CONSTRUCTION OF UP TO 132KV POWER LINE AND SUBSTATION FOR THE !XHA BOOM WIND FARM, NEAR LOERIESFONTEIN IN THE NORTHERN CAPE PROVINCE

SOCIO-ECONOMIC BASIC ASSESSMENT

JULY 2017

P.O. Box 13554, HATFIELD 0028
Tel: (012) 342-8686
Fax: (012) 342 8688
E-mail: pta@urban-econ.com

Celebrate Development Diversity

URBAN-ECON
Development Economists

Celebrate Development Diversity.

Version:

Draft version 1

26 July 2017

Project leader:

Elena Broughton

Cell: 082 463 2325

Email: elena@urban-econ.com

Report writer:

Zimkita Nkata

Cell: 083 974 0167

Email: zimkita@urban-econ.com

SPECIALISTS DETAILS

Elena Broughton

Cell: 082 463 2325

E-mail: elena@urban-econ.com

Position: Manager/Senior Economist

Qualifications: MSc Technology Management, BSC (Hon) Technology Management, BCom (Hon) Economics

Experience: 12 years

Brief profile: Elena Broughton is a senior professional and the manager of the Innovation & Sustainable Development Unit at Urban-Econ. She has extensive knowledge in various fields of economic development that includes 13 years of experience in undertaking socio-economic impact assessment studies for a variety of private clients spanning the mining, manufacturing, energy, infrastructure, and retail sectors. She also acted as a peer reviewer in a number of socio-economic impact assessment studies and completed a few strategic socio-economic impact assessments. Her involvement in the field allowed her to develop a sound understanding of the South African environmental legislation and developmental policies and equipped her with a widespread knowledge of socio-economic implications and benefits of various new developments.

Zimkita Nkata

Cell: 083 974 0167

E-mail: zimkita@urban-econ.com

Position: Junior Development Economist

Qualifications: B.Sc (Environmental Science and Economics), B.Sc (Hons) Environmental Science

Experience: 1 year, 3 months

Brief profile: Zimkita Nkata is a Junior Development Economist in the Innovation and Sustainable Development Unit at Urban-Econ. She recently joined the company after her 5-month internship with the Council for Scientific and Industrial Research (CSIR) in Waste Management. At this job, most of her work entailed a project management role and overseeing role over waste management related grant projects. She completed her BSc degree, at Rhodes University in 2014 specialising in Environmental Science and Economics. She then went on to complete her BScHons degree in Environmental Science at the same institution. Since her time at Urban-Econ she has been exposed to a number of Socio-Economic Impact Assessment studies for Renewable Energy developments which has enhanced and developed her working skills in Environmental Impact Assessment studies in general.

DECLARATION OF INDEPENDENCE

I, Elena Konstantinovna Broughton, declare that:

- I act as the independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, regulations and all other applicable legislation.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- All the particulars furnished by me in this form are true and correct.
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signed: 

Date: 26 July 2017

DECLARATION OF INDEPENDENCE

I, Zimkita Nkata, declare that:

- I act as the independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, regulations and all other applicable legislation.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.
- All the particulars furnished by me in this form are true and correct.
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signed:  Date: 26 July 2017

TABLE OF CONTENTS

LIST OF MAPS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

BA	Basic Assessment
CAGR	Compounded Average Growth Rate
CSP	Concentrated Solar Power
DM	District Municipality
ED	Enterprise Development
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
GDP-R	Gross Domestic Product per Region
GGP	Gross Geographic Product
I&AP's	Interested and Affected Parties
IDP	Integrated Development Plan
IRP	Integrated Resource Plan
IPAP	Industrial Policy Action Plan
LED	Local Economic Development
LM	Local Municipality
MLL	Minimum Living Level
MW	Megawatt
NC	Northern Cape
NDP	National Development Plan
NGPF	New Growth Path Framework
PGDS	Provincial Growth & Development Strategy
PV	Photovoltaic
RE	Renewable Energy
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SED	Socio-economic Enterprise Development
SDF	Spatial Development Framework
WTP	Willingness to Pay

1 INTRODUCTION

This document is prepared by **Urban-Econ Development Economists** as requested by **SiVEST Environmental** on behalf of **Mainstream Renewable Power South Africa (Pty) Ltd** (hereafter referred to as Mainstream) to undertake a socio-economic basic assessment study for the **proposed construction of the 33kV/132kV on-site substation, a 132kV linking substation, and an associated 132kV power line** for the !Xha Boom Wind Energy Facility near Loeriesfontein in the Northern Cape province. The socio-economic study is conducted as part of the basic assessment (BA) process managed by SiVEST Environmental.

1.1 Scope of the Study

The purpose of the socio-economic basic assessment is to determine the potential socio-economic implications of the proposed project activities and to advise on the most beneficial alternative to be implemented. The study forms part of the specialist input into the basic assessment report that is outlined by SiVEST Environmental. The basic assessment report addresses the impacts as set out in the guidelines outlined in the Environmental Impact Assessment Regulations of 2014. The purpose of the socio-economic basic assessment study is as follows:

- To undertake a policy review and assess the alignment of the proposed project with the national, provincial and local socio-economic policies, with a focus on the compatibility of the project with the spatial planning, development objectives, and land use management plans of the respective authorities.
- To create a socio-economic profile for the study area using both secondary and primary data. The guidelines for the basic assessment specifically call for information on the level of unemployment and skills available in the local community as well as the economic profile of the local municipality.
- To identify and analyse the potential socio-economic value of the proposed project and associated components thereof and to recommend the preferred alternative considering the socio-economic characteristics.
- To evaluate the potential positive impacts versus any negative socio-economic effects that may ensue as a result of the change in status quo of the affected and benefiting communities and economies.

1.2 Project Content, Location and Study Area Delineation

The proposed project involves the development of the 132kV on-site substation, a 132kV linking substation and an associated 132kV power line. The size of the proposed on-site substation will be approximately 500m x 300m, while the linking substation will be approximately 600m x 600m. The width of the proposed power line corridor will be between 100m and 500m wide. According to the project proponent, the proposed power line requires a 31m wide servitude, which will be placed within the corridor.

The proposed power line will include a series of towers that will be 170m to 250m apart. At this stage, the considered power lines will include various self-supporting suspension monopole structures. The steel monopole structures are expected to be between 18 and 25m in height (this will be largely dependent on the terrain). The exact location of the towers is not yet finalised and will only be determined during the final stages of the power line.

The proposed construction of the on-site substation, linking substation and associated power line serves the purpose of connecting to the !Xha Boom Wind Energy Facility to the national grid via the Eskom Helios substation near Loeriesfontein in the Northern Cape province to allow for the evacuation of electricity generated by the wind facility. Thus, the proposed project consists of the following main activities:

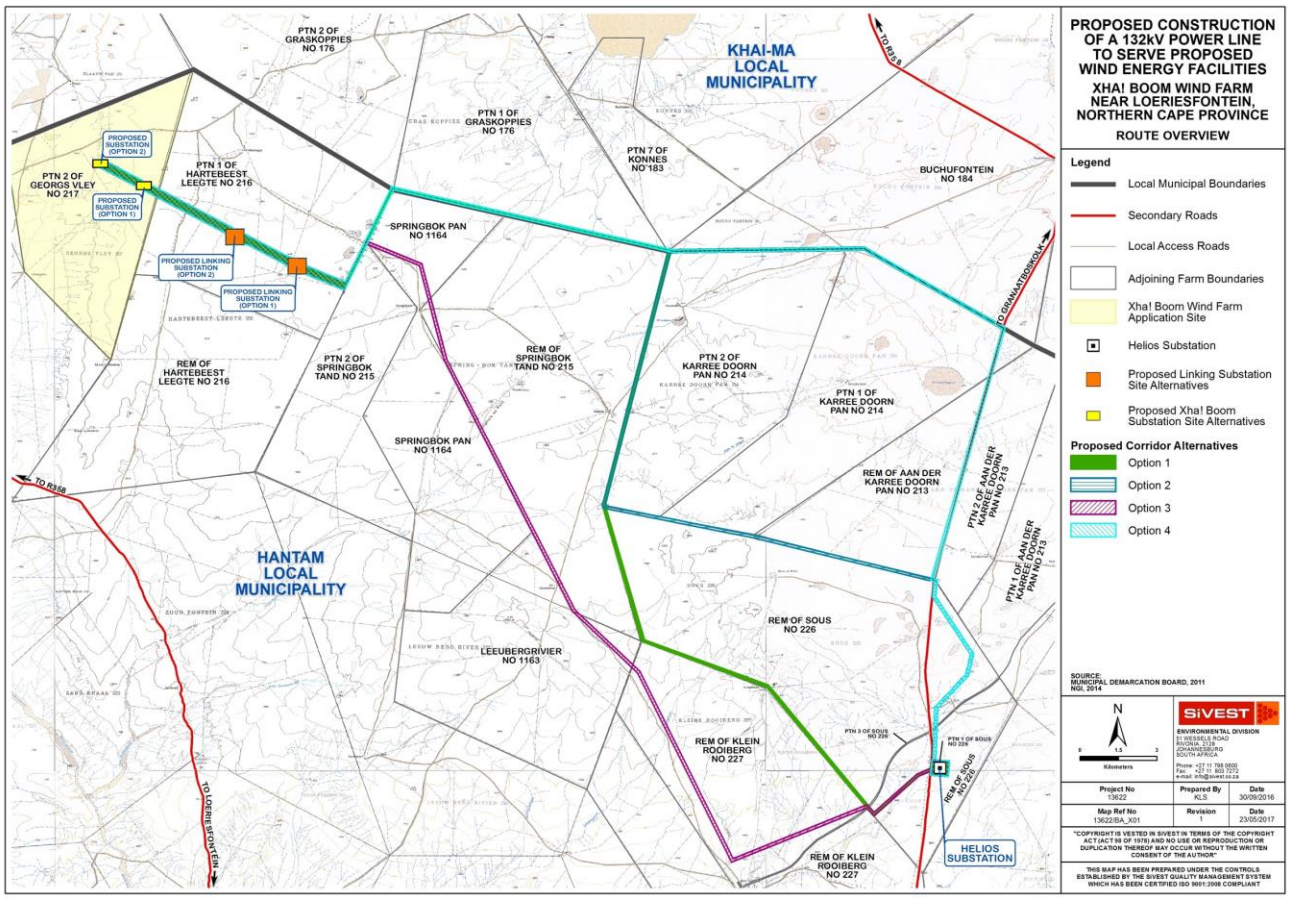
- Construction of 1x 132 kV substation (referred to as the “proposed !Xha Boom Substation”)
- Construction of 1x 132 kV linking substation
- Construction of 1x 132 kV power line from the proposed !Xha Boom Substation, via the linking substation to Helios substation approximately 33km south-east of the proposed !Xha Boom Wind Farm.
- Four corridor routes have been proposed for the 132kV power line. These corridors will serve as alternatives to each other for the comparative assessment exercise.

The four power line corridor alternatives include the following:

- Corridor 1 (Green): 52.2km
- Corridor 2 (Blue): 52.8km
- Corridor 3 (Pink): 47.0km
- Corridor 4 (Light blue): 53.4km

Considered project alternatives

Three sets of alternatives are considered, i.e. on-site substation alternatives (two possible locations), linking substation alternatives (two possible locations) and power line route alternatives (four possible options). These are represented in Map 1-1 below.



Map 1-1: Substation alternatives & power line route alternatives

Project location and study area delineation

The proposed project is to be located approximately 68km north of Loeriesfontein in the Northern Cape province. It forms part of the Namakwa DM and lies within the borders of the Hantam and Khai-Ma LMs. The on-site substation alternatives, on-site linking substations and the four power line corridor alternatives fall within the bounds of both municipalities.

The **zone of influence** of the project is envisaged to be limited to the farm portions that will be directly affected by the footprint of the substations and power line. The list of the farm portions included in the zone of influence includes:

Table 1-1 Farm portions included in zone of influence

Farm Portion	Farm Name	Farm no.	Type
2	Georges Vley	217	Directly affected
1	Hartebeestleegte	216	Directly affected
1	Graskoppies	176	Directly affected
1	Konnes	183	Directly affected
0	Springbok Pan	1164	Directly affected

Farm Portion	Farm Name	Farm no.	Type
0	Buchufontein	184	Directly affected
2	Springbok Tand	215	Directly affected
Rem	Springbok Tand	215	Directly affected
2	Karree Doorn Pan	214	Directly affected
1	Karree Doorn Pan	214	Directly affected
Rem	Aan Der Karree Doorn Pan	213	Directly affected
2	Aan Der Karree Doorn Pan	213	Directly affected
0	Leeubergrivier	1163	Directly affected
Rem	Klein Rooiberg	227	Directly affected
Rem	Sous	226	Directly affected

1.3 Methodology

The methodology employed in conducting the study comprised of three steps as illustrated in Figure 1-1.

Figure 1-1: Methodology

The following paragraphs briefly describe each step.

Step 1: Data gathering

Impact assessment requires the knowledge of the socio-economic environment that will be affected by the proposed project and envisaged expenditure on the project during both the construction and operational phases. In order to create a comprehensive understanding of the socio-economic environment that might be affected by the proposed developments, a socio-economic profile of the study areas as well as the zone of influence was developed.

