sarah Baartman District Municipality (Unemployment rate: 19,1%; Labour force participation rate: 63,1%).

The relatively high unemployment rate and lower labour force participation relative to the district averages further suggests that the Makana Local Municipality is subject to outward migration due to the limited number of employment opportunities available within the local municipality.

3.2 Economic Profile

The following subsection outlines the economic profile at a national as well as a provincial and local municipal level.

Nationally, South Africa's Real Gross Domestic Product (GDP) for the first quarter of 2019[1] declined by 3.2% quarter-on-quarter (seasonally adjusted and annualised). This was followed by a recovery of the economy, with growth of 3.2% in the second quarter of 2019. However, the third quarter of 2019 saw a decline of 0.6%. A further decline of 1.4% was experienced in the fourth quarter of 2019 which indicates that South Africa is in a technical recession (StatsSA, 2019) (StatsSA, 2020).

3.2.1 Regional economic profile

The GVA (Gross Value Added) of the Makana Local Municipality was R 3,7 billion in 2018 (constant prices), which collectively accounts for just over 19,3% of the district economy's GVA, and 1,7% of the Eastern Cape's GVA (Quantec, 2018). This suggests that, although the Makana is relatively small in terms of its GVA, it is important in the broader Sarah Baartman District in terms of economic output.

Table 3.3: Economic structure of the Eastern Cape Province, Sarah Baartman District and Makana Local Municipalities between 2008 and 2018 (constant 2010 prices)

Sector	**Eastern Cape**		**Sarah Baartman District**		**Makana Municipality**	
	2008	**2018**	**2008**	**2018**	**2008**	**2018**

[1] Latest published data available

Agriculture and hunting	1,7%	1,6%	7,0%	6,4%	2,5%	2,2%
Mining and quarrying	0,3%	0,3%	0,1%	0,1%	0,1%	0,1%
Manufacturing	14,9%	13,6%	11,6%	13,9%	9,8%	12,8%
Electricity, gas and water	1,4%	1,2%	1,7%	1,5%	1,4%	0,9%
Construction	3,6%	3,8%	5,0%	4,7%	3,9%	4,1%
Trade	19,4%	19,5%	21,7%	21,1%	17,8%	19,0%
Transport and communication	8,6%	8,9%	6,8%	7,7%	6,7%	8,2%
Finance and business services	19,9%	20,6%	19,4%	20,1%	18,2%	19,7%
Community services	22,6%	22,9%	19,1%	17,7%	29,7%	24,4%
General government	7,7%	7,5%	7,6%	7,0%	9,9%	8,7%
TOTAL GVA	**R 189 068**	**R 214 384**	**R 16 134**	**R 19 183**	**R 3 233**	**R 3 707**

Source: Quantec Standardised Regional (2020)

The growth of the Makana Municipality over the last few years was largely due to the strong performance of the manufacturing (brickmaking, building equipment, aquaculture equipment etc.), transport (shuttle services, taxi industry etc.), construction and finance sectors. Many of these are linked to and service the large education-based sector that is present in the town of Makhanda. These sectors have grown their contribution to the GVA at a larger rate than other sectors e.g. agriculture. Electricity, gas and water only contributes a small margin to the economy of Makana however, some of these industries have been strained, especially water. Electricity is a new industry in the municipality with only one operational wind farm located in Makana. Any new development would likely greatly increase the contribution of the utilities and construction sectors to the GVA.

Table 3.4: 2018 GVA per sector for the Makana Local Municipality (2010 constant prices; in R' millions)

Sector	**Makana Local Municipality**		
	2008	**2018**	**Compound Annual Growth Rate (CAGR)**
Agriculture and hunting	R 82,2	R 82,2	0,0%
Mining and quarrying	R 2,1	R 2,2	0,4%
Manufacturing	R 316,3	R 472,7	3,7%
Electricity, gas and water	R 45,2	R 35,1	-2,3%
Construction	R 124,9	R 153,4	1,9%
Trade	R 575,4	R 704,9	1,9%

Transport and communication	R 215,8	R 302,2	3,1%
Finance and business services	R 589,7	R 729,6	2,0%
Community services	R 960,6	R 903,9	-0,6%
General government	R 321,3	R 320,8	0,0%
TOTAL GVA	**R 3 233**	**R 3 707**	**1,3%**

Source: Quantec Standardised Regional (2020)

Over the last ten years, the CAGR of Makana was +1,3%. The growth of the above-mentioned sectors was somewhat offset by the stagnation of the agriculture sector and the reduction of the growth in the general government and community services sectors which has been in upheaval in the area especially with regards to provision of health, water and other essential services to communities in the area.

As evident by Table 3.5 the agricultural sector has experienced a significant decline in terms of its employment levels between 2008 and 2018. This has resulted in the sector shedding over 230 formal jobs in a ten-year period. This decline in employment could possibly be attributed to the longstanding drought that the area has recently experienced. The local area has also experienced a gradual movement away from traditional livestock farming towards game farming and eco-tourism.

The local agricultural sector includes limited subsistence (informal) farming, unlike other areas in the Eastern Cape where this practice is more dominant. The presence of this subsistence agricultural means that the number of households that are dependent on agricultural activities for income could be slightly greater than the figures presented in Table 3.4. This is due to the fact that the table only indicates those individuals that are formally employed in the agricultural sector.

Table 3.5: Employment structure and contribution of the Makana Local Municipality between 2008 and 2018 per economic sector

Sector	**Contribution to Employment per Sector**		**Change in Absolute Values 2008-2018**
	2008	**2018**	
Agriculture and hunting	12,5%	10,8%	-8,9%
Mining and quarrying	0,0%	0,0%	-16,7%
Manufacturing	7,1%	7,3%	8,3%
Electricity, gas, and water	0,3%	0,3%	-12,9%
Construction	4,9%	5,8%	19,7%
Trade	21,5%	23,4%	13,8%

Transport and communication	2,8%	3,6%	27,4%
Finance and business services	11,6%	12,2%	11,1%
Community services	18,6%	16,4%	-6,3%
General government	20,5%	20,2%	5,0%
TOTAL EMPLOYMENT	**22 692**	**24 218**	**6,3%**

Source: Quantec Standardised Regional (2020)

In general, agricultural activities are relatively labour intensive, thus a small decline in the size of the sector would generally lead to greater job losses than for example in manufacturing or utilities, which tend to be more capital intensive in nature. The agricultural sector is also frequently one of the largest employers in rural areas and it is for these two reasons that the sector is generally prioritised in development strategies. An important aspect to note is that finance and business services now account for a larger proportion of labourers in the municipality than agriculture.

Aside from the primary sector, secondary industries such as mining, utilities and community services also experienced a decline in employment levels between 2008 and 2018. Many of these job losses were, however, offset by growth in the tertiary sector, particularly general government and finance and business services.

3.3 Profile of the Immediately Affected Environment

A profile of the immediately affected environment was developed utilising available secondary information and interviews with landowners of the affected area.

3.3.1 Land use profile

The land on which the proposed Fronteer Wind Farm will be located is currently used for agriculture (predominant use). This farming is in the form of livestock farming with the predominant form of livestock being beef (80% of respondents) and sheep and goats (60% of respondents. Very few respondents perform crop farming (both dryland and irrigated) which is largely utilised for animal feed. Game breeding for the purposes of resale to game farms or hunting was present on 40% of respondent's farms. None of the farms are solely utilised for agriculture with all respondents indicating that other revenue earning activities take place on their properties such as game farming, hunting or tourist accommodation.

The area of the proposed wind farm is also used for game farming, hunting and eco-tourism purposes. Tourists (predominantly local hunters or visitors) will visit their farms to hunt (normally for biltong), hike or utilise bike trails.

It is important to point out that some farm owners declined to respond to the questionnaire used to gather information for this report.

3.3.2 Socio-economic profile of the affected area

From the data obtained from surveyed landowners, it is estimated that agricultural operations (including hunting and tourism) in the directly affected area employ approximately 30 people, the majority of whom are permanent employees. Most of the employees live on the farm and those who do not, live in Makhanda. An additional 94 people live on the farms who are not labourers.

It is recognised that many farms in the area practice a combination of crop, livestock and hunting activity. As such, most farms are involved in all three land uses as indicated previously. The dominant activity currently undertaken on farms that were surveyed was agriculture but, significant numbers of tourist activities occur on the farms. The following observations were made regarding land use:

- All of the farmers are commercial farmers
- Goats and sheep were the most common animals found in the area (3 200 animals) but, beef cattle (386 animals) were present across all respondents surveyed
- The average size of property owned was 1 913 and ranged between 350 and 2 990 ha
- The majority of labourers live on the farms they work on with their family members
- Livestock animals reared for sale and kept for production of food products include goats, sheep and cattle
- All of the farms were the primary residence of the farm owner
- Approximately 42 international tourists visited the area in a year (32 for hunting purposes, 5 for leisure or game viewing, and 5 for eco- or adventure purposes)
- Approximately 335 domestic tourists visited the area in a year (115 for hunting purposes, 70 for leisure or game viewing, and 150 for eco- or adventure purposes)
- Domestic hunters made up the largest proportion of the respondents total turnover
- Some of the farms have accommodation facilities for visitors
- Farms receive visitors mostly between April and December
- Some of the game farms earn income through the trading of live game
- Eco-based tourism in forms such as photography, hiking trails is also undertaken in the area but to a lesser extent than hunting.

The immediate area surrounding the proposed Fronteer Wind Farm is very similar in terms of land use. There are farms that cater to mixed land uses including tourism and agriculture.

3.3.3 Agricultural land use

According to the agricultural specialist appointed for the EIA process of this project it is likely that less than 1.54% of the land will be altered by the development. It is thus likely that any existing agricultural use of the land will not be impacted as a result of the proposed development. Low density agricultural activities which prevail in the area (i.e.,

grazing for livestock) will not be impacted as the animals would still be able to graze around the turbines and associated infrastructure.

Additionally, the revenue received by the owners of the farms could be utilised to invest in solutions to mitigate challenges currently facing the agricultural industry in the surrounding area (droughts).

4. IMPACT ASSESSMENT ASSUMPTIONS

This chapter of the report describes the assumptions used in the socio-economic impact assessment study and specifically in the economic modelling exercise which aims to quantify the economic impact of the project. The assumptions presented in this chapter refer to construction, operation, and decommissioning assumptions applicable to the project as provided by Fronteer (Pty) Ltd.

4.1 Fronteer Wind Farm Assumptions

The proposed facility will have a maximum installed capacity of 213 MW. The assumptions specific to the phases of the project's lifespan are provided in the following sub sections.

4.1.1 Construction phase assumptions

The following assumptions regarding the construction phase of the proposed wind energy facility are made:

- The construction of the facility is planned to commence in 2022 contingent on project approval and will take 30 months to complete.
- Construction will overlap for all projects sequentially.
- The total South African investment into the establishment of Fronteer Wind Farm is valued at R 4,6 billion in 2021 prices.
- Only local expenditure is considered in this analysis.
- The construction of the facility will create an estimated 480 project specific full time equivalent (FTE) employment positions (including foreign FTE positions) over the period of construction of which **460 will be South African based residents**
- Only the South African based employment positions will be considered for this facility.

4.1.2 Operation phase assumptions

The assumptions regarding the operation phase of the project used in the modelling exercise are as follows:

- The facility is anticipated to begin operating once construction is completed in mid-2024.
- The facility will operate for 20 years.
- The operations and maintenance cost of the facility will be valued at R 28,5 million per annum over the 20-year operational life of the project.
- The operation of the facility will create an estimated 25 full time equivalent (FTE) employment (including foreign FTE positions) positions annually (for 20 years) for the lifetime of the operation of the facility of which **22 will be South African based residents**
- Only South African based employment positions will be considered for this facility

4.1.3 Decommissioning phase assumptions

The costs of decommissioning the plant are not yet known. Given the nature of wind technology and the unlimited wind resource, it is highly likely that instead of decommissioning the plant, the facility will be refurbished in order to extend its lifespan beyond the 20-year period.

5. POTENTIAL ECONOMIC IMPACTS AS A RESULT OF THE WIND ENERGY FACILITY

This chapter of the report seeks to describe the economic impacts that are expected to occur as a result of the development of the Fronteer Wind Farm.

5.1 Defining Economic Impacts

Economic impacts can be defined as the effects (positive or negative) on the level of economic activity in a given area(s). The net economic impact is usually measured as the expansion or contraction of an area's economy, resulting from the changes in (i.e., opening, closing, expansion or contraction of a facility, project, or programme.

5.1.1 Temporal nature of impacts

All new projects/interventions have two basic types of investments namely an initial capital injection/expenditure (CAPEX) which can take the form of either a greenfield development (i.e. new construction project on vacant land) or brownfield development (i.e. a modification of an existing structure and there is an annual investment made to maintain/operate the investment).

The economic impacts created by a capital injection (CAPEX) are once-off impacts that will only occur for the duration of construction. Thus, economic impacts associated with the construction phase are not sustainable economic impacts. Operational economic impacts, unlike capital expenditure economic impacts are sustainable and thus are calculated as an annual impact based on operational expenditure (OPEX) for a given year.

It is important to note that due to the temporal nature of CAPEX and OPEX, impacts should not be accumulated to determine the 'total' economic impact.

5.1.2 Types of economic impacts

The net economic impact of an exogenous change in the economy will be translated according to various direct and indirect economic effects, as are defined below:

- **Direct economic impacts:** These are the changes in local business activity occurring as a direct consequence of public or private activities in the economy, or public programmes and policies. Furthermore, increased user benefits lead to monetary benefits for some users and non-users (individuals and businesses) within the geographical area:

    * For affected businesses, there may be economic efficiency benefits in terms of product cost, product quality or product availability, stemming from changes in labour market access, cost of obtaining production inputs and/or cost of supplying

finished products to customers. For affected residents, benefits may include reduced costs for obtaining goods and services, increased income from selling goods and services to outsiders, and/or increased variety of work and recreational opportunities associated with greater location accessibility.

- **Indirect and induced impacts:** The direct benefits to business and the residents of communities and regions may also have broader impacts, including:

    * Indirect business impacts – business growth for suppliers to the directly affected businesses and potential growth of municipal revenue due to raised taxes and service levies.
    * Induced business impacts – business growth as the additional workers (created by direct and indirect economic impacts/effects) spend their income on food, clothing, shelter and other local goods and services.

5.1.3 Economic impacts considered

The direct and indirect economic impacts listed are measured according to the following broad economic variable categories:

- **Production/Business Sales**: refers to the value of all inter- and intra-sectoral business sales generated in the economy as a consequence of the introduction of an exogenous change in the economy. Explained more simply, new business sales equates to additional business turnover as a result of the introduction of an exogenous change in the economy.

- **Contribution to GVA:** GVA is a broader measure of the full income effect. This measure essentially reflects the sum of wage income and corporate profit generated in the study area as a result of an exogenous change in the economy.

- **Employment**: Refers to the employment resulting from the construction or operation of the project under investigation.

- **Personal Income:** Refers to the salaries and wages earned as a result of the employment generated from the development of the proposed wind farm

Using the Input/Output model methodology, various anticipated direct and indirect economic impacts of construction and operation phases of the proposed wind energy facility have been identified. These economic impacts have been derived using an understanding of economic cause-effect relationships. The principle of cause-effect is that for any economic action, there can be a multitude of different economic reactions (effects).

5.2 Economic Impacts During the Construction Phase

The following table outlines the potential economic impacts during the construction phase of the proposed Fronteer Wind Farm. The total impact on production/business sales is likely to equate to R 11,9 billion (direct, indirect and induced) for the duration of construction and will largely be spent in the Eastern Cape. The total impact on GDP (direct, indirect, and induced) is likely to be R 2, 3 billion and create 460 FTE employment positions over the period of 20 years with the total impact on employment being 1 570 FTE employment positions. These will largely be felt through the construction sector and through the value chains associated with the construction of a wind farm.

Table 5.1: Estimated impact on the national and local economies (R' million, 2020 prices) as well as employment (FTE positions) for the duration of construction

Indicator	Direct	Indirect	Induced	TOTAL
Impact on Production				
TOTAL	R 4 621	R 5 209	R 2 028	R 11 858
Impact on Gross Domestic Product				
TOTAL	R 1 435	R 630	R 238	R 2 303
Impact on Personal Income				
TOTAL	R 610	R 700	R 261	R 1 570
Impact on Employment				
TOTAL	460	591	316	1 367

5.3 Economic Impacts During the Operation Phase

The table below provides the potential economic impacts during the operation phase of the proposed Fronteer Wind Farm. The total impact on production/business sales is likely to equate to R 63,4 million (direct, indirect, and induced) per annum and will largely be spent in the Eastern Cape. The total impact on GDP (direct, indirect, and induced) is likely to be R 22,9 million per year. It is anticipated that 22 South African based FTE employment positions will be created for the operation of the proposed wind farm per annum. The total impact on employment will be 50 FTE employment positions which will largely be experienced in the utilities sector and other value chains associated with wind farm operations.

Table 5.2: Estimated impact on the national and local economies (R' million, 2020 prices) as well as employment (FTE positions) for the operation phase

Indicator	Direct	Indirect	Induced	TOTAL
Impact on Production				
TOTAL	R 28, 5	R 22, 1	R 12, 8	R 63, 4
Impact on Gross Domestic Product				
TOTAL	R 15, 8	R 4, 4	R 2, 7	R 22, 9
Impact on Personal Income				
TOTAL	R 17, 4	R 6, 4	R 2, 8	R 26, 6

Impact on Employment				
TOTAL	22	24	3	50

6. POTENTIAL BUSINESS TOURISM IMPACTS AS A RESULT OF THE WIND ENERGY FACILITY

The purpose of this chapter is to provide an overview of the potential tourism impacts for the visually affected area near Fronteer Wind Farm. This will be done by examining international literature, case study analysis of tourism surrounding existing Eastern Cape wind farms and by examining the potential impact of the proposed wind farm on tourism to the visually affected area.

This analysis is informed by an examination of international literature and local case studies of similar wind farms in the Eastern Cape which include Jeffrey's Bay/Oyster Bay, Makhanda and Cookhouse.

6.1 International Literature Review

In order to determine the potential impacts of wind farms on tourism, a review of literature has been undertaken that specifically focused on examining the impact of onshore wind farms on the tourism industry, in areas that are generally associated with high visual sensitivity to man-made infrastructure (areas considered to have an abundance of natural beauty).

A balanced approach was utilised in determining the literature to review and included the impact of wind farms on tourism in selected areas of Iceland (2020); UK (2014); USA (2013); Scotland (2008); Portugal (2016); and Ireland (2012). The following table summarises the key insights gathered from the review of the research undertaken in the above-mentioned areas.

Table 6.1: International wind farm literature

Factor	Description
Study	Not in my back yard or not on my playground: Residents and tourists' attitudes towards wind turbines in Icelandic landscapes (Sæþórsdóttir & Ólafsdóttir, 2020)
Area	Búrfell, Iceland
Date and authors	Study completed in 2020 by Sæþórsdóttir & Ólafsdóttir
Methodology	• Examination of perceptions based on a proposed wind farm in a visually sensitive area. • Questionnaire survey in order to examine tourist and resident's perception towards: o The area o Attitudes towards the two existing wind turbines in the area, towards wind turbines in Icelandic nature and the proposed new wind farm, and whether it affects their interest in visiting the area again.