Step 2: Data analysis

A description of the study area and the zone of influence is given in terms of selected socio-economic variables. The developed profile is used to interpret the impacts and measure the extent of socio-economic impacts that could be derived from the proposed activities in the context of the local, provincial and national economies. It includes the analysis of parameters such as population size and household numbers; structure and growth of the economy; and labour force and the employment situation.

Step 3: Impact identification and evaluation

This step includes the description and evaluation of socio-economic impacts that could be expected during the construction and maintenance phases of the proposed substations and power lines. Firstly, alternatives will be compared against each other and the preferred option which renders the least negative impact on the socio-economic environment is identified. Secondly, the anticipated impacts associated with the preferred alternative are analysed and evaluated following the methodology prescribed by the environmental consultant (refer to Annexure A).

1.4 Data gathering and consultation process

The project made use of both secondary and primary data.

Secondary data gathering

Secondary data was sourced from the following databases and documents:

- Stats SA Census, 2011
- Quantec Research Standardised Regional Data, 1995-2013
- Integrated Development Plans (IDPs)
    - Namakwa District Municipality Integrated Development Plan (2015-2016)
    - Hantam Local Municipality Integrated Development Plan (2015-2020)
    - Khai-Ma Local Municipality Integrated Development Plan (2011)
- Spatial Development Frameworks (SDFs)
    - Northern Cape Spatial Development Framework (2012)
    - Namakwa District Spatial Development Framework (2012)
    - Hantam Local Municipality Spatial Development Framework (2010)
      Khai-Ma Local Municipality Spatial Development Framework (2011)
- Provincial strategic documents
    - Northern Cape Provincial Growth and Development Strategy (2011)
    - Northern Cape Local Economic Development Framework (2011)

Primary data gathering

The main purpose of the primary data collection exercise was to gain insight into the socio-economic characteristics of the zone of influence. Therefore, the primary data gathering exercise focused on engaging with interested and affected parties (I&APs) through telephonic interviews and e-mail communication. Initial contact was done through telephonic communications, which took place the 10th - 12th of July 2017.

Table 1-2: Information on contacted interested and affected parties (I&APs)

Farm Portion	Contact Person	Means of interview
Portion 2 of Georges Vley Farm No.217	Farm owner	Telephone interview 10/07/2017
Portion 1 of Hartebeestleegte Farm No.216	Farm owner	Telephone interview 10/07/2017
Portion 1 of Konnes Farm No.183	Farm owner	Telephone interview 10/07/2017 E-mail correspondence 12/07/2017
Portion 1 of Graskoppies Farm No.176	Farm owner	Telephone interview 10/07/2017 E-mail correspondence 12/07/2017
Portion 2 of Karree Doorn Pan Farm No.215	Farm owner	Telephone interview 10/07/2017
Portion 1 of Karree Doorn Pan Farm No.214	Farm owner	Telephone interview 10/07/2017
Remainder of Aan Der Karree Doorn Pan Farm No. 213	Farm owner	Telephone interview 10/07/2017 E-mail correspondence 12/07/2017
Portion 2 of Aan Der Karree Doorn Pan Farm No.213	Farm owner	Telephone interview 10/07/2017

Farm Portion	Contact Person	Means of interview
Remainder of Klein Rooiberg Farm No.227	Farm owner	Telephone interview 10/07/2017
Remainder of Sous Farm No.226	Farm owner	Telephone interview 10/07/2017

Although the most desirable outcome is reaching all the affected landowners, the following table outlines the I&APs that it was not possible to engage with for various reasons. In order to address the possible gap in knowledge, the review of the feedback received from the I&APs after the submission of the scoping (i.e. during public comment period) was relied on. This was to allow the tracing of any outstanding concerns that the owners of these farm portions may have had with respect to the project. It should therefore be noted that no concerns or issues were raised by these parties during the public comment period that followed the submission of the scoping report.

Table 1-3: I&APs that could not be contacted

I&AP	Reason for non-engagement
Portion 0 of Springbok Pan Farm No. 1164	Contact details not provided
Remainder of Springbok Tand Farm No.215	No answer on given contact details
Portion 2 of Springbok Tand Farm No. 215	No answer on given contact details
Portion 0 of Leeubergrivier Farm No. 1163	Contact details not provided
Rem of Klein Rooiberg Farm No. 227	No answer on given contact details

1.4 Assumptions, limitations and gaps in knowledge

- The secondary data sources used to compile the socio-economic baseline (demographics, dynamics of the economy), although not exhaustive, can be viewed as being indicative of broad trends within the study area.
- The study was done with the information available to the specialist within the time frames and specified budget.
- Project-related information supplied by the environmental practitioner and the client for the purpose of this analysis is assumed to be reasonably true.
- It is assumed that the project description and infrastructure components as discussed above are reasonable accurate. These details were used to assess the potential impacts.
- Possible impacts, as well as stakeholder responses to these impacts, cannot be predicted with complete accuracy, even when circumstances are similar and these predictions are based on research and years of experience, taking the specific set of circumstance into account.
- With regard to the interviews undertaken the following assumptions are made:
    - Questions asked during the interviews were answered accurately.
    - The degree of the perceived possible significance of concerns raised by some of the respondents were rated by them truthfully.
    - That the attitudes of the respondents towards the project will remain reasonably stable over the short to medium terms.

- The focus on the primary data collection was on those parties that were perceived to be the most sensitive to the proposed project. As such, it is believed that the study was able to identify the most significant impacts and assess the most pertinent issues.

2 POLICY REVIEW

A policy review plays an integral role in the early stages of a project. The review provides a high-level indication of whether a project is aligned with the goals and aspirations of the developmental policy within a country and at a local level. Furthermore, the analysis signposts any red flags or developmental concerns that could jeopardise the development of the project and assists in amending it and preventing costly and unnecessary delays.

The following government strategic documents applicable to the delineated study areas were examined:

- National: (South Africa)
  - New Growth Path Framework (NGPF) (2010)
  - National Development Plan (NDP) 2030 (2011 – 2030)
  - Integrated Resource Plan (IRP) 2010-2030 promulgated in 2011
  - Industrial Policy Action Plan (IPAP2) (2012/2013 – 2014/2015)
- Regional: Northern Cape province
  - Northern Cape Provincial Spatial Development Framework (2012)
  - Northern Cape Municipal Local Economic Development Framework (2011)
  - Northern Cape Provincial Growth and Development Strategy (2011)
- Local: Namakwa District Municipality, Hantam and Khai-Mai Local Municipalities
  - Namakwa District Spatial Development Framework 2012
  - Namakwa District Municipality Integrated Development Plan 2015-2016
  - Hantam Local Municipality Local Economic Development Strategy 2011
  - Hantam Local Municipality Integrated Development Plan 2015-2020
  - Hantam Local Municipality Rural Spatial Development Framework 2010
  - Khai-Ma Local Municipality Integrated Development Framework 2012-2017
  - Khai-Ma Local Municipality Spatial Development Framework 2011

National context

The expansion of South Africa's renewable energy capacity generation is expected to play a vital role in consolidating energy security, mitigating climate change and stimulating economic growth to improve the general standard of living of all South Africans. Developing the renewable energy (RE) industry is one of the national priorities as per the following policies and strategies:

- **New Growth Path Framework** (NGPF): At the forefront of the government action plan is the creation of decent employment opportunities through the support of labour-intensive sectors and assurance of long-term economic growth. To ensure sustained job creation prospects, government has placed further emphasis on the promotion of local industrial capacity and skills development in advanced industries. Because of this, the New Growth Path Framework (NGPF) states that the diversification of the national economy is vital to improving both the rate of absorption as well as the gross domestic product (GDP) growth rate and has thus set a target to

stimulate employment by five million new jobs by the year 2020. As such, the development of the RE sector is particularly identified to have a potential to play an important role in creating decent work opportunities. Targets for RE also open up major new opportunities for investment and employment in manufacturing new energy technology as well as in construction (Department of Economic Development, 2010).

- The **National Development Plan** (NDP): To successfully overcome the triple threat challenge of poverty, unemployment, and inequality posed to the country, the NDP encourages all regions to seize the advantage of natural resources endowed to them. This, however, must be achieved in a sustainable and equitable manner**.** For the goals embedded within the policy to be met, the proposed path toward developing a green economy is of critical importance. In line with international protocol and ambitions, the NDP acknowledges South Africa's dependence on fossil fuel based energy production as a key challenge, and this has placed further emphasis on the need to transition toward a low-carbon economy. To achieve this, the NDP seeks to ensure that half of all new electricity generating capacity is provided through renewable energy resources (National Planning Commission, 2011)**.**
- **Integrated Resource Plan** (IRP): The IRP**,** which was promulgated in 2011, was established with the purpose of serving as a living plan to monitor South Africa's forecast electricity capacity by the year 2030. Since the IRP's establishment, the government has committed itself to producing 8 400 MW from wind by the year 2030. The path to achieving this goal then led to the establishment of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) which is essentially the key vehicle for securing electricity capacity from the private sector for renewable energy as well as non-renewable sources. Currently, the three ministerial determinations have called for a procurement of 13 125 MW of renewable energy from IPPs; of this, 6 360 MW has been allocated to wind energy projects. In consideration of the four and a half bidding windows that have already been achieved, 3 346 MW has already been awarded to existing wind projects. This has resulted in the possibility of 3 013 MW to be allocated to more renewable energy projects thus creating opportunities for projects such as the one under analysis to be established.
- **Industrial Policy Action Plan** (IPAP): Both the Integrated Resource Plan and the Industrial Policy Action Plan (IPAP) specify that 21 500 MW of renewable energy capacity should be established by 2030. This capacity will be primarily derived from wind and solar technologies, which will serve to reduce the country's heavy reliance on energy derived from coal-intensive non-renewable resources thus significantly reducing greenhouse gas emissions.

The review of the national policies suggests that the proposed !Xha Boom substation and powerlines agrees and is in alignment with national developmental priorities insofar as it will assist in achieving the set target for electricity generation using renewables and contributing to the development of human capital.

Provincial context

- **Northern Cape Provincial Growth and Development Strategy** (NC PGDS): Developing new energy sources through the adoption of energy applications that are in correlation with the

Provinces' natural resource endowment are at the forefront of the provincial strategy. The provision of electricity through renewable energy sources is also seen as a reliable way to promote and accelerate economic growth within the Province through ensuring that key industry users at critical locations improve their competitiveness. Although there is sufficient reason towards investing in the use of renewable energy in the Province, it is essential that potential developments be considerate of the tourism industry component of the Province.

The Northern Cape province has had an average annual growth of 17% in national visitors as well as 25% annual growth of international visitors during the 2001-2011 period, resulting in a total tourism contribution of 6% toward the provincial gross geographic product (GGP) (Dennis Moss Partnership, 2012). This highlights that tourism is a key sector in the Northern Cape that has the potential to grow, transform and diversify the provincial economy. This means that extra care should be taken in ensuring that renewable energy developments do not result in a negative impact on the tourism potential of the Province, nor do they interfere with the region's natural environment.

- **Northern Cape Municipal Local Economic Development Framework** (NC LED)**:** In South, just over a third (37%) of the population reside in rural areas. Linked to this, the provision of a mix of alternative energy sources is thus important so as to make affordable and adequate energy available to developing communities. To achieve this, there needs to be a sufficient optimal exploitation of renewable sources. As a result of this, the Department of Minerals and Energy has embarked on several national, provincial and local level wind and solar energy systems. The Namakwa District, in particular, has potential for both wind and solar electricity generating capacity developments such as the one under analysis (Northern Cape Province, 2011).

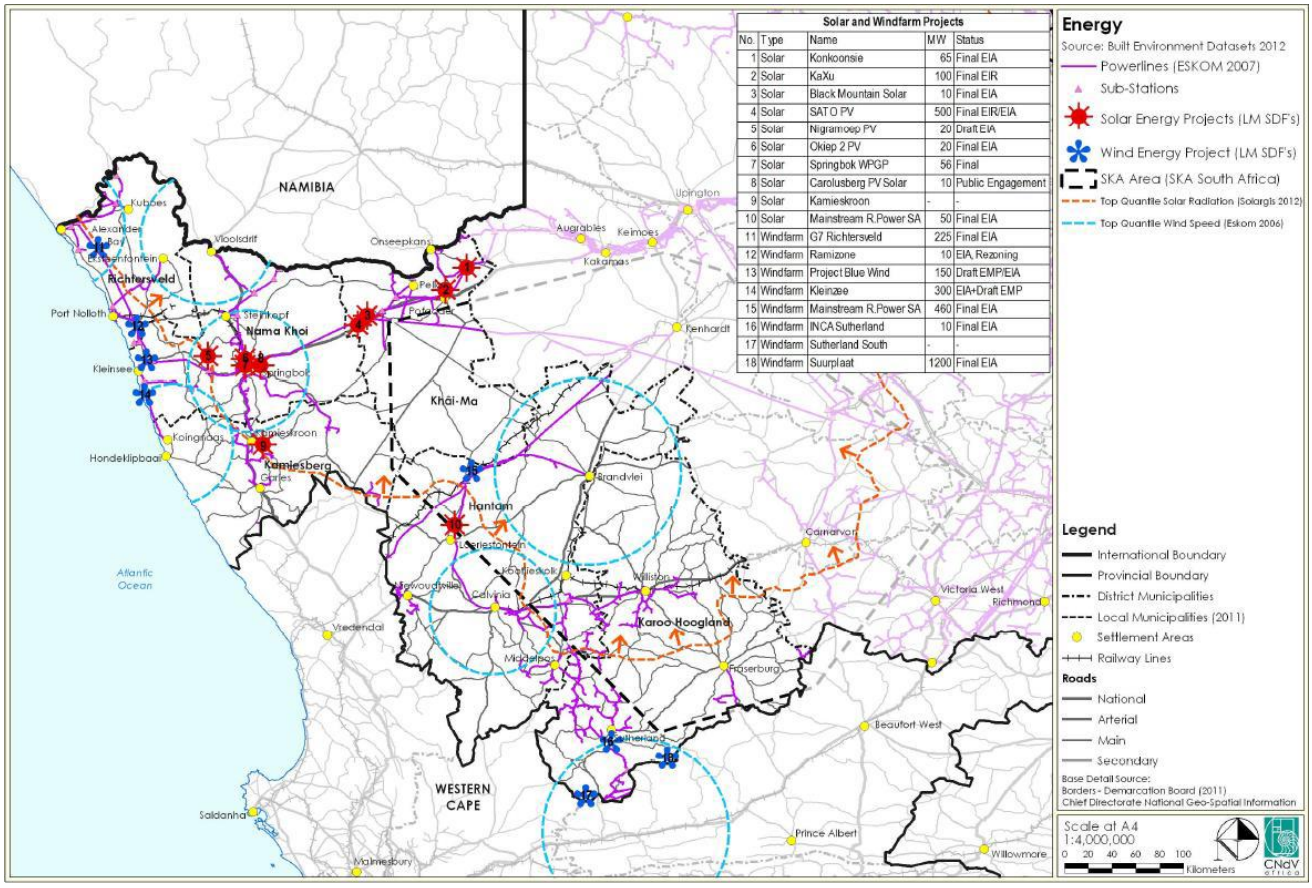
Provincial policies promote the development of the renewable energy projects, which in turn implies the promotion of the development of the associated infrastructure such as substations and powerlines, particularly if these projects are capable of also facilitating the development of the local tourism industry or if they at least do not prevent the industry from realising its potential.