Factor	Description
	○ Attitudes towards the construction of the various types of renewable power infrastructure and whether they are concerned about climate change. ○ Questions supported by photographs regarding people's preferences for landscape.
Tourism overview	• Iceland's main tourist attraction is nature as 83% of tourists visit the country because of the natural landscape and about 49% especially mention its beauty, wilderness and pristine characteristics • Most of Iceland's wilderness areas are located in the Central Highlands • The area is uninhabited and covers about 40% of the country • The landscape is mountainous and characterized by stony deserts, post glacial lava fields, active volcanoes, geothermal areas, large ice caps and glacial rivers • Landscape modification by humans is still very limited due to the fact that the Highlands have been more or less uninhabited through the ages. However, in recent decades wilderness areas have been diminishing, mostly because of hydro power development and increased tourism • The exact location of the proposed wind farm is not a tourist attraction as such, still, the main gateway for travellers in and out of the Southern Highlands passes the area of the proposed wind farm • Some of the most popular destinations in the Highlands, such as Landmannalaugar, are close by and most tourists visiting those areas would pass the wind farm
Key findings	• Even though the construction of several hydropower plants has changed the landscape considerably, the study area is still perceived as natural, beautiful and quiet both among tourists and residents. • Both tourists and residents are in general mostly positive towards wind energy. • Numerous researchers highlight that thresholds for when an alteration of the natural landscape is evaluated as a disturbance depends on people's background, expectations and motives. • The residents seem to be more critical of the natural landscape, evaluating it as less natural, less beautiful, and less quiet than tourists. • In the Highlands, the wind farm would presumably have a very different impact on the wilderness experience for both residents and tourists than the existing hydro power plants • The residents are notably more positive than tourists towards wind farms and their presence in the Highlands. It is likely that potential economic gain influences the more positive attitudes of residents as municipalities in which power plants are built receive a property tax from the plant.

Factor	Description
	• The results further show that both residents and tourists are more negative towards a wind farm than individual wind turbines. • Wind turbines are very rare in Icelandic landscapes, Icelanders have therefore much less experience than the international tourists that may have wind turbines in their everyday surroundings. • Changes in the natural landscape that are in opposition to the image and experience that people connect with can lead to an alteration in their travel behaviour so that they stop visiting the area. The majority of residents and tourists in this study claim that a wind farm within the area would not affect their interest in travelling in the area, still it would impact the residents more than tourists. • This indicates that the tourists are likely to accept the changes in order to visit the wilderness located further into the Highlands. Conversely, the residents know about other remote places to fulfil their travel expectations without travelling through the area with the wind farm. Still, further industrialization at the edge of the Highlands will impact the current buffer zone existing between the inhabited lowlands and the uninhabited wilderness in the Highlands, and subsequently decrease the Icelandic wilderness resource as a whole. • Although the tourists claim not to avoid travelling in areas where there are wind turbines, they are of the opinion that wind farms should be prohibited in national parks, and beautiful landscapes in general. This suggests that they believe that wind farms spoil beautiful landscapes.
Study	The impact of wind farms on tourism in New Hampshire, USA (Polecon Research, 2013)
Area	New Hampshire, USA
Date and authors	Study completed in 2013 by Polecon Research
Methodology	• Empirical evidence of introduction of wind farms in the area • Impact on tourism activity is measured before and after a single wind farm put into operation in November of 2008 in Lempster, Sullivan County, New Hampshire
Tourism overview	• Visitors to New Hampshire travel to the area for vacation and visiting friends and family, followed by outdoor recreation. • Sightseeing, scenic drives, beaches and national park are among the most common activities reported by tourists
Key findings	• Operation of the wind farms started just after the onset of the financial crisis and the US entered recession. • No significant difference in the rooms and meals growth rate, as well as tourism employment, in the Lempster Wind region compared to other regions was observed after the project was commissioned, , which suggests "that any impacts of the project have been so small as to not be visible in the data"

Factor	Description
	• Anecdotal information obtained as the result of Iberdrola's presence in Lempster suggests that the Lempster wind farm has increased the level of interest in the town and contributed to increased visits. • There has been a large increase in attendance and camping revenues at state parks closest to Lempster Wind, indicating that "visitors seeking natural and recreational amenities in the region did not avoid the parks in response to the presence of Lempster Wind in the region".
Study	Evolution of the impacts of onshore wind farms on tourism on Northumberland, UK (Northumbria University Newcastle, 2014)
Area	Northumberland, UK
Date and authors	Study undertaken in 2014 by Northumbria University, Newcastle
Methodology	• Desktop research, online surveys and focus group • Perception focus – not historical evidence based
Tourism overview	• Tourism is very important to Northumberland • It relies on the natural beauty and scenery that has "ancient castles, hidden gardens, unspoilt beaches, rolling hills, rugged moorland, sweeping views, friendly little market towns and a cultural heritage all of its own." • Hiking and rural walks are common attractions to the area. • Area is well known for stargazing and low levels of light pollution.
Key findings	• Desk-based meta-study revealed that "there is no empirical evidence to-date that wind farms/turbines have a significant impact on tourism either positively or negatively in UK settings." • The results of the online survey of potential visitors revealed: "The impact of additional wind farms on visitor numbers to Northumberland is present but the majority feel that wind farms are not having an influence on their likelihood to visit the area…For those whose decision to visit would be affected this was primarily because of the impact on scenery and because they are unattractive but overall 61% of the total sample agree that a correctly sited wind farm does not ruin or intrude on the landscape." • The results of the online survey of tourism product owners revealed: "that 63% of respondents said that wind farms had not impacted upon their businesses. However, the remaining 37% who said that they experienced negative effects is a significant minority…Concerns about negative impacts on landscape and scenery and the effects of this on tourists are uppermost in these responses." • "The focus group with twelve people representing the voice of concern regarding the impacts of wind farms on tourism in Northumberland revealed a very deep scepticism of any voice or research that indicates wind farms are either neutral or beneficial in regard to tourism because, as this opinion has it, this does not

Factor	Description
	square with day to day, real world experience of Northumberland. This is particularly the case regarding certain localities."
Study	The economic impacts of wind farms on Scottish tourism (Moffat Centre, 2008)
Area	Caithness and Sutherland; Stirling, Perth and Kinross; The Scottish Borders; and Dumfries & Galloway
Date and authors	Completed in 2008 by Moffat Centre, Glasgow Caledonian University, and Cogentsi
Methodology	• Set to determine the potential number of tourists to be affected, reaction of affected tourists, economic impact of reactions • Focus on replacing myth with evidence and providing policy guidelines for future development • Four case study areas selected with scenic landscape and high tourism importance • Person-to-person surveys of 380 tourists with likelihood of seeing a wind farm while visiting the area • Internet survey of current and potential tourists – 600 from UK and 100 from US
Tourism overview	• 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). • Scotland prides itself on its countryside, hills and landscapes, ancient landmarks and coastal seascapes
Key findings	• Person-to-person surveys: o "Three-quarters of people felt wind farms had a positive or neutral impact on the landscape" o "Overseas visitors seemed to be more positive about wind farms than domestic tourists" o "Respondents that had seen a wind farm were less hostile than those who had not" o "A significant minority (20% to 30%) of tourists preferred landscapes without wind farms. However, of these only a very small group were so offended that they changed their intentions about revisiting Scotland." 97% of respondents indicated a 50% or above likelihood of returning to Scotland. • Internet survey: o There is perception that "turbines are as prevalent in areas designated as areas of natural beauty as they are in other non-scenic parts of the country." o "Tourists are generally unaware of attempts to keep wind farms away from the most scenic areas" o "A much higher percentage of respondents indicated that they would not visit an area if a wind farm was constructed (17.8%) than was found in the intercept survey…which is

Factor	Description
	indicative of the level of negative feeling some people have towards wind farms" ○ "Most people … appear to believe that, from the hotel bedroom, it is better to face an open hillside, rather than a wind farm. The value of the view from a bedroom "was seriously eroded by wind turbines, pylons and telegraph poles". ○ "There appears to be a diminishing marginal loss of value associated with increasing size of wind farms. In effect, it appears that once there has been an intrusion into the scenery, the effect on the value of the landscape of expanding the size is relatively small." • The investigation into intentions of visitors revealed that "the vast majority (93-99%) of those who had seen a wind farm suggested that the experience would not have any effect. Indeed there were some tourists for whom the experience increased the likelihood of return rather than decreasing it."
Study	Visitor attitudes on the environment – Wind Farms (Failte Ireland, 2012)
Area	Ireland
Date and authors	• Completed in 2012, but presents an update on research that took place in 2007 • Prepared by Millward Browne Landsdowne on behalf of Fáilte Ireland
Methodology	• Surveys were undertaken with holidaymakers at various tourist offices and visitor attractions around the country and a similar size and mix of domestic and overseas visitors was included.
Tourism overview	• "Ireland is seen as a major tourist attraction most notably for its green hills, unspoilt cliffside views, culture and romantic scenery" • Ireland's scenery has been a cornerstone of international tourism marketing campaigns for decades. In 2012, 91% of overseas holidaymakers to Ireland rated scenery as an important part of a destination with natural/unspoilt environment also rated highly at 91%. The future sustainability of Ireland's tourism industry is, therefore, inextricably linked to the maintenance of the character and scenic qualities of the Irish landscape. • Wind farms tend to be located in upland areas and areas close to the coast where the wind speeds are greatest, and these areas also contain some of the most valuable scenic landscapes
Key findings	• Awareness of wind farms in 2012 was very high amongst visitors to Ireland, with over 95% of visitors claiming to have seen a wind farm before • "The 2007 research found that the majority of visitors felt that wind farms had either no impact (49%) or a positive impact (32%) on the landscape, whilst 17% felt it had a negative impact. The 2012 research indicated an increase in the polarisation of opinion – with increased positive (47%) and negative responses (30%) and less neutral responses (23%). It is notable that

Factor	Description
	those interviewed who did not see a wind farm during their trip held more negative perceptions and opinions on wind farms to those that did." • "The type of landscape in which a wind farm is sited can have a significant impact on attitudes. Although 21% feel that wind farms have a fairly or very negative impact on sight-seeing, this figure increases substantially for wind farms in coastal areas (36%) and is even higher from accommodation (38%)." • "Coastal areas (91%) followed by mountain moorland (83%) and fertile farmland (81%) continue to be rated as the most scenic, and unsurprisingly resistance is greatest to wind farms in these areas. For instance, there was a greater relative negativity expressed about potential wind farms on coastal landscapes (40%), followed by fertile farmland (37%) and mountain moorland (35%)." • "Seven out of 10 (or 71%) of visitors claim that potentially greater numbers of wind farms in Ireland over the next few years would have either no impact or a positive impact on their likelihood to visit Ireland. Of those who feel that the potentially greater number of wind farms would impact positively on future visits, the key driver is support for renewable energy, followed by potential decreased carbon emissions. There has been a slight increase from 21% to 24% in those who say it would impact negatively on their likelihood to visit again due mainly to the negative aesthetics of wind farms followed by preferences for alternative renewable energy sources." • "Those who have not seen a wind farm on this visit have more negative opinions regarding the theoretical impact of a wind farm on their sightseeing compared to those who have actually seen one. This suggests there are some negative associations with wind farms that in reality do not materialise for those who have seen them." • "Given the scenario where more wind farms are to be built in Ireland in the future, the most widely held view is that this will not impact their likelihood to visit the area again, with a slightly greater majority saying that this would have a positive rather than a negative impact."
Study	Wind farms and rural tourism: A Portuguese case study of residents' and visitors' perceptions and attitudes (Silva & Delicado, 2017)
Area	Portugal
Date and authors	Completed in 2016 by Silva, L. and Delicado, A.
Methodology	• Set of semi-structured interviews conducted in 2012, 2013, and 2016 comprising of 21 residents and 68 visitors • Interviews focused on the respondents' perceptions and attitudes towards wind energy in Portugal and Sortelha
Tourism overview	• "Sortelha is a village located in a mountainous area, with stone outcrops of granite, in the municipality of Sabugal, some 30 km

Factor	Description
	from the city of Guarda in central eastern Portugal, close to the border with Spa." • "Sortelha includes two separate places: the walled village, a designated built heritage site, and the outskirts of the village, where the great majority of its about 150 permanent residents live." • "The main sources of income for local families are employment in public or municipal administration, small-scale retail, money transfers from pension and retirement payments, and tourism, complemented by small-scale agriculture for family consumption. Today, tourism occupies 12% of residents – who work in tourist accommodations (8 units, providing a total of 19 bedrooms), restaurants (2), cafés/snack-bars (4), the tourist office, handicrafts, or home-made food products, but also relies on the built heritage site and its rural setting/landscape."
Key findings	• Two wind farms were constructed in 2010-2011 – 39.1 MW and 18.4 MW. • The viewpoint of residents: o "All residents interviewed were supportive of wind energy generation and utilisation in Portugal…They did, however, show conflicting perceptions and attitudes about the siting of the currently existing wind energy facilities in Sortelha. Most of them (14 of 21) declared themselves against it, though only a few (3) have joined the aforementioned opposition movement." o "…according to these residents, in contrast to their initial expectations and fears, the wind turbines do not exert a negative outcome on tourism demand, including on return visits. "Tourists continue to come to Sortelha" is a common refrain in their discourses. However, residents have complained that the wind turbines have a detrimental impact on the tourist experience, because of the contrast between the modern wind turbines and the medieval architecture." o "In contrast, a third of the residents interviewed expressed support for the existence of wind farms in Sortelha, with no concerns about it. What is significant is that they all are involved in the wind farms, either directly, as occurs with the local promoter and the owners of the rented land (3), or indirectly, as happens with their relatives (3)." • The viewpoint of visitors: o "Virtually all respondents reported having seen the wind farms during their visit to the village, considered them noticeable or quite noticeable and believed that they do not constitute a threat to the physical preservation of the heritage site. But most of them (42 of 68) mentioned concerns with the visual impact, particularly the perceived

Factor	Description
	incongruity between the landscape on site and the wind turbines." ○ "…these negative perceptions of the presence of wind turbines at the destination were counterbalanced by the positive view of wind energy as a "clean", "environmentally friendly" electricity. Indeed, almost all visitors declared themselves in favour of wind energy generation and utilisation in Portugal, and most of them (43 of 68) accepted the presence of wind turbines in Sortelha." ○ "Moreover, a clear majority of the visitors, including most of the returnees, stated that they were unaware of the presence of wind farms before arriving in the village. In addition, almost all of them believed that wind turbines do not interfere with their choice of destination, either positively (attraction effect) or negatively (avoidance effect)." ○ "This study has provided empirical evidence from Portugal that wind farms do not make heritage-based rural tourism destinations less attractive. Visitors' perceptions may be considered partly critical, but they have no consequence for the final assessment not to visit the village of Sortelha because of the wind farms. In comparison, the residents' attitudes vary according to the perceived benefits and involvement in the decision-making processes."

The review of the above-mentioned articles and reports suggests that there is a difference between public attitude towards clean energy in general, and opposition for development of wind energy facilities in the localities that are endowed with scenic landscapes used to attract visitors to the area. Moreover, there appears to be a divergence of views between local residents and tourists, as well as among these two groups of stakeholders which in turn, is directly linked to personal attitudes towards wind farms and perceptions.

The negative public attitude towards wind energy projects is generally characterised as "not in my backyard" (NIMBY) syndrome (Karydis, 2013; Sæþórsdóttir & Ólafsdóttir, 2020). Changes to the landscape character, noise, land devaluation and impact on birds are usually cited as the most common impacts of wind farms augmented by limited job creation potential and negative impact on tourism (Karydis, 2013; Sæþórsdóttir & Ólafsdóttir, 2020). Despite the various negative impacts that are usually associated with wind projects, negative impacts on tourism appears to be a recurring motivator for campaigns against wind farms (Silva & Delicado, 2017; Sæþórsdóttir & Ólafsdóttir, 2020).

The concerns of the public with respect to the impact of wind farms on tourism stems from the attitude and perceptions by the same public that wind farms adversely impact on the valuable tourist resources or products that derive their value from visual dimension of the area and specifically the landscape (Silva & Delicado, 2017). As stated in the 2008 Moffat Report, "scenery clearly has value" but, the studies into the relationship between tourism

and wind farms continue to show conflicting results. Some studies show that wind farms "may have" an impact on tourism, while others reveal that tourism is innocuous or in some instances even benefiting from wind farms (Silva & Delicado, 2017). The studies presented above indeed collaborate this observation:

- The study of the proposed wind farm in Búrfell, Iceland (Sæþórsdóttir & Ólafsdóttir, 2019) indicated that perceptions of wind farms were complicated matters. The findings indicated that residents generally, seem to be more critical of the natural landscape, evaluating it as less natural, less beautiful, and less quiet than tourists. The results indicate that the relationship between residents and the landscape of the proposed site is based on its use as highland pasture and the residents' romantic conception of the landscape, which for centuries has been characterized by wildness and remoteness. The residents are notably more positive than tourists towards wind farms and their presence in the Highlands. It is likely that potential economic gain influences the more positive attitudes of residents as municipalities in which power plants are built receive a property tax from the plant (Sæþórsdóttir & Ólafsdóttir, 2020).
- The investigation into impact of wind farms on tourism in New Hampshire, USA revealed that the development of wind farms had no negative effect on tourist visitations; moreover, it appears it had "increased the interest in the town" and lead to the increase in revenues derived by the national parks located in close proximity to Lempster Wind Project location (Polecon Research , 2013). Moreover, it was stated that "visitors seeking natural and recreation amenities in the region did not avoid the parks in response to the presence of Lempster Wind" (Polecon Research, 2013).
- The investigation into the impact of wind farms on Northumberland (UK) tourism revealed that the majority of potential visitors' decision to visit the area is not affected by the presence of wind farms in the area in Northumberland (Northumbria University Newcastle, 2014). However, tourists who generally perceive wind farms to be unattractive also believe these to negatively impact the scenery and would therefore be deterred from visiting an area. The potential negative impact on visitation was also collaborated by the tourism product owners with a significant minatory pointing to some negative effects on their businesses (Northumbria University Newcastle, 2014).
- The 2008 Moffat Report (2008) investigating the impact of wind farms on tourism in four Scottish regions pointed to a substantial individual variance of current and potential tourists' attitude towards wind farms and the effect thereof on their decision to visit the area. It was revealed though that the majority of tourists are either positive or neutral to wind farms' impact on natural landscape; however, a significant minority remained to be objecting to seeing wind farms (Moffat Centre, 2008). Importantly though, a very small majority would actually change their decision to re-visit the area (Moffat Centre, 2008). The study also determined that tourists who have seen wind farms before are "less hostile" and objecting to their presence in natural landscape than those who have not (Moffat Centre, 2008).

Overall, the study estimated that the potential loss of value of tourism in the area could be around 19.7%, which is also associated with a very low confidence level of 15% to 25% (Moffat Centre, 2008).

- Additionally, an examination in 2017 (Blackett, 2017) of tourism around 18 wind farms revealed that in 15 of the 18 locations, sustainable tourism employment had increased by more than the Scottish average despite the appearance of turbines. Furthermore, once construction had been completed, 380 tourists were surveyed. Of those, 75 per cent felt wind farms had a positive or neutral effect on the landscape. Just four people, two percent of those who had seen turbines, said it would affect their decision to visit the area again: two said they would be less likely to return, while the other two were keener to return (Blackett, 2017).
- The investigation into the impact of wind farms on tourism in Ireland (Failte Ireland, 2012) also revealed that about 30% of visitors felt that wind farms were associated with a negative impact and about a quarter of visitors would be impacted by the presence of wind farms either positively or negatively impacted. Noteworthy is that tourists who have not seen wind farm before were more likely to have a negative attitude towards it than those who have seen it (Failte Ireland, 2012).
- The final case study investigated the impact of wind farms on the historical village of Sortelha in Portugal and exposed further differences in views and opinions on wind farms impacts on tourism. While significant proportion of local residents of the village objected the development of the wind farms, they later confirmed that both new and return visitors continued coming to the village (Silva & Delicado, 2017). They did complain though that experience of tourists was detrimentally altered (Silva & Delicado, 2017). Visitors to the village acknowledged that wind farms do have a noticeable presence, which negatively impacted on the visual aesthetics of the place; however, this alteration in the scenery did not "interfere with their choice of destination" (Silva & Delicado, 2017).