Local context

Although much of the focus within district and local municipalities relates to the development and delivery of basic services, infrastructure, agriculture and tourism, the development of a green economy remains to be seen as an additional fundamental pillar of growth. Thus, in like manner with the national and provincial policies, the district and local municipalities have placed considerable emphasis on the prioritisation and promotion of renewable energy resources within their boundaries. The Namakwa District Municipality, Khai-Ma and Hantam Local Municipalities have developed strategies to extract growth and development potential from such investments.

- **Namakwa Integrated Development Plan** (IDP): This plan sets out to utilise natural resources in the Province by optimally utilising and managing resources in each sector; this includes the growing realisation of investing in more renewable energy based development. The Namakwa DM has a competitive advantage in the energy sector as wind, solar, wave, nuclear and natural

gas energy plants have all been identified as suitable investments in the area. Amongst other sectors, such as agriculture and tourism, renewable energy is thus prioritised. Several large-scale renewable energy projects have already been included in the IDP of the district. These are also depicted on Map 2-1 below. The district also recognises the importance of the agriculture and tourism industries in the area and promotes their development and transformation, especially eco-heritage. This and other projects that are under investigation are outlined in the following map extracted from the districts' spatial development framework (Namakwa DM, 2014).



Map 2-1: Renewable projects in Namakwa (CNdV, 2012)

- **Hantam LM Integrated Development Plan and Khai-Ma LM Integrated Development Plan (IDP)**: Considering the location of the site relative to the Hantam and Khai-Ma Local Municipalities, the review of the strategic policies therefore highlights the importance of improving the living standards of the citizens of the municipalities as being amongst the top priorities of local government. Stimulating and strengthening the economy through various sector development interventions is envisioned to be one of the means to achieve this. Based on the composition and natural resource endowment of these municipalities, particular developmental priority is given to the agriculture and tourism sectors. Although flower tourism is seasonal in the Hantam LM, eco-tourism has been recently seen as the main growth stimulant for the regional economy. At the same time, the agricultural sector provides the most employment opportunities in the municipal

area, thus, making it the backbone of the Hantam LM (Hantam IDP, 2015). The above suggests that the tourism and agricultural sectors should be preserved, and all effort needs to be made in order to ensure that no new development results in the loss of these activities.

Considering the information above, it is clear that local government prioritises the improvement of service delivery and living standards of its residents through the adequate provision of basic services. The proposed substations and power lines will not directly contribute to the above-mentioned objective since the electricity generated by the wind farm will be evacuated to the national grid. However, the proposed project is likely to have an indirect contribution to the above as it will enable investments into the local economy. Importantly, the project does not raise any red flags or implies contradictions with the local government developmental objectives.

3 BASELINE INFORMATION

This chapter examines key socio-economic characteristics of the study area, as per the delineation provided. This is essential as it provides both qualitative and quantitative data related to the communities and economies under observation, creating a baseline against which the impacts can be assessed.

3.1 Study area's composition and locational factors

Spatial context and regional linkages

Geographically, the **Northern Cape** is the largest province located within South Africa with an area of 372 889km^2 equating to approximately 30.6% of South Africa's spatial composition. Despite having the largest surface area, the Northern Cape is the least populated province in South Africa with a population of 1.1 million people equating to 2.2% of the national population (Stats SA, 2011).

The proposed Substations and power lines falls within the **Namakwa DM** which is situated on the western part of the Northern Cape province and is the largest municipality of the five main municipal districts of the Province covering an area of 126 900km^2 (34%) of the total provincial landmass. Although it is the largest district geographically, the Namakwa DM is sparsely populated with a population of 115 842 people, which comprises 10.11% of the total province population (Stats SA, 2011).

In the Namakwa DM, the project lies within the borders of the Hantam LM and the Khai-Ma LM. The **Hantam LM** is an inland municipality which lies to the west of the Namakwa DM and is located 140km from Springbok. The Hantam LM covers an area of 36 128km^2 and has a population of 21 581 people (Stats SA, 2011). The municipality is known for its wide, open spaces, striking mountain ranges and nature reserves filled with a vast array of indigenous plants and bulbs (Hantam IDP, 2015). The main attractions of the area are, therefore, the floral displays, hiking and the natural environment. Hantam municipality is also furnished with four conservation areas, namely Ooorlogskloof Nature Reserve, Hantam National Botanical Gardens, Tanique Karoo National Park and the Akkerdam Nature Reserve (Umsebe Development Planners, 2010).

With a total surface area of 16 627km^2, the **Khai-Ma LM** is situated along the north-western part of the Namakwa DM and is a sparsely populated region with 12 466 people. The Khai-Ma LM is bordered by Namibia on the north, the ZF Mgcawu LM on the east and, the Nama-Khoi LM on the west. Urban nodes surrounding the local municipality include Poffadder town, as the main centre; Aggeneys; Pella; Witbank and Onseepkans. Although the surrounding area of the region has a low grazing potential, a vast amount of extensive land in Khai-Ma is predominantly used for livestock farming (Umsebe Development Planners, 2010).

3.1 Sense of place, history, and cultural aspects

The closest town to the proposed 132kV substations and 132kV powerline is Loeriesfontein. This is a small rural service centre town that lies within a basin surrounded by mountains and is situated to the north-west of the town of Calvinia. Loeriesfontein was built around a general store in the year 1894 by a British bible salesman, Frederick Turner (Hantam IDP, 2015). The town has a population of 2 746 people, which has grown by 12.4% since the year 2001. Loeriesfontein town covers a total surface area of 34.45km^2 and has a population density of 80 people/km^2 (Stats SA, 2011).

The south-western part of Leoriesfontein forms part of Namaqualand, which is a region popular for its spring flowers and its wide variety of diverse vegetation (Hantam IDP, 2015). Loeriesfontein town also houses the Gannabos (Quiver) Forest, which is home to the world's largest colony of the *Aloe Dichotoma* species (Umsebe Development Planners, 2010). During spring, the town is flooded with tourists attracted by the spring flowers. The town also boasts its Windmill museum, which is one of only two in the world. Sheep farming and salt mining are the predominant activities within and around Loeriesfontein town (Umsebe Development Planners, 2010).

3.2 Demographic Profile

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

Population demographics

As previously noted, the **Hantam LM** has a population of 21 581 individuals accounting for 18.6% of the total population of the Namakwa DM. In comparison to the year 2001, the population of the Hantam LM has increased by 6.6%. Within the local municipality, 80% of the people reside in urban areas whilst the rest occupy farms. In total, the Hantam LM has 6 341 households with a household density of 0.14km^2 (Stats SA, 2011). The majority of the people in the Hantam LM reside in the city centre, which is Calvinia town; thus, only a small percentage of people reside in other smaller surrounding towns such as Loeriesfontein (13%) (Stats SA, 2011). Over 90% of the residents in the municipality, as well as the nearby towns (Loeriesfontein and Brandvlei), speak Afrikaans as a first language, with the dominant race being coloured people (82%) and white people lagging behind at 11%. The Hantam LM's population consists of 50.1% males and 49.9% females. The largest group of people falls under those aged between 35 and 64 years of age. In this LM, the youth (15-34 years) encompass about 29.1% of the total population. Only 28% of Hantam residents are married, whilst 54% have never been married (Stats SA, 2011).

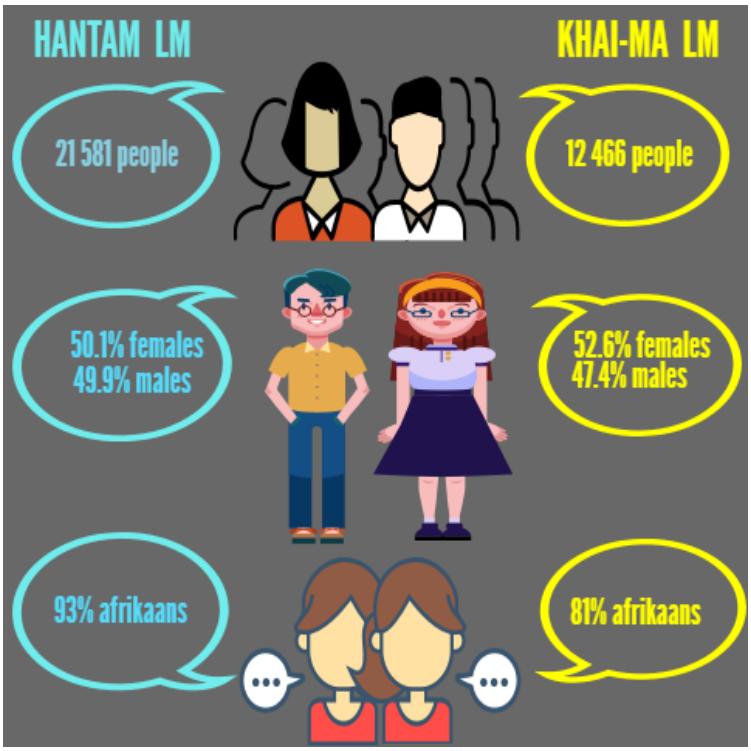


Figure 3-1: Hantam and Khai-Ma LM population dynamics

Loeriesfontein, being the closest town to the !Xha Boom Substation project site, only has 806 households in total resulting in a household density of 23.3 km^2. The majority (94.3%) of people have access to formal

housing whilst the rest either live in houses or flats in a backyard (0.87%) or in informal dwellings (4.12%). A huge portion of people living in Loeriesfontein are coloured (86%), followed by white people at 11.54% whilst black people equate to 1.9% of the total population. Afrikaans is the main language spoken as more than 90% of the people cited it as their first language; only 0.4% residents speak English whilst 0.5% speak Setswana (Stats SA, 2011). Only 26.5% residents are married, whilst 56.9% have never married.

Although Loeriesfontein is a relatively small town, residents and farm owners stated that since the introduction of renewable energy projects in the area, namely Khobab and Loeriesfontein 2 wind farms, the town has experienced an influx of people either in an attempt to find employment or to seize economic opportunities brought by the wind farms.

The **Khai-Ma LM**, on the other hand, has a smaller population of 12 466 people; this accounts for 10.7% of the total population of the Namakwa DM. Although the population has increased by 6.2% from 11 692 people in 2001, it is still only almost two-thirds of the Hantam population (Stats SA, 2011). Most residents within the Khai-Ma LM reside in the urban areas (81%) whilst some reside on farms (17%). The total number of households in the Khai-Ma LM is 3 796, resulting in a household density of 0.22km^2. Just over 80% of the residents speak Afrikaans in the municipality (Stats SA, 2011). Coloured people equate to three-quarters of the total population with black people (18%) being the second dominant race. Only 24% of the Khai-Ma LM residents are married whilst 64% have never been married. In like manner with the Hantam LM, the Khai-Ma LM has more males (52.6%) than females (47.4%) with the largest population also falling within 35 and 64 years of age. Although this is the case, this local municipality, however, has a youth population (15-34 years) that is just over a third (36.8%) of the total population (Stats SA, 2011).

Health demographics

The process of assessing and monitoring the level of health in a particular area is beneficial as it provides useful information on the development as well as human welfare of an area. Over the last 15 years, in comparison to the rest of South Africa and the Northern Cape Province, the effect of HIV has been less severe on the DM and LMs. AIDS-related deaths have also been following a similar pattern.

In the year 2015, the **Hantam LM** reported a total of 956 people living with HIV, which equates to 4.5% of the total LM population. Although the number of HIV-positive people for the Namakwa DM (4.9%) is close to that of the LM (4.5%), national and provincial HIV infected percentage levels are much higher, as they are at 11.4% and 7.3%, respectively.

Table 3-1: Population, HIV positive, AIDS and other deaths (2015)

Indicator	South Africa	Northern Cape	Namakwa DM	Hantam LM	Khai-Ma LM
Population	54 956 509	1 175 780	116 834	21 371	11 805
HIV positive	6 248 908	86 146	5 702	956	673
AIDS deaths	206 761	2 360	113	20	7
Other deaths	444 866	9 729	1 159	213	98

The **Khai-Ma LM** had a slightly higher percentage of people living with HIV (5.7%). AIDS-related deaths at the national, provincial, regional, and local context are relatively low as they range from a range of 0.1-0.4%. In a period of 15 years (2000-2015), people living with the HIV illness in the Hantam LM had

increased by 695 people whilst residents living in the Khai-Ma LM with the same illness increased by 463 within the same period.

Although the prevalence of HIV/Aids in **Loeriesfontein town** isn't clear, during the site visit and telephonic interviews conducted with various stakeholders it was revealed that construction workers employed to develop wind farms in the area, namely Khobab and Loeriesfontein 2, mingle with young females and this has since resulted in a sharp increase in the rate of teenage pregnancies. The presence of construction workers in the area has also resulted in several social ills such as the use of alcohol and drug abuse. Although interviewed residents agree that this has always been a norm in the town, they have also alluded to the fact that the social ills have exacerbated in the last few years, correlating with the period of establishment of the two wind farms. One such example is the increase in the number of liquor licences applied for as well as an increase in the number of young school girls who interact with construction workers resulting in unwanted pregnancies.

Crime demographics

In the **Hantam LM**, 816 serious crimes were reported; of these, a total amount of 760 were community reported crimes whilst 56 of them were detected by the police. Common assault was the most frequently reported crime with 207 cases, followed by property-related crime with 154 cases and assault with the intention to harm with 125 cases. The total number of serious crimes equates to 17% of the district reported crimes and 1.41% of the provincial reported crime cases. Although the use of alcohol and drugs has increased in Loeriesfontein town, crime levels have been stable and have not resulted in any criminal activities that can be directly linked to the heavy influx of people.

In 2015, the **Khai-Ma LM** had less crime-related occurrences, as only a total of 285 serious crimes were reported. The most commonly reported crimes are similar to trends noted in the Hantam LM but are at less severe rates with common assault reported to have had 69 cases, property related crime with 52 cases and assault with the intent to harm with 46 cases. Crimes reported in Khai-Ma LM equates to 6% of the cases reported at the district level and only 0.5% of the provincial reported crimes.

Table 3-2: Crimes reported by crime type (2015)

Types of crime	South Africa	Northern Cape	Namakwa DM	Hantam LM	Khai-Ma LM
Serious crimes	2 209 068	57 817	4 782	816	285
➢ **Community reported crimes**	2 068 261	54 724	4 212	760	255
➢ **Crimes dependent on police action for detection**	140 807	3 093	570	56	30

3.3 Economy

The structure of the economy and the composition of employment provides valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

The **Hantam LM** is a relatively small economy valued at R1 184 million in current prices. In total, the economy of the Hantam LM equates to 11.1% of the Namakwa District's gross domestic product per Region (GDP-R) which was valued at R10 696 million in current prices (Quantec, 2016). The contribution of the LM to the Province as a whole is significantly low as it only accounts for 1.64% of the Northern Cape province. As outlined in Figure 3-2 below, the Hantam LM economy has been manifesting a fluctuating growth rate revealing its sensitivity to external shocks related to national and global changes. For instance, the Hantam economy was adversely affected by the 2008 global recession as presented in Figure 3-2. Although this was the case, the economy began slowly recovering between the 2010-2011 period. Overall, between the 1995-2011 period, the Hantam LM economy grew at a compounded annual growth rate (CAGR) of 3.19%.

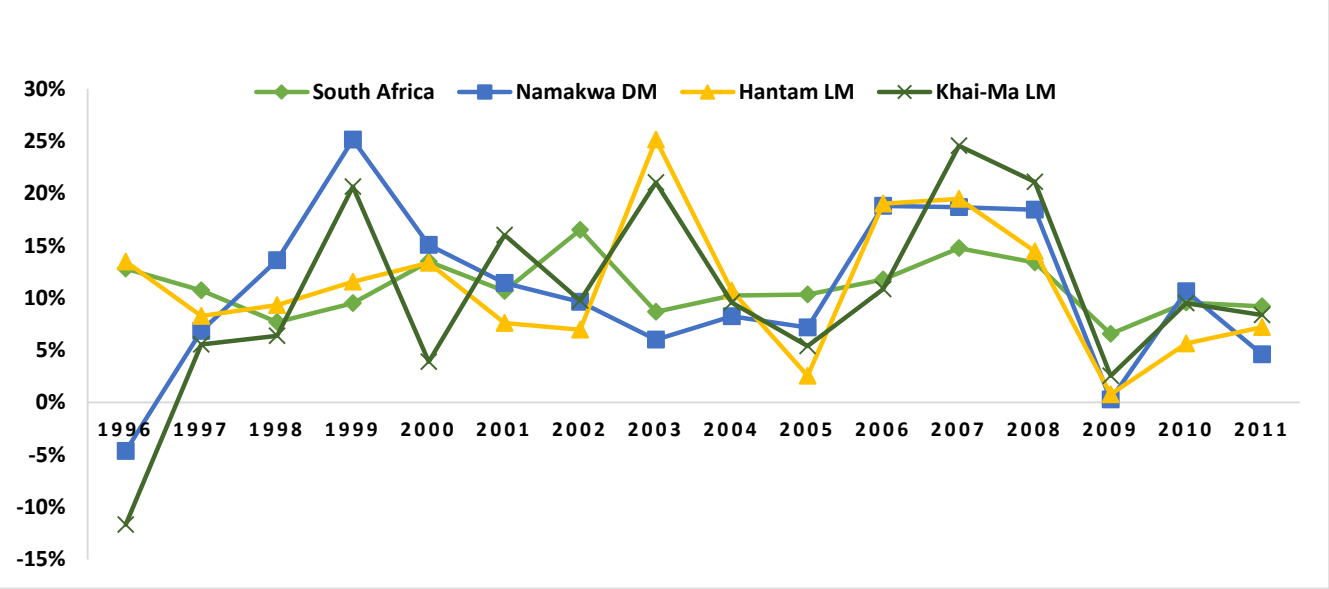


Figure 3-2: Regional economic GDP-R historical trends (Quantec, 2016)

The economy of the **Khai-Ma** LM lags behind the Hantam economy with a total size of R939 million in current prices (Quantec, 2016). This contribution accounts for 8.8% of the district's economy and 1.3% of the Province's economy. The Khai-Ma LM experienced similar growth patterns with Hantam, as it experienced stagnation in the year 2009 after the global recession and began recovering shortly after. At constant prices, the 16-year period (1995-2011) CAGR for Khai-Ma LM equates to 2.44%.

According to the Hantam LED Framework (2011), economic development ought to be sustainable. Ensuring that it is sustainable entails strengthening and diversifying the economy through a range of sectors such as the primary, secondary and tertiary sector which should cater for all consumer and business needs. Due to the fact that 72% of the GDP-R of the **Hantam LM** is generated by the tertiary sector, this LM is a service economy with prominent sub-sectors such as general government (13%); transport and communication (16%); as well as wholesale, retail, and trade (25%). A contributing factor to this is most likely the numerous government departments that are situated in Calvinia town as it serves as the main seat and administrative town of the Hantam LM (Hantam IDP, 2015). On the other end of the spectrum, within the primary sector, agriculture is the main contributor to GDP-R as it equates to 18% of the Hantam economy.

Although the mining industry currently has a very low contribution to the economy, 80% of the world's gypsum reserves lie just outside Loeriesfontein town; thus, an opportunity exists for salt and gypsum mining in the region as salt pans at Dwaggas Pit also employ 30 permanent workers (Umsebe Development Planners, 2010).

Since the start of the construction of Khobab and Loeriesfontein 2 wind farms, the informal hospitality industry in the town of Loeriesfontein has boomed as construction workers have been in need for accommodation in town. To meet the increased demand in accommodation, the majority of the town's residents have transformed their backyards and availed their garages for rent purposes.

In conjunction with the 20-year old wind museum in the town, the recently established wind farms have also added value to the tourism component of the area. Due to the influx of people in the town, the economic impact has been positive for the town; as a result of this, food and fuel sales have spiralled, increasing businesses' gross revenues and profits in an unprecedented manner. Further positive investments are expected to trickle down to the Loeriesfontein community when the surrounding wind farms start investing 5% of the generated profits in the community, which will take place in eight to nine years.

In the **Khai-Ma LM,** the primary sector contributes the highest percentage (67%) to the municipal GDP-R. Within the primary sector, mining and quarrying is the prominent industry with a contribution of 51%, whilst the agriculture industry contributes 15% to the overall economy. The high percentage contribution of the mining industry is most likely due to the presence of various minerals - such as zinc, copper, lead, granite, and quartz - within the municipal area (Umsebe Development Planners, 2010). Mining activity is thus exacerbated by the existence of the Black Mountain mine in Aggeneys town as well as the gypsum mine in Pofadder town. The second contributor to the GDP-R of the Khai-Ma LM is the tertiary sector with a contribution of 28%. Within the tertiary sector, the most imminent industries are general government (10%), transport and communication (6%) as well as wholesale and retail trade, catering, and accommodation (6%).

3.4 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

Labour force composition

During the year 2011, the total working population of the **Hantam LM** consisted of 13 680 people, within this figure, the total labour force only equated to 7 004 people. As outlined in Table 3-3 below, a percentage of 3.4% of people is described as discouraged job seekers, which typically refers to a group of people who are capable of searching for employment but have become discouraged and are no longer looking for employment. The difference between the number of people employed (6 122) and unemployed (882) in the region results in an unemployment rate of 12.6%, which is relatively low in comparison to the national and provincial unemployment rates (29.7% and 27.4%), respectively. Within the Hantam region, Loeriesfontein town has a slightly higher unemployment rate of 14.7% (Stats SA, 2011).

Although only 100-150 local residents are currently employed by the nearby wind farms, the impact of increased employment levels in **Loeriesfontein** has been significant; this is so because in the past the town was heavily reliant on income from extensive farming. However, in the event that agricultural farms undergo expansion, employment levels usually remain the same as farming in the area largely comprises of livestock farming, which is not very labour-intensive. However, with that being said, the prevalence of drug abuse has restricted the number of locals that can be employed as the impact of the drugs is said to result in a lack of personal motivation.

In the **Khai-Ma LM**, the total working population consisted of 8 541 people with a labour force equating to 5 889 people. In 2011, about 4% of people were recorded as discouraged jobseekers. The Khai-Ma LM has a relatively higher unemployment rate of 20.9% (Stats SA, 2011).

Table 3-3: National, Provincial & Regional Labour Force Profile

Town/settlement	Working age	Labour force			Discouraged job seekers	Unemployment rate
		Employed	Unemployed	Total		
South Africa	33928806	13254829	5586624	18841453	1848720	29,7%
Northern Cape	736205	284202	107379	391581	40170	27,4%
Namakwa DM	76579	33713	8455	42168	4258	20,1%
Hantam LM	13860	6122	882	7004	475	12,6%
Loeriesfontein	1767	680	117	797	33	14,7%
Khai-Ma LM	8541	4660	1229	5889	327	20,9%

(Stats SA, 2011)

Employment structure

As depicted in Figure 3-3 below, within the working age population (15-64 years) of the **Hantam LM**, about 60% of the individuals are employed in the formal sector whilst 21% are employed in the informal sector. Employment opportunities provided by private households equate to approximately 17% of the Hantam working population. Within the Hantam LM, Loeriesfontein town employed the least people in the formal sector resulting in it being the dominant job creator in the informal sector. In the **Khai-Ma LM**, more employment is offered in the formal sector whilst only a minority of people work in the informal sector. Similar patterns can be observed for the provision of employment by private households within the LM as well as the towns.

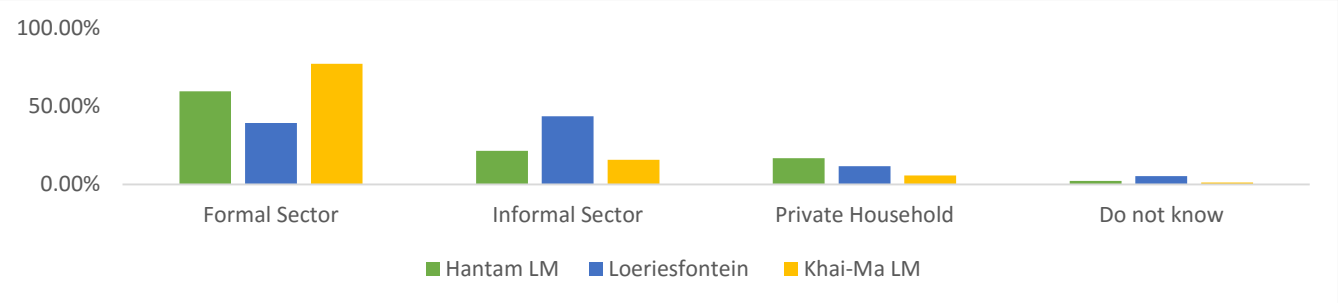


Figure 3-3 : Hantam LM regional employment by sector (Stats SA, 2011)

Within the formal sector, only 14% of people of the Hantam LM's working population are considered to be skilled, whilst the majority (30%) of the people either occupy jobs that require semi-skilled or low-skilled individuals. The rest of the working population (27%) is employed in the informal sector. In the Khai-Ma LM, very few individuals (10%) within the working population are considered skilled. Instead, similar to the Hantam LM, the majority of people are semi-skilled and lowly-skilled (Quantec, 2016). Twenty percent (20%) of the people within the LM are occupied in the informal sector. As it can be noted in Table 3-4 below, employment percentages by skill level for the local municipalities (Hantam and Khai-Ma) are relatively similar to the district's skill level percentages.