The conclusion that can be drawn from the above is as follows:

- Scenery can be said to have a monetary value, and attractive landscapes and natural beauty are important factors for tourists visiting a specific area.
- The overall attitude towards wind farms (either positive or negative) does not always translate into action, i.e. a negative attitude towards wind farms does not imply that a tourist will not visit or come back to the area. Therefore, research undertaken reveals that the actual losses of tourists, if any, are usually considerably smaller than the share of people with a negative attitude towards wind farms.
- A significant majority of tourists engaged in the various studies considered, support the use of wind energy to generate "clean" electricity and they appear to be even more in favour than the wider public of alternative energy sources. Some tourists, though, do have negative attitude towards wind farms but not everyone will be deterred from visiting an area. On average, a significant minority (25%-35%) have a negative attitude towards wind farms, but this varies with the age of those interviewed.

- Local residents in close proximity to wind farms, are more likely to have negative perceptions and attitude towards wind farms than tourists due to the NIMBY syndrome. This is particularly the case for those residents or stakeholders who are not involved and benefiting from the project (Sæþórsdóttir & Ólafsdóttir, 2020).
- Overall, public opinion with regard to the negative impacts of wind farms on tourism is higher during the planning and construction stage and considerably lower during the operation stage (Karydis, 2013; Aitchison, 2012). This is also confirmed by the fact that tourists and local residents who have not seen wind farms before are more likely to have negative perceptions about wind farms than those who have experienced them already (Sæþórsdóttir & Ólafsdóttir, 2020). As stated by Aitchison (2012), opposition towards wind farms can fall markedly after they are developed and in operation.

From the above, it can be surmised that it cannot be ruled with confidence whether wind farms have or do not have a negative impact on tourism but, those studies that pointed to the possible negative effects report marginal and not detrimental impact on tourism (Aitchison, 2012; Moffatt Centre, 2008; The Tourism Company, 2012; Sæþórsdóttir & Ólafsdóttir, 2020). It appears that many other factors such as the size and range of wind farms, the demographics of tourists (families with kids are more accepting of wind farms), the landmarks, location of the wind farm in relation to the tourist destination, and other physical and environmental attributes of the destinations all contribute to the decision of tourists to visit or re-visit an area. One trend that seems to be common though is that the outcry against wind farms is generally considerably greater during the pre-construction stage than during operations suggesting that initially perceived negative impacts to be associated with wind farms do not always come to fruition.

6.2 Effects of Wind Farms on Business Tourism: RSA Case Studies

In order to determine the impacts of wind farms on tourism in the South African case study areas, interviews were conducted with relevant stakeholders. These stakeholders were product owners of accommodation establishments in close proximity to the already established wind farms. These stakeholders were consulted by means of a standardised questionnaire that sought to determine:

- Business performance prior to 2020
- Visitor numbers
- Likely causes for visitor number and business performance

The following table outlines the accommodation establishments consulted as well as the area they are located in.

Table 6.2: Accommodation establishment consulted and location thereof

Establishment Type	**Area**
BnB	Makhanda
Backpackers	Makhanda

Guesthouse	Makhanda
Conferencing, holiday apartment and wedding venue	Jeffrey's Bay/Oyster Bay
Lodge	Jeffrey's Bay/Oyster Bay
Self-catering accommodation	Jeffrey's Bay/Oyster Bay
Farmstay	Cookhouse
BnB	Cookhouse

6.2.1 Visitor and business performance

The majority of business owners/managers indicated that they had noted a decrease in the revenue as well as the number of visitors who stayed at their establishments unrelated to the developments of the wind farms. Some business owners stated that their revenues had decreased by between 40% and 60% over the previous five years prior to 2020.

When queried as to the likely reason for the decrease in visitors and revenue, all establishments linked the poor performance with social, infrastructural, and economic issues that were persistent in their regions. One owner indicated that attacks on tourists were on the rise and that they had noted some of their own patrons (especially those from international locations) were targets of crime. This led to a decrease in travellers from those areas. Persistent water and electricity challenges were pointed to by the owners as some of the leading causes of decreased business performance. Many businesses were spending revenue on sourcing electricity and water backup systems which were expensive to operate and maintain. The degradation of infrastructure such as roads also played an important part to the reduction of performance according to business owners. Generally, the poor performance of the economy and corruption was pointed to as to the underlying cause of the challenges faced by accommodation establishments. The effects of corruption and poor economic performance have eroded the trust of international tourists and reduced the ability of local tourists to travel as they no longer have the means to afford such travel.

6.2.2 Effect of wind farms on visitor and business performance

All tourism product owners, who were engaged with during the interviews, stated that they felt there was no impact from the wind farms on their business performance. Additionally, no complaints about the nearby wind farms were received by the owners from customers.

Interviewed product owners further noted that the initial landscape change created a 'visual shock' but, notably the community has come to accept the changes to the landscape.

It was also indicated that some businesses benefitted from the development of the wind farm as they hosted wind farm employees for a notable duration during construction or during maintenance of the wind farms.

Additionally, it has been noted in a study performed by Terblanche (2020) that the game farm owners in and around the Cookhouse and Waainek wind farms (located near Cookhouse and Makhanda in the Eastern Cape) had no complaints from guests and have noted no changes to performance of their game farms as a result of the presence of the wind farms. The reason stated for this was that overseas visitors are used to the sight of wind farms and were unlikely to be negatively impacted by their presence. Terblanche (2020) further indicated that three game farms (including Amakhala) unsuccessfully appealed the Environmental Authorisation of Waainek Wind Farm in 2011 but, **since wind farm operation have reported no effects on their eco-tourism and game/hunting business.**

6.3 Potential Losses as a Result of the Development of Fronteer Wind Farm

While it is noted that there is a low probability of any negative impact to tourism occurring, as indicated in the section above, there is a possibility that the development of the proposed wind fam may decrease the number of tourist visitors to the region.

As described earlier, the immediately affected environment is characterised primarily by livestock farming (sheep, goats and to a lesser extent cattle), with some tourism and game farming activity. The wider area is noted for its wildlife and game farm tourism.

During the operation of the wind energy facility, a small proportion of the land (less than 1.54% of the development footprint) on the proposed development site will be taken up by permanent wind farm infrastructure (turbines, substation, control building and crane hard standings) according to the Agricultural Impact Assessment. It is not envisaged that significant changes will occur to land use once the wind farm has been built, and animals will be free to graze across the site with landowners being able to continue to use the land in the same manner as they did prior to the establishment of the wind energy facility.

Accordingly, the revenue generated through livestock farming is unlikely to be affected by the visual disturbances in the area, however, the opposite may be applicable to the tourism and game farming industries. The following paragraphs describe the sensitivity of the tourism industry and game farms towards the visual disturbances and provide an estimation of the potential loss in revenue that could result from the establishment of the wind energy facility.

6.3.1 Assumptions regarding sensitivity of tourists to visual disturbances

It is assumed that the majority of international tourists visiting farms in the area are almost exclusively trophy hunters or come to the area for leisure. Domestic tourists are mainly biltong hunters visiting the farms of their friends. A smaller proportion of domestic tourists also visit the area for relaxation.

International tourists are expected to be fairly sensitive to a visual disturbance in the area. One of the reasons international tourists visit the area is to experience a "Wild Africa" and to hunt/view game. An outside disturbance that would affect this "Wild Africa" experience is therefore likely to negatively impact the level of satisfaction that some of these tourists experience. It is, however, known that one of the critical factors that international hunters consider when visiting local game farms is the quality of the trophy (Damm, 2007). In many cases this is the chief concern of international hunters.

It was also noted that many of the international tourists visiting local game farms are repeat visitors and have been referred to the farms by friends and family. This means that any visual disturbance that would affect the experience of international visitors could impact on their decision to return to the respective game farm. It is also probable that these international visitors would likely spread the word about their experience to other potential tourists meaning that, in a case where the experience is unsatisfactory, international tourists may not make referrals to the game farms.

A key aspect that has been raised in a study by Terblanche (2020) is that the international tourists are used to the sight of wind farms. The study further concluded that the game farms that are in the areas of Cookhouse and Makhanda noted no change in their business as a result of the wind farms in the area.

Domestic tourists are also expected to be sensitive to visual disturbance that affect their sense of place, as well as their experience of the game farms but, less so than international hunters as a result of increased exposure to wind farms by international visitors. Biltong hunters are, however, expected to be less sensitive than trophy hunters or even domestic visitors interested in eco-tourism. This is largely due to the fact that small groups of biltong hunters primarily hunt for meat to make biltong and are generally not very demanding as far as their facilities and environment are concerned. The situation might differ if corporate groups are examined. Corporate tourists are likely to be more demanding with regard to facilities and thus more sensitive to the ambience created by the surrounding environment.

It is important to note that for both international and domestic tourists the visual experience of the area is but one factor that is considered when visiting a game farm. Other factors include inter alia:

- Location and quality of the facilities
- Variety and abundance of wildlife
- Quality of the trophy (for hunting tourists)
- Relationship with the farm owner/s

7. POTENTIAL IMPACTS ON PROPERTY VALUES AS A RESULT OF THE WIND ENERGY FACILITY

The following chapter outlines the potential impact of the proposed wind farm development on property values in the surrounding area. Three areas of examination have been chosen for the analysis namely Makana Non-Urban (NU; Makhanda), Blue Crane Route NU (Cookhouse non-urban areas) and Kouga NU (Jeffrey's Bay / Oyster Bay / St Francis Bay / Cape St Francis / Hankey / Patensie / Humansdorp non-urban areas). These areas have existing wind farms and are largely in rural areas similar to that of the proposed development.

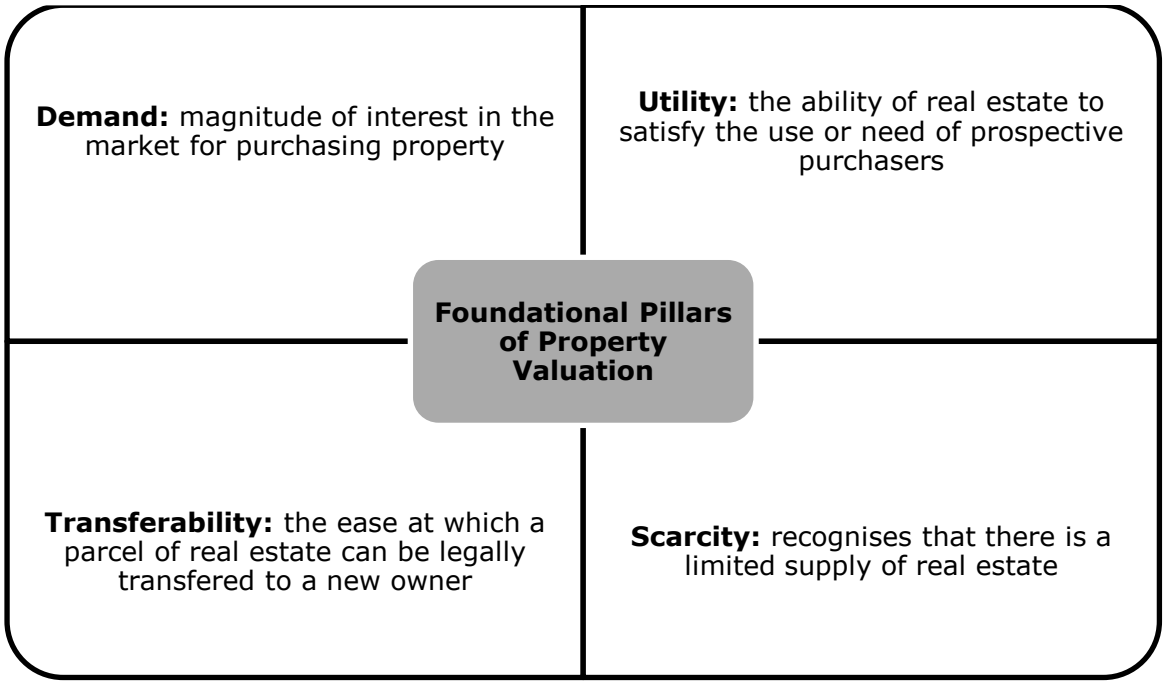
7.1 Definition of Property Value

Prior to analysing the potential effects of a project on property values, it is important to make a distinction between property values and property price:

- Property value denotes the fair market value of a given property, albeit the actual price of the property may be higher or lower (Jean Folger, 2018). Property value is determined through property valuation, which determines the economic value of real estate (Madlener, 2016).
- The actual sale price (i.e. property price) is dependent on what information the buyer and seller have and the extent to which one or the other seeks to buy or sell the property and any additional incentives the seller offers to entice the buyer (Study, 2018).

The pillars of property valuation are indicated below.

Figure 7.1: Four Foundational Pillars of Property Valuation (Study, 2018)



Location has long been recognised as the paramount variable in real estate. Therefore, development of neighbouring land can be controversial and often cause nearby landowners' scepticism (Carter, 2011). The four stigmas associated specifically with wind farm developments are (Carter, 2011):

- **Nuisance stigma:** sounds or shadow flicker from nearby wind turbines
- **Proximity stigma:** turbines make the area appear more developed
- **Scenic vista stigma:** an undesirable view (negative visual impact)
- **Wind farm anticipation stigma:** the uncertainty surrounding where turbines will be located and the effects the wind farm will have on residents when the development is initially proposed

Not all stigmas affect properties to the same extent. Individual perception of stigmas associated with wind energy developments largely derives from the individual's opinion of wind turbine aesthetics and renewable energy. The predominant perception of wind turbines is that they lower nearby housing values (The Royal Institute of Chartered Surveyors, 2007). The most reliable way to explore the issue is therefore not by polling to gauge public opinion (as it will likely be skewed due to the unknown and perceived nature of the impact), but by analysing property market trends in the areas where such developments have already taken place and considering the experiences of real estate agents.

7.2 Historical Trends and Assessment

The areas that have been chosen as areas of comparison include the existing area of Makana NU (Makhanda), Blue Crane Route NU (Cookhouse) and Kouga NU (Jeffrey's Bay/Oyster Bay etc.). These areas have existing wind farms established and have similar development locations as the proposed development. These areas are made up of rural property types which consist of farm dwellings and small holdings. The reports that the case study analysis make use of examine the sales data associated with the rural areas and outlines the nature of the current owners, sellers and buyers.

The Waainek Wind Farm (located approximately 20km from the proposed development in Makana NU) is largely characterised by rural property types with some light industrial developments located to the east of the wind farm. The primary land use is that of livestock farming (sheep, goats) with some game and wildlife farming. The area can therefore be classified as rural but located on the periphery of an urban node. Comparatively, the areas surrounding Jeffrey's Bay Wind Farm, Oyster Bay Wind Farm and Gibson Bay Wind Farm (Kouga NU) are also largely rural in nature. The area is predominantly dominated by agricultural land use with some tourist land use located in the surrounding areas such as conference venues, game farming and beachside accommodation. Finally, there are five wind farms (Cookhouse, Amakhala Emoyeni, Nojoli, Golden Valley and Nxuba wind farms)

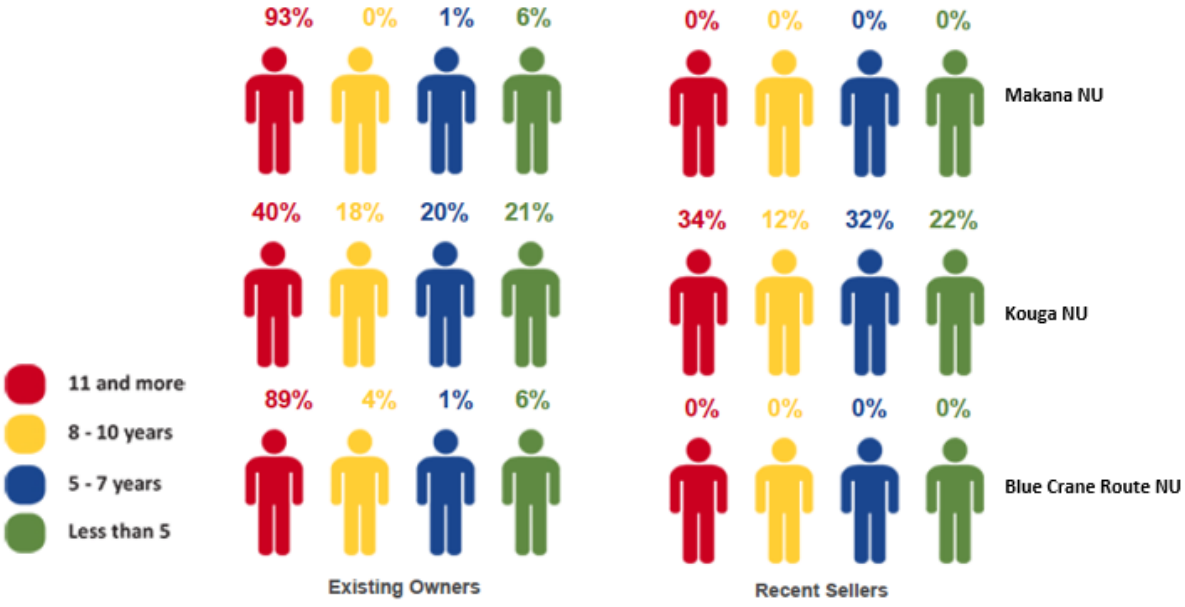
located in the Blue Crane Route NU (Cookhouse) in a largely rural area that is dominated by livestock farming.

When examining the period of ownership of the areas surrounding the wind farms it is important to note the insights that these figures offer in terms of:

- Existing property owner's views of the area
- Recent sellers' views of the area

The property ownership statistics for the areas under analysis (Figure 7.2) suggests that most owners in all areas under analysis are long-term owners who have lived in the area for more than eight years. In Makana NU and Blue Crane Route NU, the average duration of ownership of property is higher than that of Kouga NU. The figures indicate that Makana and Blue Crane Route rural areas are static property markets and have not experienced any major changes that have made long-term owners want to sell. The figures also suggest that the areas around Jeffrey's Bay are more dynamic and are placed on the market more often. The recent sellers from Kouga indicate that there is an even split between long-, medium- and short-term owners but, those who do own property in the areas have owned it for more than eight (8) years (58%). The dominance of long-term owners in all of the areas reviewed, though, suggests that the residents are highly content or rarely have motive to move.

Figure 7.2: Property ownership statistics for case study areas from June 2019 to May 2020 (Lightstone, 2020)



It is worth noting there have been no recent sales in Makana NU or Blue Crane Route NU over the past year with the last sales in execution occurring in 2018 in Makana NU (two properties) and in 2005 in Blue Crane Route (one property). The number of sales in execution in Kouga NU was 25 over a ten-year period since 2010. The largest number of sales in execution was in 2013 (six).