Table 3-4: Employment sector and compensation by skill level (2015)

Skills	Employment sector & compensation by skill level					
	Namakwa DM		Hantam LM		Khai-Ma LM	
	Employment	%	Employment	%	Employment	%
Formal: skilled	5092	14%	987	14%	446	10%
Formal: Semi-skilled	11151	32%	2004	29%	1613	36%
Formal: Low-skilled	9917	28%	2077	30%	1536	34%
Informal	8962	26%	1849	27%	879	20%

(Quantec, 2016)

In the Hantam LM, the tertiary sector is the largest contributor to formal and informal employment with 60% share of all employment provided in the municipality. As depicted in Table 3-5 below, such employment consists of opportunities working in wholesale and trade (18%), finance and business services (7%), general government (17%) as well as community, social and personal services with 15%. Although the Hantam LM is dominated by the services sector, within the primary sector, agriculture employs the largest number of people (29%). The secondary sector makes very little contribution to employment services as it only accounts for 10% of the Hantam working population.

In contrast, the Khai-Ma LMs labour force is dominated by the primary sector, equating to 54% of the municipal working age population. Within this sector, half of the total employment within the municipality is provided by the agriculture industry. The tertiary sector is the second largest contributor to job creation in the Khai-Ma LM; within this sector, prominent industries include general government (12%) and wholesale and retail trade (12%). The secondary sector lags with a contribution of 10% to the working population.

Table 3-5: Employment by economic services in region (2015)

Economic sector	Employment by area					
	Namakwa DM		Hantam LM		Khai-Ma LM	
	Employment	%	Employment	%	Employment	%
Agriculture, forestry & fishing	7948	23%	1972	29%	2220	50%
Mining and quarrying	783	2%	2	0%	175	4%
Manufacturing	1384	4%	140	2%	335	7%
Electricity, gas & water	152	0%	20	0%	4	0%
Construction	2760	8%	564	8%	114	3%
Wholesale and retail trade, catering, and accommodation	7016	20%	1253	18%	517	12%

Economic sector	Employment by area					
	Namakwa DM		Hantam LM		Khai-Ma LM	
	Employment	%	Employment	%	Employment	%
Transport, storage, and communication	1138	3%	218	3%	64	1%
Finance, insurance, real estate, and business services	2689	8%	493	7%	178	4%
General government	6269	18%	1200	17%	557	12%
Community, social and personal services	4983	14%	1055	15%	310	7%
Industry employment total	**35122**	**100%**	**6917**	**100%**	**4474**	**100%**

3.5 Income

In order to improve the living standards of residents in terms of to the minimum living level (MLL), which broadly refers to the minimum monthly income needed to sustain a household, the Khai-Ma SDF stipulates that a greater disposable income per household is required. Linked to this point, economic development is thus seen as an essential pathway to raising the living standards and general well-being of residents (Umsebe Development Planners, 2010).

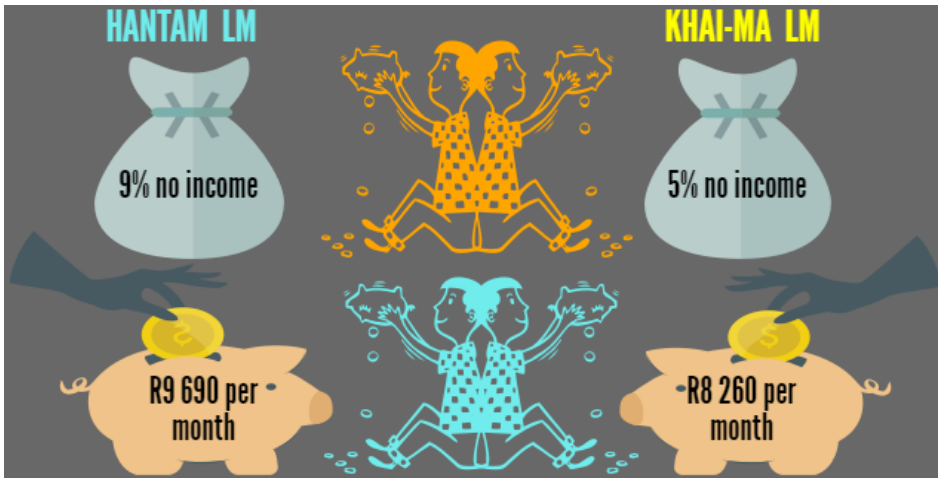


Figure 3-4: Hantam and Khai-Ma LM household income distribution (Stats SA, 2011) (Quantec, 2016)

The average household annual income in the **Hantam LM** is R116 276 in 2016 prices; this implies an average household monthly income of R9 690. The monthly income for Loeriesfontein is R10 620; these figures are relatively higher than the provincial average income, which is R8 521 per month. As highlighted in Table 3-6 below, 9% of households do not have a regular amount of income in both the Hantam LM and Loeriesfontein town which is on par with the national and provincial levels, where the proportion of people who do not receive any form of income equated to 9% and 7% respectively. In the Hantam LM, 54% of people fell below the poverty line as they earned less than R3 200 per month.

The main source of income in the municipality is the agricultural sector - predominantly sheep farming and rooibos tea. The second largest income contributor is the community employment sector - particularly the social and personal services industry.

Subsequent to the establishment of the two wind farms in the area, new economic opportunities in **Loeriesfontein** town have emerged. Public transport has benefitted as a result of the increased demand for the transportation of workers to and from construction sites. Cleaning services have also provided work opportunities for unemployed individuals whilst informal trading amongst residents has also increased and has stimulated further income and job creation in the town. Wind farm construction companies either pay their workers once a month or every fortnight; this has resulted in more money in circulation as the purchasing power of local residents also increased. This is important as it may assist in reducing the number of people living below the poverty line. Upon consultation, one farmer went to the extent of sharing that poverty levels have been slightly alleviated in the Loeriesfontein town.

The average household annual income in the **Khai-Ma LM** was R99 144 in 2016 prices; this equated to an average household monthly income of R8 262. The main source of income in Khai-Ma is the Black Mountain Mine situated in Aggeneys town as well as several government departments. Commercial farmers depend on incomes generated from their farms. The rest of the residents are either dependent on the government grant or they earn a living by providing housekeeping and gardening services (Umsebe Development Planners, 2010).

Table 3-6: Household per monthly income group (2011)

Indicator	Namakwa DM	Hantam LM	Loeriesfontein	Khai-Ma LM
No income	8%	9%	9%	5%
R1 – R3 200	54%	57%	61%	62%
R3 201 – R6 400	14%	12%	12%	10%
R6 401– R12 800	12%	11%	10%	13%
R12 801– R25 600	7%	6%	4%	6%
R25 601– R51 200	2%	2%	2%	1%
>R51 200	4%	3%	3%	2%

(Stats SA, 2011)

3.6 Access to services and state of local built environment

Access to shelter, water, electricity, sanitation, and other services are indicators that assist in determining the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure is another indicator to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities further indicates the nature of the study area, which is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against which the potential impacts of the proposed project can be assessed.

3.6.1 Settlement profile

In comparison to the national population density (42 people/km^2), the Hantam LM is characterised by a low density of people per square kilometre. It is also relatively lower than the district (0.91 people/ km^2)

and provincial (3.07 people/ km^2) density. Although population densities for the LM are significantly low (0.59 people/ km^2), as outlined in **Table 3-7** below, Loeriesfontein town has a higher population density of 79.69 people/km^2 making it the most densely populated area between the three areas under analysis.

Table 3-7: Population density of Hantam and Khai-ma LM (2011)

Indicator	Towns in the Hantam & Khai-Ma LM's		
	Hantam LM	Loeriesfontein	**Khai-Ma LM**
Population total	21581	2746	12466
Area (Sq. Km)	36128.07	34.45	16627.9
Population density	0.59	79.69	0.74

(Stats SA, 2011)

The Khai-Ma LM also has a relatively low population density with only 0.74 people/km^2, making it a sparsely populated region. Most people in the Khai-Ma LM are situated in the urban areas or in agricultural clusters along the Orange River, which also provides opportunities for water sport and recreation as well as resort development (Umsebe Development Planners, 2010)

3.6.2 Access to Housing and Basic Services

With respect to basic service provision and housing, the Namakwa DM is responsible for assisting and ensuring that local municipalities provide adequate housing to inhabitants in their jurisdiction. The current level of access to various basic services in the municipality are as follows:

Housing

During the year 2011, housing shortages in the **Hantam LM** were an acute problem. In the Hantam LM, 94% of houses had access to formal housing (i.e. a house made of brick or a concrete structure on a separate yard). Towns of the Hantam LM followed a similar path with Loeriesfontein having 94% access to formal housing (Stats SA, 2011). Amongst other pressing developments of the municipality, new housing unit developments have been identified by the Hantam SDF (Umsebe Development Planners, 2010). In comparison to the Hantam LM, the **Khai-Ma LM** residents had less access to formal housing, as only 74% of inhabitants resided in formal housing structures (Stats SA, 2011).

Access to water

In the **Hantam LM,** more than 90% of the households have access to piped water either inside their dwellings or yards. This includes residents living in Loeriesfontein town. More than 95% of water for the Hantam LM as well as for nearby towns is supplied by a regional or local water scheme operated by the municipality. In the **Khai-Ma LM**, more than 90% of households have access to piped water either in their dwellings or yards. A very low percentage of people do not have any type of access to piped water in the Khai-Ma LM.

Access to sanitation

Although the Spatial Development Framework suggests that almost all households in the **Hantam LM** had access to flush toilets in 2011 (Umsebe Development Planners, 2010), statistics show that just over three quarters (76%) of households in Hantam LM have access to flush toilets, either connected to the sewerage or to a septic tank. Whilst the Hantam LM believes to have eradicated the bucket system (Umsebe Development Planners, 2010), 3.1% of residents rely on the bucket latrine system whilst 0.9%

do not have any form of access to any form of sanitation (Stats SA, 2011). Just over half of Loeriesfontein residents utilise flush toilets. The **Khai-Ma LM** has the same proportion of people who have access to flush toilets as the Hantam LM, with 6% of people not having access to any type of sanitation.

Access to electricity

In the **Hantam LM**, only urban areas are provided with electricity whilst the rural areas depend on other sources (Umsebe Development Planners, 2010). Slightly more than three-quarters (77%) of households in the municipality have access to electricity for lighting whilst only 15% and 7% of people use candles and solar power for lighting, respectively (Stats SA, 2011). Similar trends can be noted when assessing the towns of the municipality, as more than 90% of Loeriesfontein town residents have access to electricity. One of the objectives of the municipality is to improve the living standards of its residents by implementing opportunities for bulk infrastructure development (Urban-Econ Development Economists, 2011). Although the SDF highlights electricity as one of the sectors experiencing backlogs in the **Khai-Ma LM**, 90% of households in the municipality use electricity for lighting whilst the rest use 7% candles and 2% use solar power. Development objectives premised on the optimisation of resources relating to bulk infrastructure such as electricity remains a goal for the municipality (Umsebe Development Planners, 2010).

3.6.3 Transport infrastructure

The transport sector plays a vital role in meeting the objectives of economic development, access to employment opportunities, and social infrastructure (Dennis Moss Partnership, 2012). As a result of this, industrial development ought to take the mode of transport utilised by the labour force of a particular region into consideration. This means that new economic developments should not be situated far from the pick-up or drop-off points of various means of transport (Urban-Econ Development Economists, 2011). In 2001, just over a third (36.8%) of people in the Hantam LM travelled to work or school by foot. The rest of the people used public transport (4.92%) whilst others made use of bicycles (1.39%) and their own transport facilities (5.12%) (Stats SA, 2001). Using the R55 gravel road, the distance between Calvinia and Loeriesfontein is 86km, whilst travelling from Calvinia to Brandvlei requires the utilisation of the R27 tar surface road for approximately two hours and 30 minutes.

The **Hantam LM** is traversed by several regional roads and encompasses two transport corridors (Umsebe Development Planners, 2010):

- Niewoudtville-Calvinia-Williston corridor: consisting of the R63 tar road and railway link among Calvinia, Williston and Carnarvon, which links Gauteng and the Western Cape
- Nieuwoudtville-Calvinia-Brandvlei-Kenhardt corridor: consisting of the R27 tar road leading from Cape Town to Upington, which provides a shortcut alternative to the route via Springbok and is often used by trucks particularly during the grape season. Considering that this is the main route in the region, it is essential that this road is maintained as it is of economic importance to the area.

The **Khai-Ma** IDP places emphasis on the need for local communities to have adequate access to services through the provision of sufficient transport infrastructure. Although the Khai-Ma LM recognises the need for sufficient transport facilities, about 30% of people walked home either to and from work or

school. The second most utilised mode of transport is public transport in the form of buses, trains, and taxis (Umsebe Development Planners, 2010).