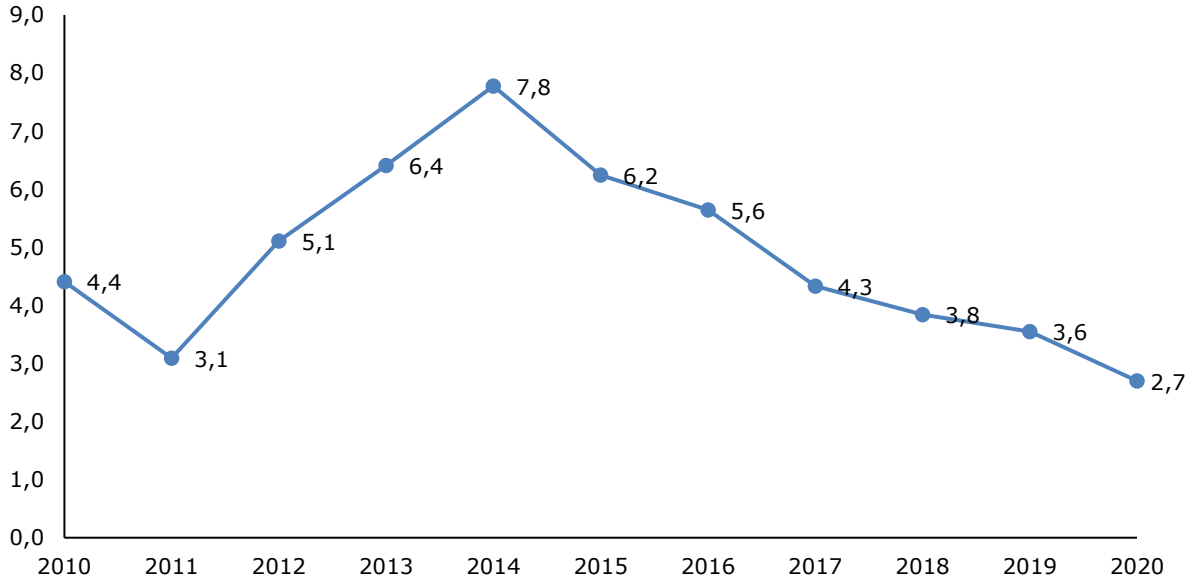
7.3 National and Local Trends in Property Prices

This section serves to provide an analysis of average property prices over a period of ten years in the case study areas. The aim was to gain an insight into the overall trends with respect to property prices.

Prior to analysing the property trends, and specifically the changes in property prices in the primary zone of influence it is important to understand the general economic conditions that took place during the analysed period and the effects thereof on property prices in the greater area of the Eastern Cape, as well as on prices of different types of properties.

The macro property trends provide an overview of the housing market performance in the country. In order to determine how the residential market is performing in South Africa, FNB's house price index (HPI) is used to illustrate the performance of the property market (Figure 7.3). Generally, these indices also include rural housing.

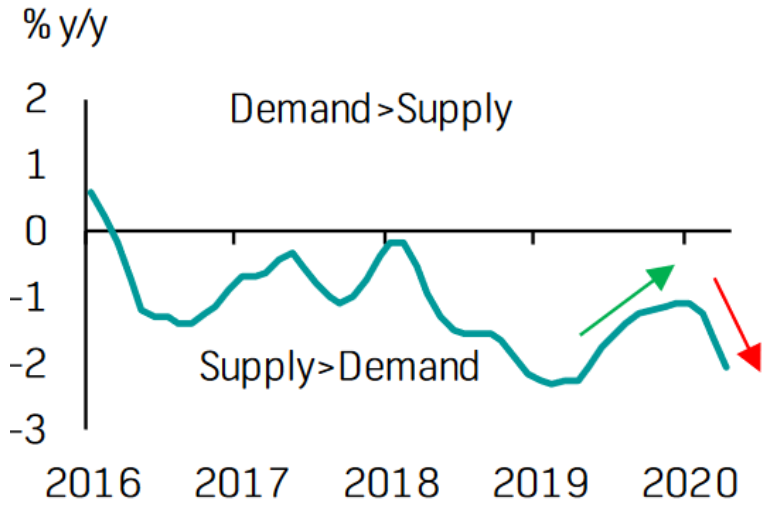
Figure 7.3: FNB Housing Price Index 2010 -2020 (FNB, 2020)



Based on the FNB property price index, it is clear that South Africa's property market performed well between 2011 and 2014 following the effects of the Global Financial Crisis. From 2014 there has been a consistent decline in the housing index from a yearly average of 7,8% to 2,7% in 2020. Additionally, while new data has given early indications, the impact of COVID-19 on the housing market is not yet fully reflected in the data. This is as a result of the lag time between mortgage applications and approvals. The FNB HPI is extremely likely to further drop as a result of the current disaster conditions.

Additionally, the Market Share Index (MSI) indicates a widening in the demand-supply gap which is likely to further impact the property markets negatively. This is indicated in the figure below.

Figure 7.4: FNB Housing Price Index percentage change 2016 -2020 (FNB, 2020)



Research indicates that historically low interest rates, a decline in house prices and lower transfer duties will eventually support purchasing activity and facilitate a house price rebound in 2021 but, this will be drawn out because of the state of the economy prior to the COVID-19 shock. This is very likely to be experienced in all facets of the property market including farms, holiday homes, leisure properties etc.

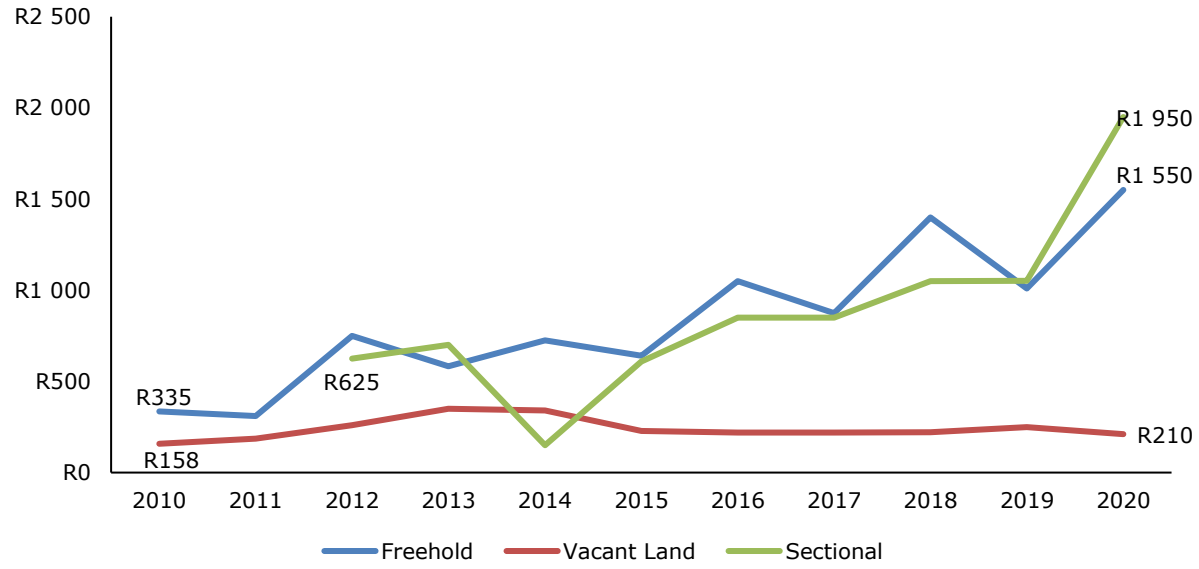
Considering the above, the following should be noted when analysing the trends in property prices:

- The property market experienced a significant drop in 2008/9
- It is likely that a similar drop will be expected in 2020 as a result of COVID-19
- The recovery of the property market is likely to be slow as a result of pre-existing issues that have plagued the South African economy prior to COVID-19
- All property segments are likely to experience a significant shock.

7.4 Case Study Area Property Trends and Dynamics

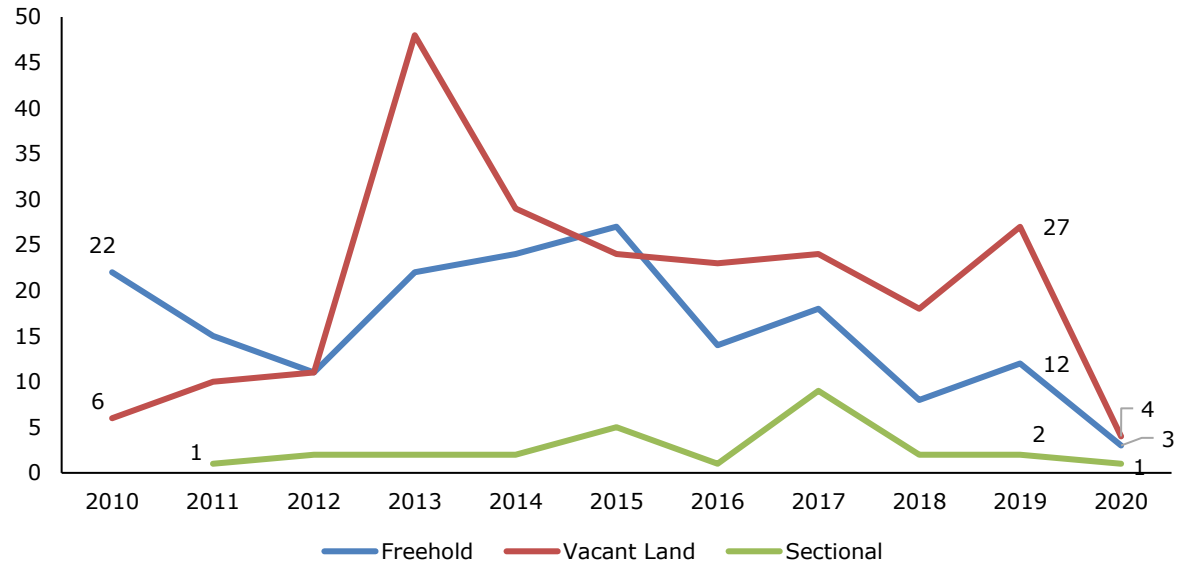
The analysis below serves to track property trends in the selected case study areas. It should be noted that no properties were recorded as 'transferred' in the ten-year period in Makana NU (Makhanda) or Blue Crane Route NU (Cookhouse) according to Lightstone (2020). This analysis will thus examine the property prices of Kouga NU (Jeffrey's Bay / Oyster Bay / St Francis Bay etc.).

Figure 7.5: Average property prices in Kouga NU between 2010 and 2020 (R '000) (Lightstone, 2020)



The below graph indicates the number of properties that were transferred between 2010 and 2020 in Kouga NU.

Figure 7.6: Number of property transfers in Kouga NU between 2019 and 2020 (Lightstone, 2020)



From the property transfer data related to Kouga NU, it can be observed that the property market was particularly active between 2013 (48 transfers) and 2014 (29). This is largely as a result of the large number of vacant land parcels that were transferred in 2013 which peaked the average vacant land price at R350 000. This coincided with the construction of the Jeffrey's Bay Wind Farm. Freehold properties followed a more stable trend of between 22 and 12 properties transferred between 2010 and 2019. Sectional schemes exhibited a generally stable number of transfers between one and nine transfers per year.

From the graphs above, it is evident that:

- Freehold property prices have been growing by 15% per annum between 2010 and 2020. Importantly, no apparent change in the freehold property prices has been identified for the area due to the development of the various wind farms (Jeffrey's Bay Wind Farm, Oyster Bay Wind Farm and Gibson Bay Wind Farm) before, during and after their construction.
- Sectional title prices have grown from R625 000 in 2012 to R1 950 000 in 2020 (14% per annum). There was a notable reduction in price in 2014 (R700 000 in 2013 to R150 000 in 2014). This could possibly indicate that some speculation took place prior to construction and during construction of the wind farms, which negatively impacted on property prices but, it is clear that the property prices on sectional titles in the area continued to increase after construction of the wind farm was complete.
- The price of vacant land in the area has been largely consistent and ranged between R 158 000 in 2010 to R 210 000 in 2020 (3% growth per annum between 2010 and 2020).
- There was a large spike in transfers of vacant land in 2013, around the period that the wind farms were constructed but, the average sale price of land was at its highest at R350 000 over the period examined.

To summarise, prior and during the construction of the Jeffrey's Bay, Oyster Bay and Gibson Bay wind farms freehold property prices gradually increased, while sectional schemes prices dipped slightly. When operation of the wind farm commenced, freehold and sectional scheme prices grew whilst vacant land prices remained largely the same. In the last five to six years since the operation of the existing wind farms commenced, freehold and sectional property prices have increased.

It can thus, be determined that there appears to be no direct correlation between the timing of the wind farm developments and the sales figures presented in this section.

7.5 Real Estate Agent Engagements

In order to augment the above data, real estate agents were interviewed to determine their views as to the likely impacts of the wind farm developments. Real estate agents from Cookhouse/Somerset East, Jeffrey's Bay/Oyster Bay and Makhanda were interviewed in order to determine their views. The table below indicates the agents and their general views towards the impacts of the wind farm on property prices.

Table 7.7: Agents and general views towards the impacts of the wind farm on property prices in the affected areas

Company	**Area**	**Likely impact of wind farm on properties**
Remax Frontier	Makhanda	Purpose dependent – noted that sellers may find it difficult to sell to those wanting to establish game farms
Just Property	Makhanda	No Impact
Harcourts	Makhanda	No Impact
Harcourts	Jeffrey's Bay/Oyster Bay	No Impact
Just Property	Jeffrey's Bay/Oyster Bay	No Impact
Pam Golding	Jeffrey's Bay/Oyster Bay	No Impact
Independent Property Consultants	Somerset East / Cookhouse	Unsure
Pam Golding	Somerset East / Cookhouse	Negative Impact – Sellers facing difficulty in selling properties
Warren Property	Somerset East / Cookhouse	No Impact

The experience of most of the real estate agents interviewed asserts that wind farm developments have not had a notable effect on the demand and value of properties surrounding wind farm developments. They state that prospective buyers have mostly been indifferent to the presence of wind farms. One real estate agent from Cookhouse noted that there has been a negative impact from the presence of the wind farms in that there have been fewer sales and enquiries for farm property in the area. The most notable impact was in the tourism and game farming industry where, the agent noted that, there has been difficulties in securing investors for those industries. This cannot, however, be solely attributed to the wind farms and could also be attributed to the downturn in the national economy. Another agent in Makhanda noted that impacts on properties were purpose dependent and stated that sellers may find it difficult to sell to buyers wanting to establish game farms but, buyers interested in agriculture will be unphased by the turbines.

A notable point is that the areas that historically have few property transfers are the areas where concerns have been raised. This is in contrast to areas such as Jeffrey's Bay / Oyster Bay where there have been no concerns raised. This is also noted in Section 6 where property price trends have indicated no noticeable impacts on the property market from the presence of wind farms.

7.6 International Literature Review

Urbis (2016) stated that the review of international literature and research in Australia on the impact of wind farms on property values suggested that the majority of published reports conclude that "there is no impact or limited definable impact of wind farms on property values". Studies that reported some negative impact on property values were in countries with higher population densities and a great number of traditional residential and lifestyle properties affected by wind farms (Urbis, 2016).

Hoen et al (2009, p. ix), stated that "concerns about the possible impact of wind energy facilities on the property values of nearby homes are reasonably well established" but the research into actual impact is often flawed by the fact that it relies on the views of homeowners and real estate agents, simple statistical techniques, and small datasets among others. To address the shortcomings mentioned above, Hoen et al (2009) made use of the hedonic price model that investigated the actual sales prices of homes and collected information on 7 459 transactions from ten communities surrounding 24 existing wind farms spread across multiple parts of the USA.

The authors stated that concerns about the possible impact of wind power facilities on residential property values can take many forms but can be divided into three main categories:

- Area Stigma: A concern that the general area surrounding a wind energy facility will appear more developed, which may adversely affect home values in the local community regardless of whether any individual home has a view of the wind turbines
- Scenic Vista Stigma: A concern that a home may be devalued because of the view of a wind energy facility, and the potential impact of that view on an otherwise scenic vista
- Nuisance Stigma: A concern that factors that may occur in close proximity to wind turbines, such as sound and shadow flicker, will have a unique adverse influence on home values

The investigation into the various stigmas on property price making use of the hedonic price model found "no persuasive evidence of any of the three potential stigmas: neither the view of the wind facilities nor the distance of the home to those" of having "consistent, measurable, and statistically significant effect on home sales prices" (Hoen, et al., 2009, p. xii). The summary of the results is also provided in the image below.

Figure 7.8: Impact of Wind Projects on Property Values: Summary of Key results of the research conducted by Berkley Lab in the USA

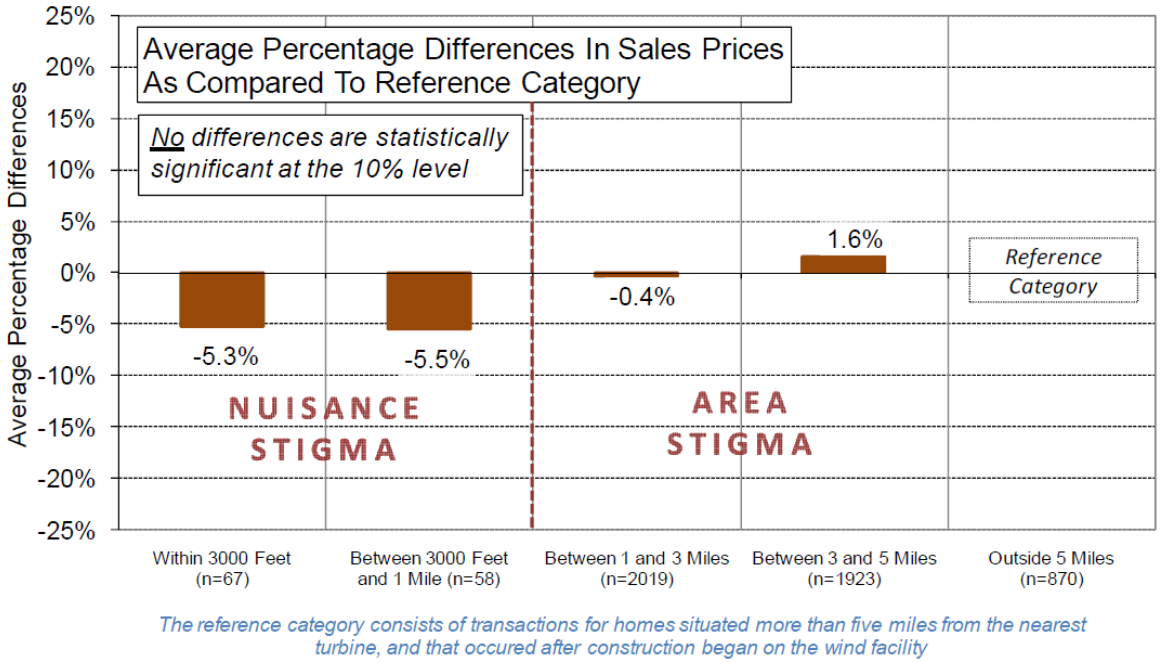
Statistical Model	Is there statistical evidence of: Area Stigma?	Scenic Vista Stigma?	Nuisance Stigma?	Section Reference
Base Model	No	No	No	*Section 4*
View Stability	Not tested	No	Not tested	*Section 5.1*
Distance Stability	No	Not tested	No	*Section 5.1*
Continuous Distance	No	No	No	*Section 5.2*
All Sales	No	No	Limited	*Section 5.3*
Temporal Aspects	No	No	No	*Section 5.4*
Orientation	No	No	No	*Section 5.5*
Overlap	No	Limited	No	*Section 5.6*
Repeat Sales	No	Limited	No	*Section 6*
Sales Volume	No	Not tested	No	*Section 7*

"No"…… No statistical evidence of a negative impact
"Yes"…… Strong statistical evidence of a negative impact
"Limited"…… Limited and inconsistent statistical evidence of a negative impact
"Not tested"…… This model did not test for this stigma

(Hoen, et al., 2009)

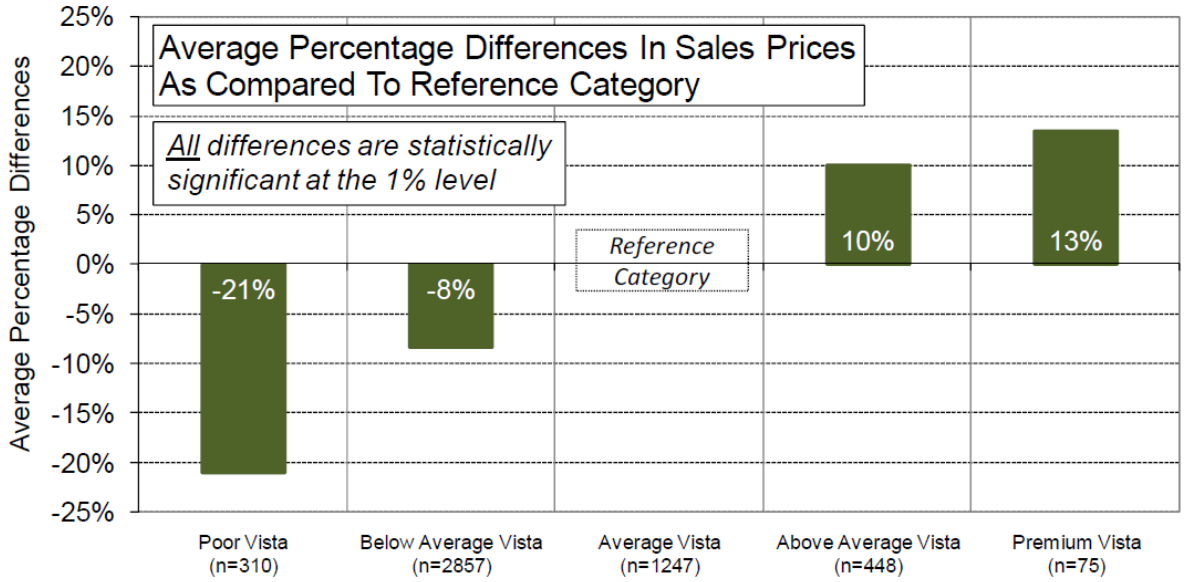
To investigate Area Stigma, the model tests whether the sales prices of homes situated anywhere outside of one mile (1,6 km) and inside of five miles (8 km) of the nearest wind facility are measurably different from the sales price of those homes located outside of five miles (greater than 8 km). No statistically significant differences in sales prices between the homes were found (Hoen, et al., 2009, p. xii), as indicated in the figure below.