As derived from the above, there is currently no national road that passes through the Hantam municipal area. Due to the influx of people and heavy load traffic in the Hantam LM as well as nearby towns, the main route (R27) in the area, which is also the only tarred road connecting Nieuwoudtville and Brandvlei via Loeriesfontein, has been rapidly deteriorating and needs to be frequently maintained.

With respect to water availability in the area, consultations with farm owners revealed that the affected farm portions do not have any direct access to water as it is a scarce resource in the area. To prevent water shortage impacts, some farmers in the area have reservoirs within their property or use water tanks to store water

3.6.4 Social and Recreational Infrastructure

More often than not, residents require access to social services and shared community experiences in order to create a sense of belonging to an area. Access to sufficient social infrastructure such as schools, universities, medical facilities also plays a significantly important role in maintaining the social contact within communities. Whereas, a lack of social infrastructure results in a number of inconveniences and triggers long-term community dissatisfaction. Throughout the country, district, and local municipal level, government therefore has the mandate and responsibility to provide and build adequate facilities such as schools, hospitals, police stations, post offices safety as well as recreational amenities.

Social and recreational infrastructure provision within the Hantam and Khai-Ma LM is depicted below:

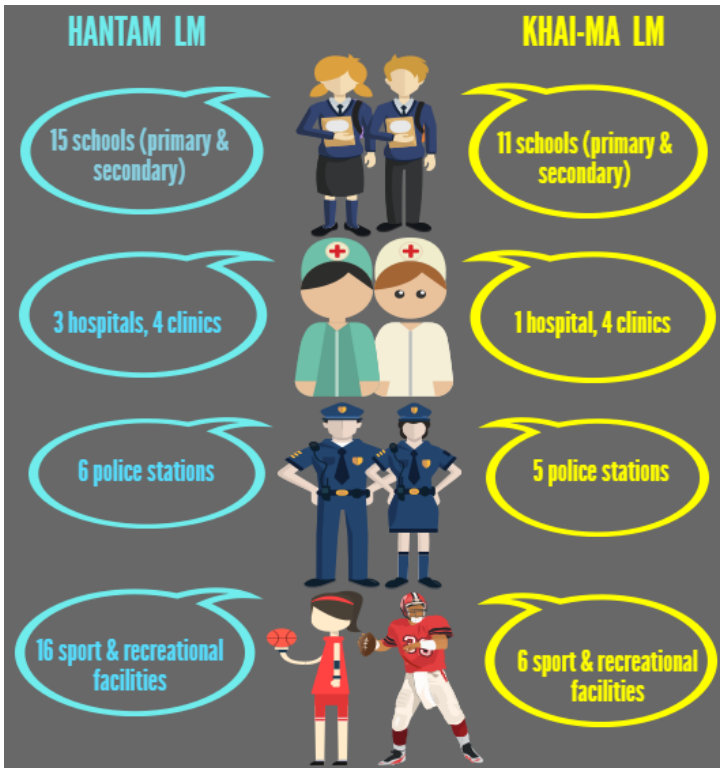


Figure 3-5: Hantam and Khai-Ma LM social and Recreational Infrastructure

4 PROFILE OF THE ZONE OF INFLUENCE

There are approximately 15 farm portions located in the zone of influence of the power line alternatives and on-site and linking substations site options. The following table indicates the farm options that may be affected by these alternatives.

Table 4-1: Zone of influence of power line and substation alternatives (portion and farm name)

Farm Portion	Power lines				On-site substation		Linking substation	
	O1	O2	O3	O4	Alt 1	Alt 2	Alt 1	Alt 2
Portion 2 of Georges Vley Farm No.217								
Portion 1 of Hartebeestleegte Farm No.216								
Portion 1 of Graskoppies Farm No.176								
Portion 1 of Konnes Farm No.183								
Portion 0 of Buchufontein Farm No.184								
Portion 0 of Springbok Pan Farm No.1164								
Portion 2 of Springbok Tand Farm No.215								
Rem of Springbok Tand Farm No.215								
Portion 2 of Karree Doorn Pan Farm No.214								
Portion 1 of Karree Doorn Pan Farm No.214								
Rem of Aan Der Karree Doorn Pan Farm No.213								
Portion 2 of Aan Der Karree Doorn Pan Farm No.213								
Portion 0 of Leeubergrivier Farm No.1163								
Rem of Klein Rooiberg Farm No.227								
Rem of Sous Farm No.226								

Given the information gathered through the telephonic interviews with the I&APs, the following can be summarised with respect to the zone of influence applicable to each alternative and substation site options:

Table 4-2: Zone of influence of power line alternatives and substations alternatives

Alternative		Brief Overview
Power line option	Option 1 (Green)	• May affect up to nine farm portions but does not cut across any farm portions • Cuts across the Sishen-Saldanha Railway line • Follows the farm portion boundary of the currently under construction Khobab wind farm for 16km
	Option 2 (Blue)	• May affect up to eleven farm portions • Cuts across the Sishen-Saldanha Railway line
	Option 3 (Pink)	• May affect up to seven farm portions • The shortest route in terms of kilometres • Directly cuts across four of the affected farm portions • Cuts across the Sishen-Saldanha Railway line
	Option 4 (Light blue)	• May affect up to thirteen farm portions • The longest route in terms of kilometres • Follows the R358 route for about 10km • Cuts across the Sishen-Saldanha Railway line • Will follow the border of the currently under construction Loeriesfontein 2 wind farm for about 8km • Cuts across the currently under construction Khobab wind farm for about 8km • Directly cuts across one farm portion

Alternative		Brief Overview
On-site Substation alternative	Alternative 1	• Will affect one farm portion • Will be located on farm used for commercial sheep farming • Will be located on same farm as the proposed !Xha Boom wind facility
	Alternative 2	• Will affect one farm portion • Will be located on farm used for commercial sheep farming • Will be located on same farm as the proposed !Xha Boom wind facility
Linking Substation alternative	Alternative 1	• Will affect one farm portion • Will be located on farm used for commercial sheep farming
	Alternative 2	• Will affect one farm portion • Will be located on farm used for commercial sheep farming

The engagement with the I&APs suggested that majority of the local land owners did not have any objections to the proposed substations and powerline. Most of the property owners highlighted their understanding of the importance of renewable energy projects in the context of South Africa. With this being said, there were some concerns expressed regarding the uncertainty of the path that would be followed by the power line. Such concerns were linked to the need to understand whether the proposed power line would affect the fencing on the farms. In addition, the presence of similar renewable energy developments that currently traverse the surrounding farm portions can also be used as an indication to further deduce that the landowners do not have any major concerns related to the establishment of the project.

5 SOCIO-ECONOMIC IMPACT EVALUATION

The following sections discuss the socio-economic impacts that the proposed power line and substations are envisaged to create, considering the knowledge of the potentially affected socio-economic environment related to each alternative and option. Based on feedback collected during the interviews with I&APs as well as the information about the proposed activities. The following potential impacts were identified and will be analysed further in the section.

- Impact 1: Stimulation of the economy and employment during the construction
- Impact 2: Increased risk of threat to personal safety and livestock theft during the construction phase
- Impact 3: Impact on sense of place
- Impact 4: Impact on service infrastructure

5.1 Impact 1: Stimulation of the economy and employment during construction

The process of constructing power lines and developing substations is often associated with the need to acquire various goods such as steel products, electrical components, cables, bricks, cement, etc. In the event that the required material is purchased locally, i.e. within South Africa, the production of the respective businesses supplying the goods will increase. In addition to this, the erection of the power lines and substation development will require the project proponent to source construction supporting activities/businesses who will facilitate the whole process. The outcome of the spending that will occur as a result of the procurement of the mentioned material and the hiring of construction services will result in the stimulation of the national economy as well as the local district (where inputs or services are procured).

The costs associated with the construction of the on-site substation and linking substation will be the same regardless the power line route chosen. With respect to the construction of the power line, though, the opposite is true. This is so because although the cost per kilometre of the power line is the same (i.e. estimated at R3mil/km), the power line route alternatives considered for the project are of different length and will therefore result in a differing capital expenditures. Therefore, the longer the route, the greater the expense of the power line erection, which ultimately results in a greater capital injection in national and local economies. Considering the length of different routes mentioned earlier in the report, Option 1, 2 and 4 appear to be the preferred options from an economic perspective. Option 3 is also an acceptable option, but since its length is significantly shorter than the other route alternatives, it is a favourable option from the perspective of economic stimulus and job creation.

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
On-site Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option
On-site Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option

Alternative	Preference	Reasons (incl. potential issues)
Linking Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option
Linking Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option
GRID LINE CORRIDOR ALTERNATIVES		
Grid Line Option 1	**PREFERRED**	• 52.2km in length • R156.6mil in investment This alternative is associated with one of the highest investment requirements and will lead to one of the highest economic benefits.
Grid Line Option 2	**PREFERRED**	• 52.8km in length • R158.4mil in investment This alternative is associated with one of the highest investment requirements and will lead to one of the highest economic benefits.
Grid Line Option 3	**FAVOURABLE**	• 47km in length • R141mil in investment This alternative is associated with the shortest route for power line and, therefore, will result in the smallest economic benefit during construction
Grid Line Option 4	**PREFERRED**	• 53.4km in length • R160.2mil in investment From the economic perspective, this alternative is associated with the highest investment requirements and will lead to the highest economic benefits.

Production and temporary employment creation during construction	
Environmental Parameter	Production in the national and local economy and employment associated with these activities.
Issue/Impact/Environmental Effect/Nature	Investment in construction of the power line and the substation will lead to procurement of goods and services and will result in creation of employment opportunities for the members of the local communities and nationally.
Extent	The impact will affect the entire country.
Probability	The impact will likely occur (between 50% and 75% chance of occurrence.

Reversibility	The impact is completely reversible.	
Irreplaceable loss of resources	The impact will not result in any loss of resources.	
Duration	Short-term. The impact will only last for the duration of the construction period (12 months and above).	
Cumulative effect	Considering the nature of the proposed development and the fact that the area that the proposed development will be in is already imbued with a presence of a number of RE projects; it is highly unlikely that it will result in a significant cumulative effect. This is so because of the size of the project as well as the expected coinciding nature of the all RE projects.	
Intensity/magnitude	The impact is rated as positive low.	
Significance rating	**Prior to mitigation measures:** Positive low impact **After mitigation measures:** The rating remains the same.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	2	2
Intensity/magnitude	1	1
Significance rating	+12 (Positive Low)	+12 (Positive Low)
Mitigation measures	• To increase the profitability of the project and ensure the trickling down effect to the local economy, the project proponent must source the materials and equipment in South Africa. • Where feasible (i.e. in cases where the appointed individuals match the skills required), the proponent is to ensure the employment of local labour. • Ensure effective lines of communication and disseminate as much information to local communities regarding the project and employment opportunities for contracting small businesses. Although the proposed mitigation measures could increase the positive impact on the local economy, it would not change the overall total impact. Therefore, the ratings for the impact will remain the same.	

5.2 Impact 2: Increased risk of threat to personal safety and livestock theft during construction phase

The erection of power lines and substations' development is expected to increase the movement and presence of people in and around the farms. Based on the information given by the project proponent, ±70% of the jobs will be allocated to local community members. As a result of this, the increased presence of people around the farms will not only increase the threat to the personal safety of landowners, but it will also result in the increased risk of livestock theft due to high exposure to people during construction. Linked to this, one of the interviewed I&APs (landowner of Portion 2 of Farm Graskoppies no.176) expressed that although he has no concerns with the erection of the power lines and development of substations, he was concerned about the possibility of the power lines affecting his fencing which he uses to control the sheep from wandering about, thus increasing the risk of losing the stock and their exposure to theft. To alleviate this impact, farms that will be affected by the construction of the power line must practice strict access control, and rules made by the farmers regarding access to their properties must also be adhered to.

Regarding the power line alternatives, the most preferred alternative would be the option that affects the least farm portions and is also the shortest, as this reduces the level of risk and exposure (in terms of time) of farmers to crime-related activities such as burglaries and livestock theft, whilst the least preferred option would be the alternative that affects the most farms. In the case of the proposed facility, the route that affects the least farm portions and by coincidence is also the shortest route is corridor option 3. However, although option 3 affects the least farms and is also the shortest route, it also directly cuts across four farms, which is in this case used as a proxy to determine the extent of the landowners' exposure to life-threatening occurrences. Due to this, option 3 will most probably result in a low-medium impact to landowners and will therefore be listed as the preferred option (which highlights that the alternative will result in a low impact).

With respect to the on-site and linking substation alternatives, no differentiation can be made as the impact will remain the same despite the alternative chosen.

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
On-site Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option
On-site Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option
Linking Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option
Linking Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option
GRID LINE CORRIDOR ALTERNATIVES		

Alternative	Preference	Reasons (incl. potential issues)
Grid Line Option 1	**FAVOURABLE**	Except for option 3, no differentiation can be made between this alternative and option 2. This power line option is 52.2km and will affect nine farm portions.
Grid Line Option 2	**FAVOURABLE**	Except for option 3, no differentiation can be made between this alternative and option 1. This power line option is 52.8km and will affect eleven farm portions.
Grid Line Option 3	**PREFERRED**	The alternative is the shortest route (47km) and is likely to lead to a shorter period of exposure to the risk as it affects seven farm portions which is the least in comparison to option 1,2 and 4.
Grid Line Option 4	**NO PREFERENCE**	This power line option is the longest route (53.4km) and will therefore affect the highest number of farm portions (thirteen), thus increasing the exposure to risk and livestock theft. It is the least preferred among the other options, but no issues could be identified to make it "not preferred".