Figure 7.9: Base Model Results: area and nuisance stigma (Hoen, et al., 2009)



For Scenic Vista Stigma, the researchers used this model to investigate whether the sales prices of homes with varying scenic vistas – absent of the presence of the wind facility - are measurably different. The model results indicated a dramatic and statistically significant difference in this instance (Hoen, et al., 2009, p. xii) as outlined in the figure below. This means that "home buyers and sellers consider the scenic vista of a home when establishing the appropriate sales price" (Hoen, et al., 2009, p. xii). When the researchers utilised the model to test for whether homes with minor, moderate, substantial, or extreme views of wind turbines had measurably different sales prices, no statistically significant differences were apparent (Hoen, et al., 2009, p. xii).

Figure 7.10: Basic Model Results: Scenic Vista (Hoen, et al., 2009)



The reference category consists of transactions for homes with an Average Vista, and that occured after construction began on the wind facility

For Nuisance Stigma, the researchers used the model to determine whether the sales prices of homes situated inside of one mile of the nearest wind energy facility are measurably different from those homes located outside of five miles. The results again indicated that no persuasive statistical evidence existed to indicate that wind facilities measurably and broadly impact residential sales prices (Hoen, et al., 2009, p. xii) as was also illustrated in the figure above.

The researchers further state that "the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted," and "if these impacts do exist, they are either too small and/or too infrequent to result in any widespread, statistically observable impact" (Hoen, et al., 2009, p. xvii).

A study by Carter (2011) in Illinois, US also revealed that wind farms did not have a negative effect on property prices within the county. "No evidence of a consistent negative effect on house prices" was also found by Heblich et al (2016, p. 3) in the study of impact of wind turbines on house prices in Scotland. On the other hand, the study by RenewableUK (2014) suggested that prices of homes dropped prior to construction but, recovered after the wind farm was erected suggesting that there was "no long-term negative impact on house prices".

From the review of the above information it can be deduced that the presence of wind farms does not automatically result in reduced property values. Moreover, it appears that there is no direct correlation between wind farms and property values over the long-term. However, individual cases of property prices being negatively impacted by the presence of wind farms cannot be discarded, as potential buyers may use that factor as an opportunity to try and reduce their costs of buying a property or indeed perceive wind farms to devalue

the attraction of a specific location. Furthermore, **if negative impacts on property prices occurs, it appears to be temporary and limited to the pre-construction period. This again suggests that perception of the possible impact of wind farms on the scenic value of an area tends to be higher before development and reduce in the medium to long-term.**

8. ASSESSMENT OF IMPACTS AS A RESULT OF THE WIND ENERGY FACILITY

This chapter of the report seeks to describe and assess the economic and socio-economic impacts that are expected to occur as a result of the development of the Fronteer Wind Farm. This chapter also provides a net effect and trade off analysis of the development of the wind energy facility in order to determine the preference of one option over another. This chapter has separated the assessment of the Fronteer Wind Farm into the projects three lifecycle phases namely construction, operation and decommissioning.

8.1 Construction Phase Impacts

The following sections indicate the impacts that are likely to occur during the construction phase of the proposed wind energy facility. Since the facility is expected to have both positive and negative effects in terms of the same indicator, the evaluation of impacts has been grouped accordingly.

8.1.1 Positive impacts during construction

a) Temporary stimulation of the national and local economy

The proposed Fronteer Wind Farm will cost R 4,6 billion (2020 prices) to establish. This will equate to a total impact of R 11,9 billion (direct, indirect, and induced) on production/new business sales in the country. The localised expenditure on the project will stimulate the local and national economies albeit for a temporary period of 30 months during construction.

As indicated in Table 5.1 it is estimated that the project will increase the GDP directly in the country by R 1,4 billion in 2020 prices, which will translate into a total impact of R 2,3 billion (direct, indirect, and induced) of Gross Domestic Product (GDP) (see Table 5.1). These effects will take place for the duration of construction.

The greatest effects on production and GDP stimulated during construction activities will be created through the multiplier effects, specifically through a combination of production and consumption induced effects. The former refers to the impact generated along backwards linkages when the project creates demand for goods and services required for construction and subsequently stimulates the business sales of the suppliers of inputs that are required to produce these goods and services. The latter refers to the effects of household spending which is derived from an increase in salaries and wages directly and indirectly stimulated by the project's expenditure.

Sectors and industries that will experience the greatest stimulus from this expenditure include:

- Basic metals, structural metal products and other fabricated metal products industries
- Trade
- Insurance
- Transport services
- Electrical machinery and apparatus

Nature: Temporary increase in the GDP and production of the national and local economies during construction		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**56 (Medium)**	**60 (High)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • The developer should encourage the EPC contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies. • The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.		
Residual Impacts: • None foreseen at this stage		

b) Temporary increase employment in the national and local economies

The construction of the facility will create 480 Full Time Equivalent (FTE) employment positions over the course of the development, however, 460 will be based in South Africa (see Table 5.1). Approximately 40% of the employment positions involve skilled Black South African construction workers, with the remaining being managers, professional engineers, and supervisors. Based on estimates by Fronteer (Pty) Ltd, it is anticipated that 40% of the FTE positions will be filled by people from local communities.

As evident by Table 3.6 the construction sector of the Makana Municipality is relatively small employing only 1 396 people in 2018 (Quantec, 2018). The area, however, is fairly close to the Nelson Mandela Bay Metro which has a significantly larger construction sector that employs approximately 19 951 people (Quantec, 2018). Given the size of the construction sector within these municipalities it is anticipated that there will be sufficient local labour to satisfy the demand for 460 South African based construction workers. Furthermore, if most of the local staff comes from the Makana Municipality it will have a

positive effect on local unemployment particularly since the area experiences an unemployment rate above the provincial average.

Beyond the direct employment opportunities that will be created by the project during the construction phase the development will also have a positive spin-off effect on the employment situation in other sectors of the national and local economies. Through the procurement of local goods (i.e., consumption induced effects) the project will support an estimated total of 591 FTE employment positions (indirect). Most of these positions will be in sectors such as construction, business services and trade.

The expenditure on the project outside of the local economies will also have a positive effect on employment creation, albeit for a temporary period of 30 months. Through the production and consumption induced impacts the project is envisioned to create an estimated additional 316 FTE employment (induced) positions. Given that a significant portion of the multiplier effects will be generated through backward linkages, more than half of these FTE employment positions will be created along the supply chain and amongst industries providing inputs to the businesses in the supply chain.

Based on these figures the total contribution of the development towards employment creation in South Africa is estimated at 1 367 FTE employment positions. Throughout the construction phase it is recommended that the developer encourage the EPC contractor to fill as many local positions as possible using labour from within Makana Municipality rather than from outside of the municipal boundaries.

Nature: Temporary increase in employment in local and national economies		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**56 (Medium)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • Co-ordinate with the local municipality and relevant labour unions to inform the local labour force about the project that is planned to be established and the jobs that can potentially be applied for. • Establish a local skills desk (in Makhanda) to determine the potential skills that could be sourced in the area • Recruit local labour as far as feasible • Employ labour-intensive methods in construction where feasible • Sub-contract to local construction companies particularly SMMEs and BBBEE compliant enterprises where possible		

• Use local suppliers where feasible and arrange with the local SMMEs to provide transport, catering and other services to the construction crews.
Residual Impacts: • Experience gained in the construction of wind farms

c) Contribution to skills development in the country and local economy

The construction of the proposed Fronteer Wind Farm is likely to have a positive impact on the skills development in South Africa. During the turbine component assembly and tower manufacturing period which is included as part of the construction phase and is planned to be conducted in the Eastern Cape, it is likely that foreign technical experts will be involved. This will present an opportunity for skills and knowledge transfer between these technical experts and local manufacturers.

It is also expected that the construction staff involved in the project will gain knowledge and experience in respect of the development of wind energy facilities. This will be highly beneficial given South Africa's target of generating 17 742 MW from wind energy by 2030 (Department Energy, 2011) as well as the multiple other wind energy developments planned for the Eastern Cape and the impending announcement of the 5th bid window for Renewable Energy Independent Power Producer Procurement Programme (REI4P; Presidency, 2020). More skilled local construction staff would most likely also lower the cost of future wind projects in the province. Since it is estimated that 40% of the construction workers will be from local communities, it is highly probable that these workers will be able to utilise these new skills over the long run, in other developments proposed in the local area.

In addition to the direct effects of the project on skills development in the country and the local economy, the project could contribute to the development of the local research and development (R&D) and manufacturing industries associated with wind technology. This could be achieved through partnerships with Rhodes University (situated in the Makana Local Municipality) or the Nelson Mandela University (NMU) in Port Elizabeth. Partnerships of this nature could further enhance the development of new skills and expertise.

Nature: Contribution to skills development in the country and in the local economy		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly Probable (4)
Significance	**33 (Medium)**	**52 (Medium)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be* enhancement*?	Yes (enhanced)	

Enhancement: • Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-establishment and construction phases • Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers, especially those from local communities • Facilitate a broader skills development programme as part of socio-economic development commitments
Residual Impacts: • South Africa's human capital development • Improved labour productivity and employability of construction workers for similar projects • Possible development of local skills and expertise in R&D and manufacturing industries related to wind technology through partnerships with Rhodes University and NMMU

d) Temporary increase in household earnings

The proposed wind energy facility will create an estimated total of 1 367 South African based FTE employment positions during construction generating R 1,6 billion of revenue for the affected households in the country through direct, indirect, and induced effects. Of this figure R 610 million will be paid out in the form of salaries and wages to those individuals directly employed during the construction phase. The remaining R 961 million in households' earnings will be generated through indirect and induced effects resulting from project expenditure. Given the average household size in the Makana Local Municipality and Eastern Cape is 3,8 and 3,9 respectively, a total of between 1 748 and 1 794 people are likely to benefit from the employment positions created and the income derived through these 460 FTE employment positions.

Although temporary, this increase in household earnings will have a positive effect on the standard of living for these households. This is especially applicable to the households benefitting from the project that reside in the Makana Municipality and broader Eastern Cape.

Nature: Temporary improvement of the standard of living of the positively affected households		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly Probable (4)
Significance	**33 (Medium)**	**52 (Medium)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • Recruit local labour as far as feasible to increase the benefits to the local households		

• Employ labour intensive methods in construction where feasible • Sub-contract to local construction companies where possible • Use local suppliers where feasible and arrange with local SMME's and BBBEE compliant enterprises to provide transport, catering, and other services to the construction crews
Residual Impacts: • Possible increase of households' saving accounts • Improved standard of living of the affected households

e) Temporary increase in government revenue

The investment in the Fronteer Wind Farm will generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies' tax etc. Additional government revenue will also be earned through corporate income tax, however since the gross operating surplus of the EPC contractor employed to construct the facility is not known, an estimate of the overall corporate income tax value is not possible at this stage. Government earnings will be distributed by national government to cover public spending which includes amongst others the provision and maintenance of transport infrastructure, health, and education services as well as other public goods.

Nature: Temporary increase in government revenue		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**40 (Medium)**	**40 (Medium)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None suggested		
Residual Impacts: • None envisioned		

8.1.2 Negative impacts during construction

a) Negative changes to the sense of place

A community's sense of place is developed over time as it embraces the surrounding environment, becomes familiar with its physical properties, and creates its own history. The sense of place is created through the interaction of a number of different factors such as the areas visual resources, its aesthetics, climate, culture, and heritage as well as the lifestyle of individuals that live in and visit the area. Most importantly, it is a highly subjective matter and dependent on the demographics of the population that resides in the area and their perceptions regarding trade-offs.

For example, a community living in poverty is generally more likely to be accepting of industrial-type development that promises employment opportunities while a more affluent residential area is more likely to oppose such a development on the grounds that the development is not likely to generate gains for the community (Sinding, 2009).

The area proposed for the development as well as its surrounds does not currently have any large-scale industries or high-rise buildings. Noise and light intrusion during the night in the area is also very low. Given the above characteristics the area can be defined as being largely rural. Any rapid changes that alter the characteristics that define the area's sense of place could potentially have a negative impact to the local population's sense of place.

During the construction of the proposed wind energy facility there are likely to be noise and dust impacts caused by the movement of vehicles as well as construction activities on site. These impacts are anticipated to occur primarily during the day with illumination from the site being experienced during the night. The presence of this noise is likely to alter the way the surrounding environment is experienced by households in the area. As construction activities progress and the footprint of the facility grows, the visual impact will also become more apparent and the sense of place experienced by households residing within the visually affected area will be altered further.

It is anticipated that residents residing on the farms on which wind turbines are proposed to be established will experience the greatest disruption in their sense of place during the construction period. Individuals who live on the surrounding farms will, over the course of the construction phase of the project, be subjected to either visual or noise disruptions that are currently not present in the area.

The sense of place at the farms located adjacent to or beyond the site of the proposed wind energy facility will also be affected to some extent. The facility will be visible from several of these farms. The visual exposure on all these farms during the construction phase will not be continuous given the proximity of some of the farms from the proposed wind energy facility. Nevertheless, the knowledge of the facility near the farm and the fact

that it could be seen from some parts will still have a negative connotation and will alter the sense of place experienced by the households residing on these farms.

As stated, the sense of place of local residents is likely to begin to be altered once the construction of the proposed facility begins. Visual impacts will, however, remain for the entire operation of the development (This is discussed in more detail in Section 5.2.2). This means that although the effect on the sense of place could be relatively small considering the population to be affected, the duration of the impact increases it significantly. It is advisable that all efforts be made to address the factors that will affect individual's sense of place such as visual effects and noise pollution to make them less intrusive.

Nature: Impact on the sense of place experienced by the local community as a result of visual and noise effects that appear during the construction phase		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**48 (Medium)**	**40 (Medium)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • The mitigation measures proposed by the visual and noise specialists should be adhered to • Natural areas that are not affected by the footprint should remain as such. Efforts should also be made to avoid disturbing such sites during construction • Public relations (PR) campaign prior to commencement of construction to communicate to community members the construction programme, inclusive of regular updates to generate excitement in the community		
Residual Impacts: • Altered characteristics of the environment • Change in the perception of tourists of the local environment		

b) Negative impact on the local tourism, game industry and associated industries during construction

As construction begins at the proposed site, disturbances will likely be minimal. The presence of construction machinery, increased traffic to and from the site (transporting staff, equipment, and material) and staff on or near the site will likely be the largest disturbances. The longer construction continues, the greater the disturbances will likely be. As the towers of the wind turbines are erected there is likely to be an increased

disturbance as towers and turbines become increasing visible in the surrounding area. During this period, the full negative impact may be experienced by local tourism.

Once construction is completed the disturbances associated with the vehicular traffic, equipment and staff will be reduced and the remaining disturbance will be that of the wind farm itself. The examination of the wind farm impacts on tourism from literature have indicated that no lasting impacts to tourism are likely to occur. According to the literature review it was revealed that during pre-planning and planning, the negative impacts would be noticed the most, however, once operational, the impacts experienced during pre-planning and planning will most likely dissipate. This impact is further discussed under the operation phase impacts.

Nature: Impact on the local tourism and game farming industry that is expected during the construction phase as a result of noise and visual effects		
	Without mitigation	**With mitigation**
Extent	Site and surrounding area (2)	Site and surrounding area (2)
Duration	Medium term (3)	Medium term (3)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**36 (Medium)**	**27 (Low)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Mitigation proposed by the visual specialist should be implemented during the beginning of the construction period to screen off visual disturbances as soon into the development phase as feasible • The mitigation measures proposed by the noise specialists should be adhered to • Heavy vehicles travelling on secondary roads should adhere to low-speed limits to minimise noise and dust pollution • If feasible, no construction activities should be carried out during weekends and outside day time working hours • Create partnerships with local tourism and game farm industry to promote the development of green energy in the community and for these establishments to communicate to their guests the benefits of green energy		
Residual Impacts: • Visual impacts cannot be eliminated due to the height of the turbines and thus the local industry could still experience some losses after construction • Perceptions of international tourists regarding the area's representation as "Wild Africa" would change		

c) Temporary increase in social conflicts associated with the influx of people

Neither the Makana nor the surrounding municipalities are sufficiently diversified to supply the entire workforce for the construction of the proposed wind farm, particularly in terms of skilled positions. A significant number of the unskilled and semi-skilled workers required during the construction phase will however be sourced locally. It is estimated that up to 40% of jobs that will be created during the construction phase could be filled by labour coming from the local municipalities and the nearby communities located outside of its boundaries. Workers from outside the immediate area will therefore comprise up to 60% of the total work force. In addition, given the scale and extent of the development, the project is likely to attract job seekers from other parts of the country, particularly from within the Eastern Cape. This would be in addition to the migrant workers contracted to work on the project.

The migration of people to the area could result in social conflicts between the local population and the migrant work force as the local population could perceive these migrant workers as "stealing" their employment opportunities. Likewise, the influx of people into the area, could potentially lead to a temporary increase in the level of crime, illicit activity and possibly a deterioration of the health of the local community through the spread of infectious diseases. Semi-skilled and unskilled construction workers could also choose to remain in the area following the completion of the construction phase. Without any form of income these individuals run the risk of exacerbating the level of poverty within Makana.

Aside from the broader community issues the increase in the number of people in the area is likely to have an adverse effect on crime levels, incidents of trespassing, development of informal trading and littering. There is also potentially a likelihood of increased stock theft.

The influx of job seekers and the potential social conflicts that can arise with in-migration of temporary workers to an area is difficult to mitigate. Appropriate awareness campaigns and strict adherence to recruiting practices could, however, reduce the extent of the adverse effect.

Addressing the challenges related to potential social impacts is best done in partnership with all stakeholders in the area, specifically the affected and adjacent property owners, local communities, ward communities and municipalities. This would promote transparency; information sharing and help build good relationships between all affected parties. In addition, all opportunities that would include the community in the project should be explored and where possible implemented. Employment opportunities, including the provision of ancillary services, are particularly relevant in this incidence as the creation of employment opportunities for locals could eliminate the potential alienation between the community and the project as well as migrant workers.

The developer has indicated that staff accommodation (six hectares in extent) would be constructed to accommodate the staff who will be constructing the wind farm. Accommodation will allow the staff the remain separate from the broader community which may decrease social conflicts associated with the influx of the workers.

Nature: Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**36 (Medium)**	**18 (Low)**
Reversibility	Reversibility within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: • Set up a recruitment office in the nearby towns (i.e. Makhanda, Riebeek East, Somerset East) and adhere to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope of finding temporary employment • Employ locals as far as feasible through the creation of a local skills database • Establish a management forum comprising key stakeholders to monitor and identify potential problems that may arise due to the influx of job seekers to the area • Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed • Assign a dedicated person to deal with complaints and concerns of affected parties • The construction of on-site accommodation will likely mitigate some social conflicts from taking place. The developer should, however, organise appropriate transport for the workers from the site to the nearest towns in order to access services or to buy goods. This will reduce the amount of time the staff spend walking to or from the site.		
Residual Impacts: • Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

d) Impact on economic and social infrastructure

The proposed wind energy facility will create and estimated 480 FTE employment positions (460 South African based positions) for the duration of the project. Given that these workers will require services there is likely to be an increase in the demand for social services, access to water and electricity.

According to the Makana Local Municipality's IDP (2019) there are a number of clinics and hospitals situated throughout the municipal area. There is also a clinic situated in Riebeek

East. Given the proximity of the development site to Makhanda, it is most likely that the health facilities in the area will experience additional demand for medical services brought about by the influx of works and job seekers.

Access to water and electricity is not a significant concern in the area, although the supply of electricity is sometimes erratic. If a construction camp is established to accommodate workers there will be a need for additional water and electrical connections for both the camp as well as the site office. These connections will, however, be minimal and it is unlikely to alter the demand significantly.

The effects of the project on road infrastructure should also be considered as it is highly likely that the development will lead to an increase in traffic volumes on surrounding roads. This could lead to a significant deterioration of local road conditions, specifically the R350, R344 and R400 regional roads which are already in a poor state of repair. The deterioration of these roads could place additional financial burdens on the municipality through additional maintenance costs. Additional traffic volumes are also likely to impact the condition of secondary roads used to access surrounding farms. The deterioration of secondary roads could add additional operating costs to farmers in the area due to delays in deliveries and damage to vehicles.

Based on the above discussion it is expected that the basic service provision, health facilities and road infrastructure will be under additional strain during the construction period. Given that the project is anticipated to attract additional people to the area the significance of the impact is considered to be medium. These impacts can however be mitigated if the developer engages with the local municipalities and plans accordingly.

It is not expected that there will be significant impact on housing and accommodation as the developer has indicated that staff accommodation will be constructed to accommodate the workers for the duration of the construction phase of the project.

Nature: Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**36 (Medium)**	**21 (Low)**
Reversibility	Reversible within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

• Provide adequate signage along the R350, R400 & R344 to warn motorists of the construction activities taking place on the site • Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in migration of workers • Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility allocations
Residual Impacts: • Further eroding of economic infrastructure and social services in the region which may not be suited to a large number of people utilising them at one time.

e) Impact on property and land value in the immediately affected area during construction

The review of the property trends in section 7 suggests that despite the concerns surrounding property values that often arise before the construction of wind farm there is in fact very little impact on the property and land values post-construction. The review of international literature further corroborates the absence of direct linkages between wind farm development and property prices with various studies confirming that there is no long-term impact of wind farms on property values. From the above it can therefore be confidently stated that there will be no long-term negative impacts on prices of properties in Makana. However, isolated cases of property price drop particularly during the pre-construction phase cannot be ruled out altogether.

Some international studies did find that in individual cases, prices on properties could drop during the planning or pre-construction phase linked to the negative perceptions associated with wind farms by potential buyers. A decline in property prices, if it occurs, though, appears to be in these cases of temporary nature as research suggests that prices do recover once a wind farm is developed. The latter is associated with the notion that negative perceptions are generally higher during the pre-construction phase than when wind farms are in operation.

Therefore, from the above it can be alluded that property prices in selected instances could be negatively impacted – depending on the perceptions of the buyers with respect to wind farms and their willingness to use the presence of wind farms to negotiate costs down. Such cases, however, as indicated by international case studies, will be isolated and importantly will not be permanent. Once the wind farm is developed, the research suggests that property prices, if they were negatively affected by wind farms specifically, do recover.

Section 7 has illustrated that numerous factors contribute to the value and price of property and a single component such as a wind farm development cannot be assessed in isolation. Having said this, as indicated earlier in the report, the scenery has value and as was found by Hoen et al (2009, p. xii) "home buyers and sellers consider the scenic vista of a home when establishing the appropriate sales price". Therefore, it would be plausible

to assume that any impacts on the visual aesthetics of the landscape could have an impact on the value of the properties.

From the assessment of the impact of existing wind farms on properties, the evidence indicates that there does not appear to be a risk of a reduction of property prices in the rural and farm areas of the proposed site. As iterated earlier in the report through primary and secondary analysis, there is no empirical evidence that shows that wind farms affect property prices in areas of scenic beauty. And if any properties would be impacted, such an impact would be of a temporary nature until the wind farm is developed (if it is approved).

Lastly, some existing and potential property owners may often have unsubstantiated perceptions concerning the negative impact of renewable energy projects on property prices in general, which is why it is a frequent concern raised by the I&APs and as shown in international studies not only the case in South Africa but, globally. The information contained within section 7 indicates that such perceptions cannot be corroborated with any empirical evidence, therefore, it is important to dispel these as early as possible i.e. during planning stages of the project.

Nature: Impact on property and land values in the immediately affected area		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**24 (Low)**	**20 (Low)**
Reversibility	Reversible with decommissioning of the facility	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: • Meet with the affected owners and discuss their concerns over property and land values, as well as educate and inform them on the potential environmental impacts that could ensue • Mitigation measures suggested by the other specialists to be implemented		
Residual Impacts: • Perceptions associated with the effect of industrial type developments on aesthetics and landscape of the natural environment cannot be entirely eliminated following completion of construction, thus some potential buyers might still reserve themselves from buying a property in the area		

8.2 Operation Phase Impacts

The following section describes the impact that the proposed wind energy facility will have once it is operational. The facility is envisaged to have a lifespan of approximately 20 years which means that the impacts observed during this phase, regardless of whether the impacts are positive or negative, will be long-lasting.

8.2.1 Positive impacts during operations

a) Sustainable increase in production and GDP nationally and locally

The proposed facility will require an annual operational expenditure of R 28,5 million over 20 years. The total impact on production in the country as a result of the project's operations will equate to R 63,4 million per annum in 2020 prices for the 20 years. Aside from the utilities sector, industries that will experience the greatest stimulus from the project will include electrical machinery and apparatus, insurance, trade, transport service and chemical production industry.

It is estimated that the project will generate R 19,6 million of value add per year over the 20-year period (comprising gross operating surplus before taxes and labour) and taxes. Through indirect and induced effects, an additional R 7 million of GDP will be generated per annum, which means that the total impact of the project on the national GDP will equate to R 22,9 million per annum in 2020 prices. The production and consumption induced multiplier effects of the project are considered to be relatively small compared to conventional electricity generating industries. This is because the energy source used to produce electricity by the proposed wind energy facility is free, unlike conventional power stations where raw inputs (i.e. coal) and the transport therefore comprise a significant portion of operating expenditure. It is for this reason that such a facility is a highly attractive business venture.

The contribution to the Makana Municipality, although small relative to the combined size of the municipality's economy, will nevertheless be positive and more importantly, a sustainable contribution.

Nature: Sustainable increase in production and GDP nationally and locally		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**56 (Medium)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No

Can impacts be enhanced?	Yes (enhanced)	
Enhancement:		
• The operator of the wind energy facility should be encouraged to, as far as possible, procure materials, goods and products required for the operation and maintenance of the facility from local suppliers to increase the positive impact in the local economy		
Residual Impacts:		
• None foreseen at this stage		

b) Creation of sustainable employment positions nationally and locally

The proposed facility will create an estimated 25 permanent employment positions across the operation phase of the development which, will be retained for approximately 20 years. Of these, an estimated 22 will be South African based positions. It is envisaged that 63% of the skilled and low skilled staff will be employed from within the local area with the remaining staff being sourced from other parts of the Eastern Cape and the country. This means that approximately 6 out of 10 positions are expected to be filled by local labour, which is a small but, positive contribution towards addressing the high unemployment rates observed in both the Makana and the Eastern Cape.

Aside from the direct employment opportunities, the facility will support an estimated 22 FTE employment positions created through the production and consumption induced effects. Due to the spatial allocation of procurement spending and direct employment created, most of the indirect and induced positions will also be created within the local area. The trade, agriculture and community and personal services sectors will benefit the most from these new employment opportunities.

Nature: Creation of sustainable employment positions nationally and locally		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**56 (Medium)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement:		
• Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy • As far as possible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility		
Residual Impacts:		
• Experience in operating and maintaining a wind energy facility		

c) Skills development of permanently employed workers

South Africa has a number of large-scale wind energy facilities with a large proportion located in the Eastern Cape, and thus the skills base to operate and maintain such facilities should be readily available. It is, however, likely that highly skilled personnel would need to be recruited from outside of the Makana Municipality as the economy would not be diversified enough to attract such specialists. These employees would include skilled "mechatronics" engineers (specialised in both electrical and mechanical engineering) likely to be recruited from the Nelson Mandela Bay Metro. Maintenance will be carried out throughout the lifetime of the turbines. A maintenance schedule usually involves an initial inspection after commissioning, semi-annual inspection, an annual inspection and two- and five-year inspections but this varies according to the turbine. Typical activities during maintenance include changing of oil, replacement of brake linings and cleaning of components.

Nature: Skills development of permanently employed workers		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Definite (5)
Significance	**44 (Medium)**	**55 (Medium)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • The developer should consider establishing vocational training programmes for the local labour force to promote the development of skills required by the wind energy facility and thus provide for the opportunities for these people to be employed in other similar facilities elsewhere in the future		
Residual Impacts: • Human capital development of the affected workers		

d) Improved standards of living for benefiting households

The creation of an estimated 22 FTE employment positions throughout the country will generate R 26,6 million of personal income (2020 prices), which will be sustained for the entire duration of the project's lifespan. Given the average household size in affected local municipalities and nationally, this increase in household earnings will support up to 86 people. The sustainable income generated as a result of the project's operation will positively affect the standard of living of all benefitting households. This is specifically applicable to the Makana Municipality, as the average income per employee at the facility would far exceed the average household income within these municipalities.

Nature: Improved standard of living for benefitting households		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (5)	Moderate (6)
Probability	Probable (4)	Probable (4)
Significance	**48 (Medium)**	**52 (Medium)**
Reversibility	Benefits are sustainable only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy • As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility		
Residual Impacts: • None foreseen at this stage		

e) Sustainable increase in national and local government revenue

The proposed facility will, through property taxes and salaries and wages payments, contribute towards both local and national government revenue.

At a local level, the project will contribute to local government through payments for utilities used in the operation of the facility. It will also increase its revenue through an increase in property taxes compared to the current level.

Given that the Makana Municipality has a relatively small economy and considering the low rates base derived by the municipality (Makana, 2019), any additional income would greatly benefit the municipality.

On a national level, the revenue derived by the project during its operations, as well as the payment of salaries and wages to permanent employees will contribute to the national fiscus. Although it is impossible to trace exactly how such revenue is allocated, any additional revenue generated means that national governments can increase its spending on public goods and services.

Nature: Sustainable increase in national and local government revenue		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)

Significance	**48 (Medium)**	**48 (Medium)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None suggested		
Residual Impacts: • None foreseen at this stage		

f) Local economic and social development benefits derived from the project's operations

The proposed Fronteer Wind Farm will make a notable contribution to poverty and social and community development in the area. The developer has pledged that 2.5% of the gross annual revenue will be dedicated to socio-economic and economic development initiatives for the duration of operation of the wind farm. Thus, this revenue share of the project can subsequently be utilised for local social and economic development projects.

Since the community has not yet been selected, it is not possible to quantify the number of households that will be direct beneficiaries of the project at this stage.

Furthermore, the social and economic development plan will prioritise numerous local welfare projects and community development initiatives that will be directed at uplifting local people and improving their standards of living. At this stage it is unknown how much the proposed development will contribute towards local economic development but, it is envisioned that the revenue generated for local economic development will be significant and assist in uplifting the local communities.

Nature: Local community and social development benefits derived from the project's operations		
	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**52 (Medium)**	**65 (High)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	Yes (enhanced)	
Enhancement: • A social development and economic development programme should be devised by the developer and implemented throughout the project's lifespan		

• The plan should be developed in consultation with local authorities and local communities to identify community projects that would result in the greatest social benefits • These plans should be reviewed on an annual basis and, where necessary, updated • When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises • In devising the programmes to be implemented, the developer should take into account the local Integrated Development Plans (Makana, 2019)
Residual Impacts: • None foreseen at this stage

g) Sustainable rental revenue for farms where the wind farm is located

It is anticipated that farms where the wind turbines are located on will enter into a rental agreement with the developer. The owners will likely thus receive rental revenue as a result of hosting the turbines on their property. The revenue that the owners of the properties receive will have a positive impact on the local economies especially if spent in the local area. This revenue is also likely to assist local property owners in dealing with economic shocks to their current business activities such as drought or unfavourable economic conditions that currently prevail. The revenue generated from the rental of land for the turbines will additionally assist farmers in investing in new technologies to improve the efficiencies of their current agricultural practices and allow farmers to better compete in the open market. While these impacts are notably only for those farms who have turbines located on their properties, the impact of additional revenue is likely to be very significant to those impacted.

Nature: Sustainable rental revenue for farms where the wind farm is located		
	Without enhancement	**With enhancement**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**35 (Medium)**	**35 (Medium)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None suggested		
Residual Impacts: • None foreseen at this stage		

h) Sustainable increase in electricity available for the local region and South Africa

The development of the wind farm will lead to a sustainable increase in the supply of electricity for the country. It was noted in section 3 that lack of electricity and load

shedding has had a notable impact on the economy of the country and is one of the reasons stated by foreign investors for the lack of investment in the country. With an improved supply of power to industry, there is likely to be an improvement in the economy as a whole.

It should be noted that while this wind farm alone is unlikely to make a large impact in the shortages of electricity in the country, the cumulative impact of all the proposed wind energy products in the region will be substantial. The combined energy production for the wind farms planned for the area will be approximately 2 007 MW which begins to reflect a notable positive injection into the energy generation capacity from the region.

Nature: Sustainable increase in electricity available for South African industry		
	Without enhancement	**With enhancement**
Extent	National (4)	National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Definite (5)	Definite (5)
Significance	**50 (Medium)**	**50 (Medium)**
Reversibility	Benefits during projects lifespan only	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None suggested		
Residual Impacts: • None foreseen at this stage		

8.2.2 Negative impacts during operations

a) Negative changes to the sense of place

The effects on the community's sense of place will initially be felt during the construction period and will continue into the operation phase. The assessment of the negative change in the sense of place that was examined in the construction phase will likely be in place during the operation phase due to the long-term duration of the development.

Nature: Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**56 (Medium)**	**48 (Medium)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • Mitigation measures suggested during construction should be adhered to		
Residual Impacts: • Altered characteristics of the environment • Change in the perception of tourists of the local environment		

b) Negative impact on local tourism, game farming and associated industries

The broader region of Makana is well distinguished as a tourism area. The proposed wind farm will be located in the area where natural landscape and aesthetics are highly valued by both residents and visitors to the area.

As per the discussion in section 6, the potential negative effects on the local tourism and game farming industry are expected to be created during the construction phase of the development. Such negative impacts are expected to ensue as a result of noise and most importantly visual disturbance, which will alter the natural and cultural landscape features of the environment and subsequently the experience of visitors to local tourism destinations and game farms. The full extent of the negative impact will, however, most probably be achieved during the operation phase of the project when the word about the proximity of the project to local game farms spread amongst potential tourists and repeat visitors and when the turbines are fully operational and visible.

As indicated earlier, the negative effects of wind farms on tourists' interest to visit the area have not been confirmed. However, based on the initial analysis of surrounding product owners, the effect of the existing Waainek Wind Farm did not impact the number of tourists visiting the area after its construction. The primary concern amongst residents was that of an ailing economy, crime and poor infrastructure.

While it is noted that there is low probability of any negative impacts occurring, there is a possibility that the development of the proposed wind farm may decrease the number of visitors to the region.

Additionally, the impact could be reversed once the wind farm's operational life cycle expires and it is decommissioned.

Nature: Impact on the local tourism, game farming and associated activities due to the altered visual and aesthetic environment experienced during the operation phase		
	Without mitigation	**With mitigation**
Extent	Site & immediate surrounding area (2)	Site & immediate surrounding area (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**30 (Medium)**	**16 (Low)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: • The mitigation measures proposed by the visual specialist should be adhered to • The mitigation measures proposed by the noise specialist should be adhered to • Socio-economic development commitments to further eco-tourism and conservation in the region		
Residual Impacts: • Visual impacts cannot be entirely eliminated; thus, the local industry could still experience some losses		

8.3 Decommissioning Phase Impacts

Upon the expiry of the Fronteer Wind Farm lifespan, the facility would need to be disbanded, although the facility would likely be upgraded in order to maintain and prolong the lifespan of the facility.

If the facility is decommissioned, the land will be rehabilitated in order to return it to pre-project conditions. This also means that all impacts whether positive or negative, which take place during the operation phase will cease to exist. At the same time spending on the disassembly of the components and rehabilitation of land will increase the demand for

construction services and other industries, thus stimulating economic activity in the local area, albeit over a temporary period.

Socio-economic impacts stimulated during the decommissioning phase are expected to be similar to those that took place during the construction phase. They will also be temporary in nature, but most likely will take a much shorter time than the construction phase. They will also be associated with some expenditure, although it will be considerably less than the investment required during the development phase. Besides the positive impacts on production, short-term employment, household income and government revenue that could ensue from the project, some negative impacts could also occur. These would largely be related to a slight increase in noise in the area surrounding the site, increase in traffic congestion on the R350 & R400 and concerns over local safety and security due to a greater number of people accessing the area. In addition, a small number of permanent staff that had been involved in maintenance could potentially be laid off.

All of the positive impacts can be enhanced to increase the benefits to the local communities, while the negative impacts could be mitigated. The impacts though are expected to be of low significance due to the very short duration and, therefore, of lower magnitude. Enhancement and mitigation measures proposed for the construction phase impacts would also apply to the decommissioning phase. Overall, the impact that would ensue during the decommissioning phase will mostly be of low significance and should not affect the decision regarding the proposed development.