Increased risk of threat to personal safety and livestock theft during construction	
Environmental Parameter	Threat to personal safety and security of assets such as livestock.
Issue/Impact/Environmental Effect/Nature	Increased foot traffic in and around the farms is expected to increase the risk of local landowners to criminal activities.
Extent	The impact will affect the site.
Probability	The impact will likely occur (between 50% to 75% chance of occurrence).
Reversibility	The impact is partly reversible.
Irreplaceable loss of resources	The impact will not result in any loss of resources.
Duration	Short term. The effects of the impact (increased risk to personal safety) will only last for the duration of the construction phase.
Cumulative effect	If approved, the building of the proposed project will occur during the building of the !Xha Boom wind farm and will most probably coincide with the simultaneous development of other projects that have received environmental authorisation or are at the EIA stage. This means that the cumulative effect of this project will not result in any significant changes and will therefore be low.
Intensity/magnitude	Low. Though it is uncertain, it is possible that the people employed for the development of the !Xha Boom wind farm will

	be the same people employed for the construction of the power line. If this is the case, then the intensity of the impact will be barely perceptible.	
Significance rating	Negative low	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	2	2
Intensity/magnitude	1	1
Significance rating	-10 (Negative Low)	-9 (Negative Low)
Mitigation measures	• Minimise the possibility of attracting a number of people in search for employment in the vicinity of the farms by ensuring clear communication regarding the project. • Engage with property owners prior to the developing of the substations and erection of the power line to ensure that the expectations (rules) of the farmers regarding access to farms are understood and effectively adhered to. • Construction workers must be thoroughly informed of the rules made by farmers and be made to understand the accompanying consequences. • Implement controlled access to farm properties where the power line and substations will be built and will ensure that the construction workers are on site during reasonable working hours. Although the proposed mitigation measures will minimise the negative impact, it will not change the total impact; therefore, the rating significance remains the same.	

5.3 Impact 3: Impact on the sense of place

According to the plans of the project proponent regarding the development of the substations as well as the erection of the power lines, the connection of the wind turbines will require the use of buried medium voltage cables except where a technical assessment of the proposed design suggests overhead lines as the more appropriate option. Overhead lines often make more sense over rivers and gullies. As such, where overhead lines are required, the use of H-pole tower types will be used.

In light of the above, the proposed power lines and substations can be expected to result in a change in the sense of place in the area. This is mostly because the infrastructural components mentioned above, as well as the construction of internal access roads, temporary construction laydown areas, administration and maintenance buildings, will all be built in an area that is relatively undeveloped and will further increase the development footprint of the project. Although this is the case, the establishment

of other proposed renewable energy facilities in the vicinity makes it reasonable to assume the future presence of similar power lines. Currently, two wind farms and one solar PV plant have been approved under the RE IPPPP whilst four other projects (three wind farms and one solar PV plant) have received environmental authorisation whilst an additional six projects (all wind farms) are currently at the environmental impact assessment (EIA) stage (including the !Xha Boom wind farm energy facility). Therefore, considering the presence of other proposed facilities, regardless of their current status of development, the landscape of the area is most likely to change significantly. However, in view of the nature of the proposed developments, none of them will alter the landscape to such an extent of completely affecting the current land-use of the area, which is predominantly commercial sheep farming, or alter the rural nature of the locality.

During the interviews with the I&APs, only one farm owner (Portion 2 of Farm Karree Doorn Pan no.214) expressed a preference that the chosen power line alternative rather follow his farm boundary on the northerly side (power line corridor option 4) as opposed to the farm boundary along the west (power line corridor option 2). The reason for the preference toward option 4 is because the farm boundary on the west (which is corridor option 2) has a bushveld which is of notable importance to the farmer. This farmer's particular concern also stemmed from the fact that Eskom already has a servitude running across his farm.

In light of the envisaged changes to the landscape as well as the concerns raised, the impact of the proposed 132 kV power line and 132 kV substations is expected to be negligible.

From the outlook of the erection of the power line route options, only route options 1 and 2 are equally acceptable. This is so because although option 3 affects the least farms, it directly cuts across four of the farm properties. While option 4 affects the most properties, it is also the only option that follows the route of a regional road for about 10km whilst also cutting across the farm portion with the currently under construction Khobab wind farm. Based on this information, there is no differentiation between options 3 and 4 as they are both associated with a higher impact on the sense of place.

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
On-site Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
On-site Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Linking Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Linking Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
GRID LINE CORRIDOR ALTERNATIVES		
Grid Line Option 1	**FAVOURABLE**	This alternative is expected to be associated with the lowest impact, similar to option 2.
Grid Line Option 2	**FAVOURABLE**	This alternative is expected to be associated with the lowest impact, similar to option 1.

Alternative	Preference	Reasons (incl. potential issues)
Grid Line Option 3	**NO PREFERENCE**	Similar to option 4, this option is also expected to result in one the highest impacts. However, no differentiation between this alternative and option 4 is suggested.
Grid Line Option 4	**NO PREFERENCE**	This alternative is associated with the higher impact as it affects the most farm portions and is likely to affect a greater sensitive group. However, no differentiation between this alternative and option 3 is suggested.

Impact on the sense of place		
Environmental Parameter	Sense of place.	
Issue/Impact/Environmental Effect/Nature	The addition of physical infrastructure will change the landscape and alter the sense of place of farm owners.	
Extent	The impact will affect the local area.	
Probability	The impact will certainly occur (greater than 75% chance of occurrence).	
Reversibility	The impact is expected to be reversible during the decommissioning phase.	
Irreplaceable loss of resources	The impact will not result in any loss of resources.	
Duration	The impact will most probably last past the operation phase.	
Cumulative effect	With the construction of other power lines and substations, the cumulative effect of this project is expected to be low.	
Intensity/magnitude	Considering the expected occurrence of other power lines from the currently under construction wind farms, the intensity of this impact is barely perceptible.	
Significance rating	Negative low	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	1	1
Irreplaceable loss	1	1
Duration	4	3
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-13 (Negative Low)	-12 (Negative Low)
Mitigation measures	• Implement mitigation measures recommended by the relevant specialist (i.e. visual). • Deconstruct the power line and substations once the wind facility is decommissioned.	

5.4 Impact 4: Impact on service infrastructure

Considering that the whole aim of the proposed substations and power line erection is to feed electricity generated at the wind farm into the national electricity grid, the establishment of these facilities will assist in increasing the capacity of the national grid. Accompanying benefits of the connection of the proposed facility to the national grid also includes the simultaneous greening of the economy (through the reduction of the use of coal for electricity production) whilst strengthening the national supply of electricity.

The impact will be the same regardless of the power line route chosen and substation alternatives; thus, no preference between these alternatives can be determined.

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
On-site Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
On-site Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Linking Substation Option 1	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Linking Substation Option 2	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
GRID LINE CORRIDOR ALTERNATIVES		
Grid Line Option 1	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Grid Line Option 2	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Grid Line Option 3	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.
Grid Line Option 4	**NO PREFERENCE**	No differentiation between this and the other option, equally acceptable.

Impact on service infrastructure	
Environmental Parameter	Electricity distribution infrastructure.
Issue/Impact/Environmental Effect/Nature	The proposed 132 kV power line and substation will allow the evacuation of generated electricity at the proposed !Xha Boom facility to the national grid.
Extent	The impact will affect the entire country.
Probability	The impact will certainly occur (greater than 75% chance of occurrence).
Reversibility	The impact is reversible.

Irreplaceable loss of resources	The impact will not result in any loss of resources.	
Duration	Effect of the impact will extend beyond the operation phase.	
Cumulative effect	The impact would result in negligible to no cumulative impacts.	
Intensity/magnitude	Medium. The impact will feed 235 MW to the national grid.	
Significance rating	Positive medium	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	4	4
Reversibility	1	1
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	1	1
Intensity/magnitude	2	2
Significance rating	+30 (Positive Medium)	+30 (Positive Medium)
Mitigation measures	• No enhancement measures proposed.	

6 CUMULATIVE EFFECT ANALYSIS

The development of numerous RE facilities in the same area has the potential to result in positive cumulative impacts. Such impacts often include the creation of employment opportunities for the local community, skills development as well as the creation of local business opportunities. However, negative impacts such as the change in sense of place as a result of the development footprint of the various projects cannot be ignored.

The area chosen for the proposed development has a notable presence of RE projects. Although such RE projects highlight the suitability of the area, all projects are at different stages of application. Currently, only two of these projects, namely Khobab and Loeriesfontein 2 wind farms, are under construction whilst the Solar Capital Orange PV facility is in the approval and financing stage. See Figure 6-1.

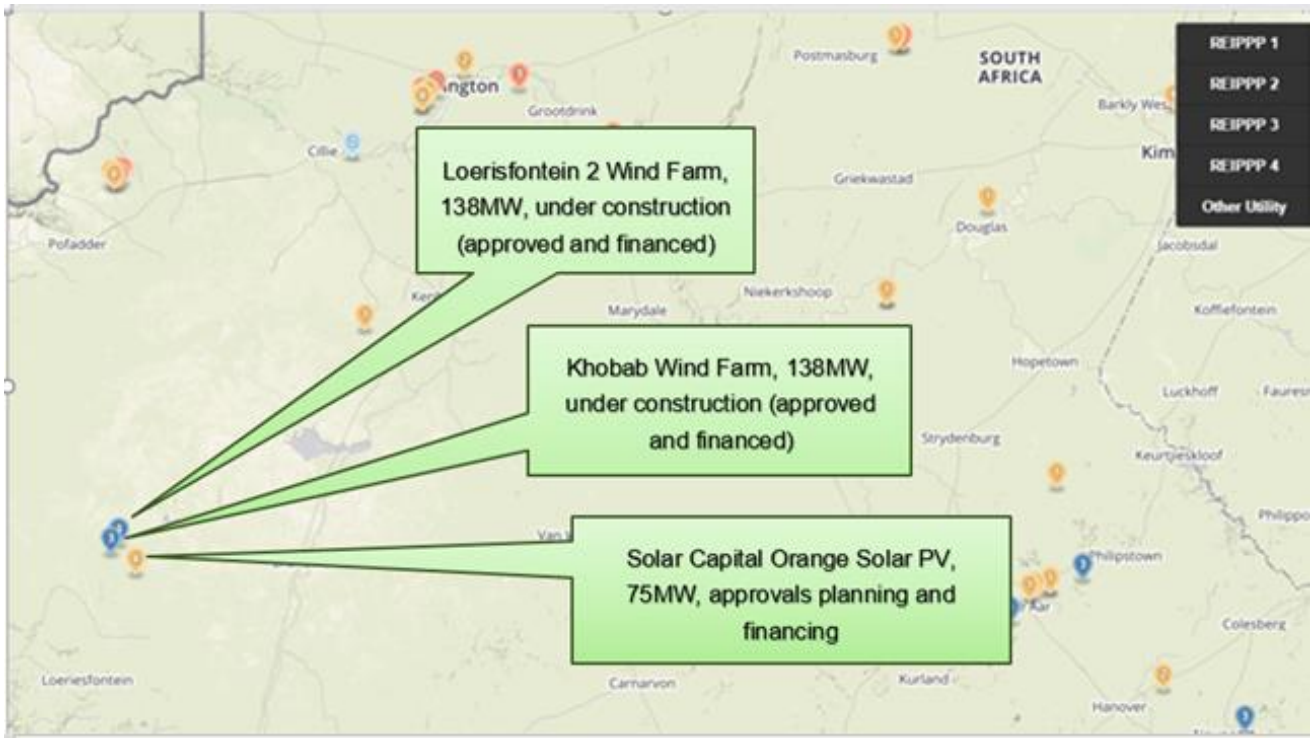


Figure 6-1: Map of approved for construction RE projects in the area

In the event that more than one RE facility is built in the immediate vicinity of the !Xha Boom Substation facility, both positive and negative impacts are likely to be amplified. As illustrated in Table 6-1, almost all the projects listed below are located in close proximity to the !Xha Boom Substation facility. Furthermore, four of the ten projects have received environmental authorisation whilst the rest (six projects) are at the environmental impact assessment (EIA) stage.