8.4 Cumulative Impacts

The proposed development of Fronteer Wind Farm cannot be considered in isolation. Cumulative impacts from other developments in the region need to be taken into consideration. The developments considered as part of this assessment include:

- Wind Garden Wind Farm - Makana
- Hamlett Wind Farm - Blue Crane Route
- Rippon Wind Farm - Blue Crane Route
- Redding Wind Farm - Blue Crane Route
- Aeolus Wind Farm - Blue Crane Route
- Solaris Fields PV - Blue Crane Route
- Sun Garden PV - Blue Crane Route

8.4.1 Positive cumulative impacts during construction

a) Temporary stimulation of the national and local economy

As stated above, several wind farms and PV sites are proposed to be built in the region. It is highly likely that if the projects are approved by government the demand for goods and services required for the construction of similar facilities would grow especially if they were

constructed simultaneously. This could provide sufficient economies of scale and thus open opportunities for the establishment of new industries in the country and new businesses in the local area, specifically in the sectors that are not well represented in the economy. This would have a significant positive impact on the regional economies and a notable impact on the national economy.

Nature: Temporary increase in the GDP and production of the national and local economies during construction		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**60 (High)**	**64 (High)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond enhancement at an individual project level		
Residual Impacts: • None foreseen at this stage		

b) <u>Temporary increase employment in the national and local economies</u>

With the number of wind farms and PV sites that are proposed for the region, it is highly likely that if the projects are approved by authorities the number of people employed from the local area would be significant. It would likely result in a significant temporary reduction in the unemployment rate in the area and increase the number of employed in the area during the construction phase of the development. This would be particularly significant if all proposed developments were constructed simultaneously.

Nature: Temporary increase employment in the national and local economies		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Very High (9)	Very High (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	**56 (Medium)**	**60 (High)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	

Enhancement: • None beyond enhancement at an individual project level
Residual Impacts: • None foreseen at this stage

c) Contribution to skills development in the country and local economy

The potential construction of numerous renewable energy projects will have a notable impact on the skills development in the region especially in the field of renewable energy. This will have a positive impact on an area that has notably been lacking skills development and employment opportunities.

Nature: Temporary increase employment in the national and local economies		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)
Probability	Highly Probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**60 (High)**
Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond enhancement at an individual project level		
Residual Impacts: • South Africa's human capital development • Improved labour productivity and employability of construction workers for similar projects		

d) Temporary increase in household earnings

The living standards in the region will likely increase for the affected households as earnings increase in the region. If construction of all proposed projects occurs simultaneously then it is likely that the cumulative impact will be notable for the region. The injection of earnings at a household level will have induced and indirect impacts on the local and regional economy as spending increases.

Nature: Temporary improvement of the standard of living of the positively affected households		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	High (8)	Very High (9)

Probability	Highly Probable (4)	Highly probable (4)
Significance	**52 (Medium)**	**60 (High)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond enhancement at an individual project level		
Residual Impacts: • Possible increase of households' saving accounts • Improved standard of living of the affected households		

e) Temporary increase in government revenue

The development of the proposed projects will likely increase government revenue through VAT, companies' tax, PAYE and income tax and property taxes. The impact of increased revenues for the local economies will be notable. At a national level this will result in lower government debt and servicing costs as revenue increases.

Nature: Temporary improvement of the standard of living of the positively affected households		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**40 (Medium)**	**48 (Medium)**
Reversibility	Benefit is terminated with the end of construction	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond enhancement at an individual project level		
Residual Impacts: • None envisaged		

8.4.2 Negative cumulative impacts during construction

a) Negative changes to the sense of place

The development of the proposed renewable energy facilities may have a notable impact on the change to the sense of place of the area. The area is currently perceived by residents and visitors as rural and "wild". This perception may change with the construction of the proposed renewable energy structures. This could be particularly evident if construction occurs simultaneously.

Nature: Impact on the sense of place experienced by the local community as a result of visual and noise effects that appear during the construction phase		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Short term (2)	Medium-term (3)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**40 (Medium)**	**56 (Medium)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: • None beyond mitigation at an individual project level		
Residual Impacts: • Altered characteristics of the environment • Change in the perception of tourists of the local environment		

b) Negative impact on the local tourism, game industry and associated industries during construction

As previously stated, it is unlikely that the area will experience a notable loss of visitors to the area from the development of Fronteer Wind Farm but, there may be a small reduction of visitors during construction owing to the perceptions associated with wind turbines in areas of natural beauty. A similar phenomenon may be experienced during construction of the other renewable energy facilities. As per international literature, this will only be a short-term or temporary effect and will not persist during operation of the wind farms.

Nature: Impact on the local tourism and game farming industry that is expected during the construction phase as a result of noise and visual effects		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site and surrounding area (2)	Regional (3)
Duration	Medium term (3)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**27 (Low)**	**30 (Medium)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Mitigation: • None beyond mitigation at an individual project level
Residual Impacts: • Visual impacts cannot be eliminated due to the height of the turbines and thus the local industry could still experience some losses after construction • Perceptions of international tourists regarding the area's representation as "Wild Africa" would change due to the development as well as similar developments proposed for other parts of the Makana Local Municipality

c) Temporary increase in social conflicts associated with the influx of people

The number of projects planned for the area may entice job seekers from outside the region to move to the area in search of employment. The increase in job seekers to an area with already low levels of employment may lead to increased conflicts in the area. Such conflicts will need to be managed by engaging the communities, local authorities and local labour unions. Managing expectations of the community is important to avoiding such conflicts at a project-by-project level.

The simultaneous construction of all the planned projects in the region will drastically increase the number of workers present in the area. This will be mitigated somewhat by the presence of staff accommodation for those developments but the presence of additional workers in the area may be a cause for conflict for local community members. It is thus vitally important that local community members are employed for the development of projects in the region.

Nature: Temporary increase in social conflicts associated with the influx of construction workers and job seekers to the area		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**18 (Low)**	**30 (Medium)**
Reversibility	Reversibility within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: • None beyond mitigation at an individual project level		
Residual Impacts: • Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

d) Impact on economic and social infrastructure

The number of projects planned for the area will increase the number of workers and job seekers in the area. This may drastically increase pressure on economic infrastructure and social services for the area. Despite the provision of accommodation, the additional staff may cause strain on the already delicate social and economic infrastructure in the area. It is thus important to employ local community members to reduce the influx of people to the area. This should be managed at a project-by-project level.

Nature: Added pressure on economic and social infrastructure during construction as a result of increase in local traffic and in migration of construction workers		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**21 (Low)**	**30 (Medium)**
Reversibility	Reversible within a short period	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mititgation: • None beyond mitigation at an individual project level		
Residual Impacts: • Contribution towards social conflicts in the area by construction workers and job seekers who decide to stay in the area after construction is complete and who are unable to find a sustainable income		

8.4.3 Positive cumulative impacts during operations

a) Sustainable increase in production and GDP nationally and locally

If other renewable energy facilities that have been proposed are approved in the Eastern Cape, together with the Fronteer Wind Farm project, sufficient economies of scale could be created to establish new businesses in the local economies. These businesses could then supply the goods and services required for the operation and maintenance of the facility that cannot currently be procured in the area. This would contribute to the local economies' growth and development. Additional impacts would be the improved energy supply in the country as well as the reduced carbon emissions in generation of electricity.

Nature: Sustainable increase in production and GDP nationally and locally		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**56 (Medium)**	**64 (High)**

Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

b) Creation of sustainable employment positions nationally and locally

The development of the proposed projects will create a notable number of sustainable employment positions for the region. The development of the Fronteer Wind Farm will create 22 direct employment positions alone. The development of other renewable projects will be notable in the region as they will likely create a similar number of sustainable positions for the duration of the operation of the facilities.

Nature: Creation of sustainable employment positions nationally and locally		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**56 (Medium)**	**64 (High)**
Reversibility	Benefits are sustained only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

c) Skills development of permanently employed workers

As per the 8.4.1 (c) above, the development of the proposed projects are likely to further develop the skills of those employed by the renewable energy projects in the region. This will further increase the skills base in the area.

Nature: Skills development of permanently employed workers		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**55 (Medium)**	**65 (High)**

Reversibility	No	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

d) Improved standards of living for benefiting households

Those workers who are employed by the renewable energy facilities are likely to experience improved standards of living. This will be fairly notable in the region which has low levels employment, high levels of poverty and limited access to resources. It is likely that the development of the proposed renewable energy facilities will support between 3,8 and 3,9 members per household.

Nature: Improved standard of living for benefitting households		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (4)	Probable (4)
Significance	**52 (Medium)**	**60 (High)**
Reversibility	Benefits are sustainable only over project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

e) Local economic and social development benefits

The benefits of the economic and socio-economic development initiatives that are to be developed as a result of the establishment and operation of the renewable energy facilities will be very notable in the region. The cumulative financial resources provided by the renewable energy projects will assist in reducing the levels of poverty in the MakhanaLocal Municipality and surrounds as a result of multiple socio-economic development projects that would be run concurrently in the area. This will lead to improved standards of living for the members of the community that benefit from these programmes.

Additionally, it is possible that improvements in access to services will be felt by the local communities such as access to healthcare and municipal services. Local infrastructure will also be improved through the social and economic programmes planned which will be a benefit to the local economy and community.

Finally, local SMEs and organisations will greatly benefit for the economic support provided by the established socio-economic and economic development plans.

Nature: Local economic and social development benefits		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	High (8)
Probability	Definite (5)	Definite (5)
Significance	**65 (High)**	**75 (High)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

f) Sustainable rental revenue for farms where wind farms are located

As with the development of the Fronteer Wind Farm, there will likely be increased household incomes for households who have renewable energy infrastructure situated on their properties. This increased infrastructure may potentially lead to improved buying power in the local economy and an ability to improve their current farming practices. This in itself will lead to increase in employment on the participating properties and may further increase the employment rate in the area.

Nature: Sustainable rental revenue for farms where wind farms are located		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site (1)	Local (2)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**35 (Medium)**	**50 (Medium)**
Reversibility	Benefits could stretch beyond project's lifespan	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

g) Sustainable increase in electricity available for the local region and South Africa

While the development of a single wind farm is unlikely to dramatically improve the levels of electricity provision in the country, the development of the proposed renewable energy projects will provide a notable injection of electricity supply to a system that is under significant pressure. The increased levels of electricity provision throughout the country will be welcomed by industry as well as the wider society and will be a boom to an economy under stress.

Nature: Sustainable increase in national and local government revenue		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	National (4)	National (4)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**50 (Medium)**	**60 (High)**
Reversibility	Benefits during projects lifespan only	
Status (positive or negative)	Positive	Positive
Irreplaceable loss of resources?	No	No
Can impacts be enhanced?	No	
Enhancement: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

8.4.4 Negative cumulative impacts during operations

a) Negative changes to the sense of place

The effects on the community's sense of place will initially be felt during the construction period and will continue into the operation phase of the various renewable energy facilities. This change in sense of place may be fairly notable in an area that has limited development in terms of pre-existing renewable energy facilities. There may be an overall change in perception of the area due to the presence of other wind farms in the surrounding area and may distress members of the community.

Nature: Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase of the renewable energy facilities		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)

Significance	**48 (Medium)**	**52 (Medium)**
Reversibility	Possible to reverse but only with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

b) Negative impact on local tourism, game farming and associated industries

The broader region of Makana is well distinguished as a tourism area. The proposed developments will be located in the area where natural landscape and aesthetics are highly valued by both residents and visitors to the area. Such developments may change the perception of the area as "Wild Africa" for visitors. The impact probability will likely be low as international literature has indicated that development of wind farms in areas of tourism has had limited impacts on tourism in their respective regions. In some cases, it has been welcomed by tourists who see the benefit of green energy while a limited number of tourists have noted the intrusion caused by wind farms. The majority of tourists however are not impacted by the presence of wind farms in an area.

Nature: Impact on the sense of place experienced by the local community as a result of visual effects that appear during the operation phase		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Site & immediate surrounding area (2)	Regional (3)
Duration	Long term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**16 (Low)**	**22 (Low)**
Reversibility	Possible to reverse with decommissioning	
Status (positive or negative)	Negative	Negative
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation: • None beyond mitigation at an individual project level		
Residual Impacts: • None foreseen at this stage		

8.5 Net Effect and Trade-Off Analysis

The review of the proposed Fronteer Wind Farm is associated with both positive and negative socio-economic impacts. In order to assess whether the project is beneficial, the additions to the environment brought about by the project need to be evaluated. The additional benefits of the intervention are the difference between the reference case

position (i.e. the no-go option) and the position if the intervention is implemented. It involves the evaluation of the net effect and trade-offs associated with the proposed intervention.

The table below provides a summary of the socio-economic gains and losses that are expected to ensue from the project during the different phases (i.e. construction, operation, decommissioning). Where gains and losses are quantifiable, figures have been included into the table in order to illustrate the total gain or loss during a particular phase. Where it was possible, local impacts were also quantified. These included direct as well as production and consumption induced impacts that could ensue from the direct effects.

Table 8.1: Summary of socio-economic gains and losses during construction and operation

Impact	Nature of Impact	Before Mitigation	After Mitigation
CONSTRUCTION PHASE			
Temporary stimulation of the national and local economy	Positive	Medium - positive	High - positive
Temporary increase employment in the national and local economies	Positive	Medium - positive	Medium - positive
Contribution to skills development in the country and local economy	Positive	Medium - positive	Medium - positive
Temporary increase in household earnings	Positive	Medium - positive	Medium - positive
Temporary increase in government revenue	Positive	Medium - positive	Medium - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative
Negative impact on the local tourism and local agriculture	Negative	Medium - negative	Low - negative
Temporary increase in social conflicts associated with the influx of people	Negative	Medium - negative	Low - negative
Impact on economic and social infrastructure	Negative	Medium - negative	Low - negative
Impact on property and land value in the immediately affected area	Negative	Low - negative	Low - negative
OPERATIONAL PHASE			
Sustainable increase in production and GDP nationally and locally	Positive	Medium - positive	Medium - positive
Creation of sustainable employment positions nationally and locally	Positive	Medium - positive	Medium - positive
Skills development of permanently employed workers	Positive	Medium - positive	Medium - positive
Improved standards of living for benefiting household	Positive	Medium - positive	Medium - positive
Sustainable increase in national and local government revenue	Positive	Medium - positive	Medium - positive
Local economic and social development benefits derived from the project's operations	Positive	Medium - positive	High - positive
Sustainable rental revenue for farms where wind farms are located	Positive	Medium - positive	Medium - positive
Provision of electricity for future development	Positive	Medium - positive	Medium - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative

Negative impact on the local tourism	Negative	Medium - negative	Low - negative

The following can be concluded from the data presented in table above:

- *During construction:* The comparison of gains and losses associated with the project during the construction phase indicates that gains related to production, employment, skills development, government revenue and household income far outweigh the expected losses with regard to the same indicators. This shows that from a pure economic perspective the project's construction would be highly beneficial to the national economy and specifically the local economy which is affected by a relatively high unemployment level. The project will, however, bring some form of disruption in the lives of the local communities and will put additional pressure on the local economic and social infrastructure. Furthermore, there is a very low probability that the property values of nearby farms could be affected although evidence at a national and international level indicate this is highly unlikely. The main trade-off during the construction phase would therefore be between the economic net benefits that would accrue in the national and local economies and the socio-economic negative impacts experienced by the local communities. The positive net effect on the economy though is deemed to be significantly greater than the negative net effects that can ensue from the project.

- *During operations:* The project is associated with a notably greater set of positive net impacts than negative net impacts. It is also evident that when considering the nation-wide effects of the project on production, employment, income, and government revenue it is associated with greater potential gains than losses. Locally, the project is also associated with greater positive economic gains than losses, especially in respect of community benefits, employment and household income. Net negative impacts that can ensue from the project are expected to relate to the loss of sense of place. This impact will be caused by changes in aesthetics and visual resources of the environment and can be mitigated although not entirely eliminated. Nevertheless, the positive net effects are expected to outweigh the net negative impacts.

- *During decommissioning:* The impacts that can occur during decommissioning would be similar to those observed during the construction phase. These impacts would however be experienced over a much shorter period and would be associated with significantly lower gains. Some impacts on the local infrastructure and the lives of the communities in the area could take place, however, they will also be short lived. Overall, the trade-offs between positive and negative impacts would be small.

Table 8.2: Summary of cumulative socio-economic gains and losses during construction and operation

Impact	Nature of Impact	Proposed Project	Cumulative Impact

		Impact in Isolation	
CONSTRUCTION PHASE			
Temporary stimulation of the national and local economy	Positive	High - positive	High - positive
Temporary increase employment in the national and local economies	Positive	Medium - positive	High - positive
Contribution to skills development in the country and local economy	Positive	Medium - positive	High - positive
Temporary increase in household earnings	Positive	Medium - positive	High - positive
Temporary increase in government revenue	Positive	Medium - positive	Medium - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative
Negative impact on the local tourism and local agriculture	Negative	Low - negative	Medium - negative
Temporary increase in social conflicts associated with the influx of people	Negative	Low - negative	Medium - negative
Impact on economic and social infrastructure	Negative	Low - negative	Medium - negative
OPERATION PHASE			
Sustainable increase in production and GDP nationally and locally	Positive	Medium - positive	High - positive
Creation of sustainable employment positions nationally and locally	Positive	Medium - positive	High - positive
Skills development of permanently employed workers	Positive	Medium - positive	High - positive
Improved standards of living for benefiting household	Positive	Medium - positive	High - positive
Local economic and social development benefits derived from the project's operations	Positive	High - positive	High - positive
Sustainable rental revenue for farms where wind farms are located	Positive	Medium - positive	Medium - positive
Provision of electricity for future development	Positive	Medium - positive	High - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative
Negative impact on the local tourism	Negative	Low - negative	Low - negative

- *Cumulative impacts:* The table above indicates that many of the positive impacts will increase with the development of other renewable energy projects. Employment, income and skills development would drastically improve as the region will host a number of wind farms. If mitigated at a project level, many of the negative impacts can be managed and will not pose:

    - an unacceptable risk,
    - an unacceptable loss,
    - a complete change to the environment
    - an unacceptable increase in impact

    Cumulatively, the positive impacts will greatly outweigh the negative impacts.

The review of the net effects of the project and the trade-offs between positive and negative impacts suggest that positive effects and impacts would outweigh the negative

effects. This is largely due to the fact that the project is expected to have a positive net impact on economic development, employment, household earnings, government revenue and skills development in the country and most importantly in the local community that experiences a high unemployment rate as well as a small economic base. The negative impacts that are expected to occur as a result of the project will be far more localised and would affect a significantly smaller number of people and households than in the case of the net benefits that would be derived by the project.

9. KEY FINDINGS AND RECOMMENDATIONS

This report contains the analysis of the socio-economic impact assessment for the proposed Fronteer Wind Farm. The facility is proposed to be established on several farms within the vicinity of near Makhanda in the Eastern Cape. The facility is proposed to have approximately 38 turbines with the facility generating up to 213 MW of electricity. Once construction is completed the facility is anticipated to have an operational lifespan of 20 years.

The purpose of the socio-economic impact assessment is to determine, and where possible, quantify the potential socio-economic impacts that can result from the proposed project. It compares various alternatives and, based on these, provides recommendation in respect of the most beneficial option. The study made use of the economic modelling technique based on the Social Accounting Matrix to quantify the potential positive and negative impacts of the project where feasible and applicable.

The following section outlines the key findings of the study and provides recommendations on the way forward.

9.1 Policy Review and Baseline Assessment

The study includes an analysis of various strategic polices and documents, as well as the socio-economic characteristic of the study area to understand the context within which the proposed facility is to be established.

The review of the policy environment covered national, provincial, and municipal strategic documents. The review of national strategic documents suggested that the utilisation of renewable energy sources in the country is considered to be an integral means of reducing the carbon footprint of South Africa, diversifying the national economy, and reducing poverty. This means that any project that would contribute towards achieving the above-mentioned objectives could be considered to be strategically important. The review of the provincial and municipal strategic documents indicated that renewable energy projects are considered a priority as highlighted in both the Eastern Cape Provincial Industrial Development Strategy as well as the provincial Sustainable Energy Strategy. The tourism industry is defined as a key intervention area at both a provincial and local level and it is important to ensure that projects developed in the area do not jeopardise the growth of this industry.

It can thus be concluded that the policy reviewed supports the proposed development form a planning perspective as it will contribute to the development of the economic and social environment of the region.

The review of the local municipality's socio-economic characteristics revealed that the Makana Municipality economy is relatively small and dependant on the trade, general government, and community services.

In 2018, Makana had a population of approximately 86 682 as well as population growth trends that suggest out-migration. This figure is also indicative of an area with low employment absorption capacity and a small economic base. The average household income for the area was R 12 406 per month – which was 13% higher than the district figure. There is also a high unemployment rate (29%) and a relatively poor labour participation rate (58%). All of these figures suggest that households in the Makana Local Municipality have a relatively low standard of living and are worse off, on average, than households in other parts of the district and province.

9.2 Impacts Associated with the Wind Energy Facility

The proposed wind energy facility will generate both positive and negative impacts starting from the construction period and ending with the decommissioning phase. The following paragraphs and tables summarise the key socio-economic impacts that were identified to have the potential to occur during the different phases.

9.2.1 Impacts during construction

During the construction phase, the proposed Fronteer Wind Farm will have both positive and negative effects on the socio-economic environment.

The project is anticipated to make a prominent contribution towards the national and local economy. It is estimated that a total of R 11,9 billion of new business sales, R 2,3 billion of GDP and 1 367 FTE employment positions will be generated by the project in the national economy through multiplier effects. Aside from the above positive effects, the project will contribute to skills development in the country, specifically as far as construction of the wind facility is concerned as well as increasing household earnings. The increase in household earnings is also likely to improve the standards of living of the affected households albeit temporarily.

Aside from the positive impacts though, the project will be creating negative direct, secondary and cumulative impacts on the local communities, specifically areas surrounding the site where the proposed facility is to be built. The main factors that will cause this negative impact are (1) the influx of workers and job seekers from outside of the local community and (2) visual and noise disturbances that would be created by the construction activities as the footprint of the facility grows.

Potential negative impacts can be mitigated, although some more successfully than others. Visual impacts though cannot be eliminated although it is possible to reduce their

significance. The summary of the significant socio-economic impacts during construction is provided in Table 6.1.

Table 9.1: Summary of construction phase impacts resulting from the facility

Impact	Nature of Impact	Before Mitigation	After Mitigation
CONSTRUCTION PHASE			
Temporary stimulation of the national and local economy	Positive	Medium - positive	High - positive
Temporary increase employment in the national and local economies	Positive	Medium - positive	Medium - positive
Contribution to skills development in the country and local economy	Positive	Medium - positive	Medium - positive
Temporary increase in household earnings	Positive	Medium - positive	Medium - positive
Temporary increase in government revenue	Positive	Medium - positive	Medium - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative
Negative impact on the local tourism and local agriculture	Negative	Medium - negative	Low - negative
Temporary increase in social conflicts associated with the influx of people	Negative	Medium - negative	Low - negative
Impact on economic and social infrastructure	Negative	Medium - negative	Low - negative
Impact on property and land value in the immediately affected area	Negative	Low - negative	Low - negative

9.2.2 Impacts during operations

During the operation of the wind energy facility the socio-economic impacts are likely to last longer when compared to those observed during the construction phase. This is the case for both positive and negative effects.

The operation of the proposed wind energy facility will generate R 63,4 million of new business sales, contribute R 22,9 million to GDP and create 22 sustainable FTE employment positions. Funds from the developer (2,5% of annual revenue) will be set aside for social and economic development programmes. These funds will be allocated towards economic development in the area and are expected to bring a significant benefit to local communities.

Negative impacts include the potential loss of sense of place and potential loss of income from tourist-based organisations. These potential losses may, however, not occur as indicated in the international literature review and local property market examination.

As in the case with the impacts observed during construction, negative effects can be mitigated, and positive impacts enhanced. Mitigation of the negative impacts though will not result in their complete elimination as visual disturbance of the nature inherent to the project are difficult to eradicate entirely. Nevertheless, the significance ratings of the negative impacts are expected to be somewhat reduced.

Table 9.2: Summary of operational phase impacts resulting from the facility

Impact	Nature of Impact	Before Mitigation	After Mitigation
OPERATION PHASE			
Sustainable increase in production and GDP nationally and locally	Positive	Medium - positive	Medium - positive
Creation of sustainable employment positions nationally and locally	Positive	Medium - positive	Medium - positive
Skills development of permanently employed workers	Positive	Medium - positive	Medium - positive
Improved standards of living for benefiting household	Positive	Medium - positive	Medium - positive
Sustainable increase in national and local government revenue	Positive	Medium - positive	Medium - positive
Local economic and social development benefits derived from the project's operations	Positive	Medium - positive	High - positive
Sustainable rental revenue for farms where wind farms are located	Positive	Medium - positive	Medium - positive
Provision of electricity for future development	Positive	Medium - positive	Medium - positive
Negative changes to the sense of place	Negative	Medium - negative	Medium - negative
Negative impact on the local tourism	Negative	Medium - negative	Low - negative

9.2.3 Impacts during decommissioning

Socio-economic impacts stimulated during the decommission phase are expected to be similar to those that take place during the construction phase. The impacts though are expected to be of low significance due to the very short duration therefore and lower magnitude. Enhancement and mitigation measures proposed for the construction phase impacts would also apply to the decommissioning phase.

9.2.4 Net effect and trade off analysis

The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operation phases than the potential losses that could occur as a result of its establishment. Stimulation of production, employment, government revenue, skills development and household income as a result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could be experienced by local businesses affected by changes in the areas aesthetic and visual resources. It should be noted though that the positive and negative impacts will be distributed mostly amongst different receptors but, will not result in inequality. Adherence to the proposed mitigation measures, however, would ensure that the offset of impacts is more balanced and that it also takes into account communities and businesses that will be negatively affected.

The positive effects generated by the project will not offset many of the negative impacts. These include impacts on the sense of place and property and business values that could occur during both construction and operation, the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings. This means that when compared with the no-go option, the proposed project is associated with greater socio-economic benefits.

9.3 Recommendations

Based on the information presented in this report, the following can be recommended from the socio-economic perspective:

- The net positive impacts associated with the development and operation of the proposed wind energy facility are expected to outweigh the net negative effects. The project is also envisaged to have a positive stimulus on the local economy and employment creation, leading to the economy's diversification and a small reduction in the unemployment rate. The project should therefore be considered for development. It should, however, be acknowledged that the negative impacts would be largely borne by the nearby farms and households residing on them, whilst the positive impacts will be largely concentrated in the local and national economies. Due to this imbalance, it is recommended that the mitigation measures suggested be strictly adhered to. Application of these mitigation measures will ensure that the negative impacts on the nearby farms and businesses are minimised and that the distribution of the potential benefits of the project are more balanced.

REFERENCES:

Adrian, T. & Natalucci, F. 2020. COVID-19 Crisis Poses Threat to Financial Stability. [Online]. Available:https://blogs.imf.org/2020/04/14/covid-19-crisis-poses-threat-to-financial-stability/

Aitchison, C. 2012. Tourism Impact of Wind Farms. Edinburgh: The University of Edinburgh. [Online]. Available: http://www.parliament.scot/S4_EconomyEnergyandTourismCommittee/Inquiries/20120426_uni_of_ed.pdf

Blackett, G. 2017. Wind Farms and Tourism Trends in Scotland. [Online]. Available: https://biggareconomics.co.uk/wp-content/uploads/2020/01/Wind-farms-and-tourism-trends-in-Scotland.pdf

Carter, J. 2011. The Effect of Wind Farms on Residential Property Values in Lee County, Illinois. Normal: Illinois State University. [Online]. Available: https://pdfs.semanticscholar.org/e87b/ed29e465f78a7fecceac9fb83ec29adeb327.pdf

Damm, G. 2007. Trophy Hunting, Hunting Trophies and Trophy Recording: Evaluating Facts, Risks and Opportunities. [Online]. Available: http://www.africanindaba.com/wp-content/uploads/2014/03/AfricanIndabaVol5-3.pdf

Duvenage, A. 2020. What the Moody's downgrade means for SA. [Online]. Available: https://city-press.news24.com/Business/what-the-moodys-downgrade-means-for-sa-20200330

e-SEK. 2020. Making sense of COVID-19's impact on South African businesses [Online]. Available: https://www.itweb.co.za/content/wbrpOMgYbkEvDLZn

Failte Ireland. 2012. Visitor Attitudes on the Environment - Wind Farms. [Online]. Available: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf

FNB. 2020. Property Barometer. [Online]. Available: https://www.fnb.co.za/downloads/economics/reports/2020/PropertyBarometerMay.pdf

Folger, J. 2018. Basic Valuation Concepts. [Online]. Available: https://www.investopedia.com/articles/realestate/12/real-estate-valuation.asp

Goldberg, A. 2015. The economic impact of load shedding: The case of South African retailers. Pretoria: Gordon Institute of Business Science - University of Pretoria.

Grimsley, S. 2018. Property Valuation: Definition & Principles. [Online]. Available: https://study.com/academy/lesson/property-valuation-definition-principles.html

Hoen B., Wiser, R., Capper, P., Thayer, M. and Sethi, G. (2009). The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. [Online]. Available: http://eetd.lbl.gov/ea/ems/reports/lbnl-2829e.pdf.

Karydis, M. 2013. Public attitudes and environmental impacts of wind farms: review. Global NEST Journal, No 4 Vol 15, pp. 581-600.

Kovaleski, D. 2019. Study shows high investor confidence in renewable energy. [Online]. Available: https://dailyenergyinsider.com/news/20058-study-shows-high-investor-confidence-in-renewable-energy/

Lightstone Property. 2020. Property Sales Report: Kouga NU, Blue Crane Route NU & Makana NU. Cape Town: Lightstone.

Madlener, Y. S. A. R. 2016. The Impact of wind farm visibility on property values: A Spatial difference-in-differences analysis. Energy Economics vol. 55 pg. 79-91.

Makana Local Municipality. 2009. Makana Municipality Local Economic Development Plan (LED). Makhanda: Makana Local Municipality

Makana Local Municipality. 2019. Makana Municipality Integrated Development Plan (IDP). Makhanda: Makana Local Municipality

McGregor, S. 2020. Impact of the Moody's Downgrade. [Online]. Available: https://www.allangray.co.za/latest-insights/markets-and-economy/impact-of-moodys-downgrade/

McSweeney, R. & Timperley, J. 2018. The Carbon Brief Profile: South Africa. [Online]. Available: https://www.carbonbrief.org/the-carbon-brief-profile-south-africa

Moffat Centre. 2008. The economic impacts of wind farms on Scottish tourism. [Online]. Available: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2008/03/economic-impacts-wind-farms-scottish-tourism/documents/0057316-pdf/0057316-pdf/govscot%3Adocument/0057316.pdf?forceDownload=true

National Department of Economic Development (DED). 2011. New Growth Path: Framework. Cape Town: Department of Economic Development.

National Department of Energy (DOE). 20003. White Paper on the Renewable Energy Policy of RSA 2003

National Department of Energy (DOE). 2019. Integrated Resource Plan (IRP2019). Pretoria: Department of Energy.

National Department of Energy (DOE). 2019. The South African Energy Sector Report 2019. Pretoria: Department of Energy.

National Energy Regulator of South Africa (NERSA). 2020. National Electricity Industry Regulation: A different focus on the electricity supply industry challenges and possible solutions. Pretoria: National Energy Regulator of South Africa

National Planning Commission (NPC). 2012. National Development Plan 2030. Pretoria: National Planning Commission.

Northumbria University Newcastle. 2014. Evaluation of the impacts of onshore wind farms on tourism. [Online]. Available: http://s3.amazonaws.com/windaction/attachments/2575/EB14-Evaluation-of-the-impacts-of-onshore-wind-farms-on-tourism.pdf

Polecon Research. 2013. The Impact of Wind Farms on Tourism in New Hampshire. Online]. Available: https://www.nhsec.nh.gov/projects/2013-02/documents/131212appendix_31.pdf

Quantec. 2020. Standardised Regional Economic Data, 2018 release. Pretoria: Quantec

Quantec. 2020. Standardised Regional Socio-Economic Data, 2018 release. Pretoria: Quantec

REN21. 2019. The Renewables 2019 Global Status Report (GSR 2019). [Online]. Available: http://www.ren21.net/gsr-2019/pages/foreword/foreword/

Republic of South Africa, 1996. Constitution of the Republic of South Africa, 1996. Pretoria: Republic of South Africa

Sæþórsdóttir, A. D. & Ólafsdóttir, R. 2020. Not in my back yard or not on my playground: Residents and tourists' attitudes towards wind turbines in Icelandic landscapes. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0973082619309913#bb0280

Santander. 2020. South Africa: Foreign investment. [Online]. Available: https://santandertrade.com/en/portal/establish-overseas/south-africa/foreign-investment

Sarah Baartman District Municipality. 2013. Sarah Baartman District Spatial Development Framework (SDF). Port Elizabeth: Sarah Baartman District

Sarah Baartman District Municipality. 2019. Sarah Baartman District Integrated Development Plan (IDP). Port Elizabeth: Sarah Baartman District

Silva, L. & Delicado, A. 2017. Wind farms and rural tourism: A Portuguese case study of residents' and visitors' perceptions and attitudes. Moravian Geographical Reports, 24 (4), pp. 248-256.

Sinding, S.W. 2009. Population, poverty and economic development. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781831/

Statistics South Africa (StatsSA). 2011. Census 2011. Pretoria: Statistics South Africa

Statistics South Africa (StatsSA). 2019. Economic Growth – December 3. Pretoria: Statistics South Africa

Statistics South Africa (StatsSA). 2020. Economic Growth – June 30. Pretoria: Statistics South Africa

Swart, P. & Goncalves, S. 2020. Downgrade of South Africa's credit rating further into junk. [Online]. Available: https://www.cliffedekkerhofmeyr.com/en/news/publications/2020/finance/finance-alert-11-may-downgrade-of-south-africas-credit-rating-further-into-junk.html

Tait, L. 2012. The potential for local community benefits from wind farms in South Africa. [Online]. Available: http://www.crses.sun.ac.za/files/research/completed-research/wind/l_tait.pdf.

Terblanche, M. 2020. Socio-economic Impact Assessment Report: Proposed construction of the Albany Wind Energy Facility, Makana Local Municipality. Makhanda: Index on behalf of CES Environmental and Social Advisory Services.

The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA). 2011. The Eastern Cape Industrial Development Strategy. Bhisho: Department of Economic Development, and Environmental Affairs

The Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA). 2012. The Eastern Cape Sustainable Energy Strategy. Bhisho: Department of Economic Development, and Environmental Affairs

The Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT). 2016. Eastern Cape Provincial Economic Strategy (PEDS). Bhisho: Department of Economic Development, Environmental Affairs and Tourism

The Royal Institute of Chartered Surveyors, 2007. What is the impact of wind farms on house prices? Oxford: RICS Research

The South African Chamber of Commerce and Industry (SACCI) 2020a. Business Confidence Index May 2020. Johannesburg: The South African Chamber of Commerce and Industry

The South African Chamber of Commerce and Industry (SACCI) 2020b. Business Confidence Index April 2020. Johannesburg: The South African Chamber of Commerce and Industry

Urbis, 2016. Review of the Impact of Wind Farms on Property Values. [Online]. Available: https://epuron.com.au/documents/444/review_of_the_impact_of_wind_farms_on_property_values_urbis_2016_07_21.pdf

van Wyk, C. 2020. SA's "big bazooka" stimulus package explained. [Online]. Available: https://www.investec.com/en_za/focus/economy/sas-big-bazooka-stimulus-package-explained.html

World Wildlife Fund (WWF). 2014. Renewable Energy Vision 2030: South Africa. Cape Town: World Wildlife Fund – South Africa.

Makana Local Municipality (2012). *Makana Municipality Integrated Development Plan 2012-2017*. Makana Local Municipality, Grahamstown.

Makana Local Municipality (2008). *Makana Municipality Spatial Development Framework*. Makana Local Municipality, Grahamstown.

Makana Local Municipality (2004). *Makana Municipality Tourism Sector Plan, 2003 – 2013*. Makana Local Municipality, Grahamstown.

Muir, A., Skowno, A. and Kerley, G (2011). *Combining conservation and socio-economic development: An assessment of eco-tourism-based private game reserves in the Eastern Cape*. [Online]. Port Elizabeth: Centre for African Conservation Ecology. Available: http://indaloconservation.co.za/files/Indalo%20socioeconomic%20report%202011_FINAL2.pdf.

NFO System Three (2002). *Investigation into the potential impact of wind farms on tourism in Scotland* [Online]. Edinburgh: VisitScotland. Available: http://www.viewsofscotland.org/library/docs/VS_Survey_Potential_Impact_of_WF_02.pdf.

NFO WorldGroup (2003). *Investigation into the potential impact of wind farms on tourism in Wales* [Online]. Edinburgh: Wales Tourism Board. Available: http://www.ecodyfi.org.uk/tourism/Windfarms_research_eng.pdf.

Quantec (2012). *Standardised Regional Data, 2011 release*.

Renewable Energy Systems (RES) (2013). *Personal correspondence with developer*.

Saayman, A., Saayman, M. and Naude, W (2000). *Economic and sectoral effects of tourism spending in South Africa: Regional implications*. [Online]. https://citeseerx.ist.psu.edu/viewdoc/download%3Fdoi%3D10.1.1.200.8933%26rep%3Drep1%.

Savannah Environmental (2011). *Proposed Spitskop wind energy facility and associated infrastructure on a site north-east of Riebeek East, Eastern Cape Province: Final scoping report*. [Online]. http://www.res-sa.com/media/19626/Spitskop-Wind-Energy-Facility-FSR-Main-Report-Dec11.pdf.

StatsSA (2012). *Census 2011*. Statistics South Africa (StatsSA), Pretoria.

StatsSA (2007). *Census of Commercial Agriculture, 2007 – Eastern Cape*. Statistics South Africa (StatsSA), Pretoria.

Sterzinger, G., Beck, F. and Kostiuk, D (2003). *The Effect of Wind Development on Local Property Values: Analytical Report*. [Online]. Washington, D.C.: Renewable Energy Policy Project. Available: http://www.repp.org/articles/static/1/binaries/wind_online_final.pdf.

Tait, L. (2012). *The potential for local community benefits from wind farms in South Africa*. [Online]. Cape Town: University of Cape Town Energy Research Centre. Available: http://www.crses.sun.ac.za/files/research/completed-research/wind/l_tait.pdf.

The Republic of South Africa. 1998. National Environmental Management Act (NEMA), Act 107 of 1998. Republic of South Africa: Pretoria.

The Republic of South Africa. 2014. Environmental Impact Assessment Regulations, 2014. Department of Environmental Affairs: Pretoria.

Wasatch Wind (2011). *Frequently Asked Questions for Landowners*. [Online]. Available: http://www.wasatchwind.com/landowners/faqs#paid.