Table 6-1: Projects under investigation or proposed for development as part of RE IPPPP

Development	Current status of development	Proponent	Capacity	Farm details
Dwarsrug Wind Farm	Environmental Authorisation Issued	Mainstream Renewable Power	140MW	Rem of Farm Brak Pan 212 & Stinkputs No. 229

Development	Current status of development	Proponent	Capacity	Farm details
Graskoppies Wind farm	Environmental Impact Assessment (EIA) underway	Mainstream Renewable Power	235MW	• Pt2 of Graskoppies Farm No.176 • Pt1 of Hartebeest Leegte Farm No.16
Loeriesfontein PV3 Solar Energy Facility	Environmental Authorisation Issued	Mainstream Renewable Power	100MW	Pt 2 of Farm Aan de Karree Doorn Pan No. 213
Hantam PV Solar Energy Facility	Environmental Authorisation Issued	Solar Capital (Pty) Ltd.	75MW	Rem of Narosies No.228
Hartebeest Leegte Wind Farm	Environmental Impact Assessment (EIA) underway	Mainstream Renewable Power	235MW	• Rem of Hartebeest Leegte Farm No.216
Ithemba Wind Farm	Environmental Impact Assessment (EIA) underway	Mainstream Renewable Power	235MW	• Pt2 of Graskoppies Farm No.176 • Pt1 of Hartebeest Leegte Farm No.16
PV Solar Power Plant	Environmental Authorisation Issued	BioTherm Energy	70MW	Pt 5 of Farm Kleine Rooiberg No. 227
Kokerboom 1 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investment No. 1788 (Pty) Ltd (BVI)	240MW	• Rem of Farm Leerbergrivier No. 1163 • Rem of Farm Kleine Rooiberg No. 227
Kokerboom 2 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investment No. 1788 (Pty) Ltd (BVI)	240MW	• Rem of Farm Springbok Pan No. 1164 • Rem of Farm Springbok Tand No. 215
Kokerboom 3 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investment No. 1788 (Pty) Ltd (BVI)	240MW	• Rem of Farm Ann De Karree Doorn Pan No.213; • Portion 1 of the Farm Karree Doorn Pan No.214 • Portion 2 of Farm Karree Doorn Pan No.214
Wind Farm	Environmental Authorisation Issued,	Mainstream Renewable Power	50MW	• Portion 1 of the Farm Aan de

Development	Current status of development	Proponent	Capacity	Farm details
	however project is no longer active			Karree Doorn Pan 213

6.1.1 Literature review sources

The following documents were reviewed in relation to the above-mentioned projects to identify the potential cumulative effect of the proposed development considering the existing and planned projects in the area.

Table 6-2: Reviewed literature concerning the selected developments in the area

Development	Reviewed report	Author	Date of release
Dwarsrug Wind Farm	Socio-economic Impact Study	Urban-Econ Development Economists	May 2015
Khobab Wind Farm	Socio-economic Impact Assessment Report	Master-Q Research	2 May 2012
Loeriesfontein 2 Wind Farm	Socio-economic Impact Assessment Report	Master-Q Research	2 May 2012
Loeriesfontein PV3 Solar Energy Facility	Socio-economic Impact Assessment Report	Master-Q Research	2 May 2012
Graskoppies Wind Farm	Socio-economic Impact Assessment Scoping Report	Urban-Econ Development Economists	November 2016
Hantam PV Solar Energy Facility	Not Available	N/A	N/A
Hartebeest Leegte Wind Farm	Socio-economic Impact Assessment Scoping Report	Urban-Econ Development Economists	November 2016
Ithemba wind farm	Socio-economic Impact Assessment Scoping Report	Urban-Econ Development Economists	November 2016
PV Solar Power Plant	Draft Environmental Management Programme	Digby Wells	15 September 2015
Kokerboom 1 Wind Farm	Final Scoping Report	Aurecon	December 2016
Kokerboom 2 Wind Farm	Final Scoping Report	Aurecon	December 2016
Kokerboom 3 Wind Farm	Final Scoping Report	Aurecon	December 2016
Wind Farm	Socio-economic Impact Assessment Report	Master-Q Research	2 May 2012

6.1.2 Identification of cumulative effects

The following table summarises the key socio-economic impacts that were identified and analysed by other specialists for the above-mentioned projects. The table indicates the rating of the identified socio-economic impacts as proposed by the other specialists in their respective studies, and based on the combination of these ratings indicates the importance of the socio-economic impact from a cumulative

effect perspective. Only cumulative effects that are expected to reach high-importance level are included in further analysis.

Table 6-3: Reviewed literature concerning similar developments and impact rating

Capital	Environmental parameter	Description/Impact	Rating by specialist	Identified importance
Natural capital	Agricultural activities in zone of influence	**Dwarsrug wind Farm:** Impact on agricultural activities on the directly affected farms due to movement of vehicles and workers, and established infrastructure.	Low negative	Low-medium negative
		Kokerboom 1,2 & 3 wind farms: Transforming the land to industrial use will result in the loss of agricultural land.	Low negative	
	Access to resources for sustainable livelihood	**Loeriesfontein PV3 Solar Energy Facility, Wind farm, Khobab wind farm, Loeriesfontein 2 wind farm:** Site access and clearance of land can result in long-term loss of land, resulting in a change in access to resources to sustain livelihoods.	Low negative	
Human capital	Temporary employment creation	**Dwarsrug wind Farm:** The establishment of the wind farm will create employment opportunities from direct, indirect and induced impacts.	Low positive	Medium-high positive
		Khobab & Loeriesfontein 2 wind farms Unemployed residents will benefit from being trained and receiving employment.		
		Loerisfontein PV3 Solar Energy Facility and Wind Farm: It is estimated that the development will create a few temporary jobs.		
		Graskoppies, Ithemba, Hartebeest Leegte , Kokerboom 1,2 & 3 wind farms During the establishment of a wind farm, large numbers of workers are required for the duration of the construction phase**.**	Medium Positive	
Social capital	Skills development	**Dwarsrug wind Farm:** Long-term skills transfer and skills development will take place as a result of the establishment of the project.	Medium positive	Medium-high positive
		Graskoppies, Ithemba & Hartebeest Leegte wind farms: Skills development can be expected to be enhanced as those who will receive employment will either be improving an existing skill or acquiring a new skill.	High positive	
		Khobab & Loeriesfontein 2 wind farms: The developer is most likely to include foreign experts to encourage knowledge transfer.	Low positive	
		Kokerboom 1,2 & 3 wind farms: There are many unemployed individuals who will benefit from being trained in a specific skill and employed.	Medium positive	
	Investment in local community	**Dwarsrug wind farm:** Project owners are required to spend a portion of their turnover on the upliftment of the community where the project is located.	Medium positive	High Positive

Capital	Environmental parameter	Description/Impact	Rating by specialist	Identified importance
		Graskoppies, Ithemba & Hartebeest Leegte wind farms: Part of the IPPPP; project owners are required to allocate a percentage of the projects' revenue towards community development.	High positive	
	Demographic changes	**Graskoppies, Ithemba, Hartebeest Leegte & Dwarsrug wind farms:** An influx in migrant workers and an increase in jobseekers is expected to ensue.	Medium negative	Medium negative
		Koekerboom 1,2 & 3 Wind farms: The establishment of these wind farms presents attractive job opportunities.	Low negative	
	Social pathologies	**Dwarsrug wind farm:** Increase in foot traffic results in an increase in social ills such as poor health, substance abuse, prostitution, etc.	Medium negative	Medium-high negative
		Graskoppies, Ithemba, Hartebeest Leegte wind farms: The increase in the number of construction workers is expected to cause a further increase in social pathologies.	High negative	
Cultural & Spiritual capital	Socio-cultural: Health and Safety	**Khobab & Loeriesfontein 2 wind farm** Construction workers employed by the developer increase the average number of men in the vicinity thus increasing the incidence of communicable diseases.	High negative	High negative
		Koekerboom 1,2 & 3 Wind farms: Impact of heavy vehicles including damage to roads, safety and health.	Low negative	
Physical capital	Sustainable increase in production & Temporary stimulation of GDP-R	**Dwarsrug, Graskoppies, !Xha Boom & Hartebeest Leegte wind farms:** The initial capital injection will set of a range of value-adding activities resulting in the stimulation of GDP-R and long-term production.	High positive	High positive
	Added pressure on infrastructure	**Graskoppies, Ithemba, Hartebeest Leegte & Dwarsrug wind farms:** An increase in the number of people in Loeriesfontein could create additional pressure on the local municipality and aggravate service provision related challenges**.**	Medium negative	Medium negative
Financial capital	Establishment of informal hospitality industry	**Graskoppies, Ithemba & Hartebeest Leegte wind farms** Formation of an informal hospitality industry as a result of the increased demand for accommodation.	Medium positive	Medium positive
	Increased household income & standard of living	**Dwarsrug wind farm:** New jobs that will be created will result in increased household income for benefitting individuals**.**	High positive	High positive
		Graskoppies, Ithemba & Hartebeest Leegte wind farms: Increase in household income is expected to accrue due to job creation as well as skills development.	Low positive	

Capital	Environmental parameter	Description/Impact	Rating by specialist	Identified importance
Political & Institutional capital	Increase in government revenue	**Dwarsrug wind farm:** Government obtains its revenue by collecting taxes and rates from the country's citizens and business.	Low positive	Medium positive
		Graskoppies, Ithemba & Hartebeest Leegte wind farms: Government obtains its revenue from collecting taxes and rates from the country's residents and business.	Medium positive	
		Wind Farm & Loeriesfontein PV3 Solar Energy Facility: Increased central and local tax income.	Low positive	

The Department of Environmental Affairs and Tourism's guidelines (DEAT, 2004) suggest that the identification of cumulative effects should focus on important and meaningful issues as "it is not practical to analyse the cumulative effects of an action on every environmental receptor". Furthermore, it is advised that the analysis should focus on "what is needed to ensure long-term productivity or sustainability of the resource" (DEAT, 2004).

Considering the range of socio-economic impacts predicted to ensue as a result of other planned developments in the area, only one negative cumulative effect was identified, which is expected to be of some concern. This cumulative effect is the envisaged changes to health and safety (specifically infectious diseases such as STIs including HIV/AIDS) of the local communities, and specifically the residents of the town of Loeriesfontein.

However, **the possible addition of the proposed development** (!Xha Boom Substation and powerline development) to the RE projects approved under the REIPPPP, those that have already received environmental authorisation, as well as the ones at the EIA stage **is not expected to result in any significant changes to the identified impacts in the literature review**. This is due to the size and nature of the proposed development relative to the other developments planned and already implemented in the area.

7 CONCLUSION

Mainstream Renewable Power South Africa (Pty) Ltd proposes the establishment of a 132 kV power line and associated substations of which the purpose will be to connect to the !Xha Boom wind farm energy facility to the national grid to evacuate electricity generated by that facility. The infrastructure will be located 33km south-east of the proposed !Xha Boom Wind Farm in Loeriesfontein town in the Northern Cape province. Four different route alternatives for power lines, two alternatives for the on-site substation and two linking substation alternatives are considered.

The relevant national, provincial, and local government policies reveal that the development of RE technologies is strongly supported by government. It is seen as the means to diversify the energy mix in the country, achieve climate change commitments, and stimulate economic development in the country while creating new employment opportunities. As such, the assessment of the proposed project revealed that the stimulation of the economy, job creation and improved service infrastructure are among the positive impacts that can ensue from the proposed project during both construction and operational phase. According to the Hantam IDP, the economy of the Hantam LM is characterised by heavy dependence on the primary sector, low education and skill levels. Therefore, the introduction of the proposed development is expected to benefit the local municipality specifically due to its small economic base and large unemployment rate.

The following table provides the summary of the identified positive and negative impacts before and after mitigation.

Table 7-1: Summary of construction & operation phase impacts

Impact	Significance rating with no mitigation	Post mitigation significance rating
Impact 1: Stimulation of the economy and creation of temporary employment during construction	+12 (positive low)	+12 (positive low)
Impact 2: Increased risk of threat to personal safety and livestock theft during construction	-10 (negative low)	-9 (negative low)
Impact 3: Impact on the sense of place	-13 (negative Low)	-12 (negative Low)
Impact 4: Impact on service infrastructure	+30 (positive Medium)	+30 (positive Medium)

Presented in Table 7-2 below is the comparative review of the proposed alternatives and options for the for the power line route and substations.

Table 7-2: Summary of comparative assessment exercise

Impact	Power line option			
	Option 1	Option 2	Option 3	Option 4
Impact 1: Stimulation of the economy and creation of temporary employment during construction	**PREFERRED**	**PREFERRED**	**FAVOURABLE**	**PREFERRED**
Impact 2: Increased risk of threat to personal safety and livestock theft during construction	**FAVOURABLE**	**FAVOURABLE**	**PREFERRED**	**NO PREFERENCE**

Impact	Power line option			
	Option 1	Option 2	Option 3	Option 4
Impact 3: Impact on the sense of place	**FAVOURABLE**	**FAVOURABLE**	**NO PREFERENCE**	**NO PREFERENCE**
Impact 4: Impact on service infrastructure	**NO PREFERENCE**	**NO PREFERENCE**	**NO PREFERENCE**	**NO PREFERENCE**

Based on the above, the following can be recommended:

- **Substation route alternative**: In all instances (impacts) related to the substation alternatives (both on-site and linking substations), no preferences were identified for any of the alternatives.
- **Power line route option**: Considering the identified potential negative and positive impacts, corridor option 3 (pink) appears to be slightly more preferred among the four alternatives. Although it will result in the lowest economic benefits to the national and local economy, such benefits would be temporary and would not be significant regardless of the route option chosen. Importantly, Option 3 affects the least farms and is associated with the shortest power line length. Option 1 and 2 are considered favourable and are slightly more preferred than Option 4 from the reviewed socio-economic impacts perspective. However, considering that the owner of the Portion 2 of Farm Karree Doorn Pan no. 214 raised an objection against Option 2 and expressed a preference for Option 4 (refer to section 5.3), it would be advisable to consider Option 1 and Option 4 before selecting Option 2.

ANNEXURE A: IMPACT RATING CRITERIA AND METHODOLOGY

The rating system will be applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts will be consolidated into one rating. In assessing the significance of each issue, the following criteria is used:

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact has different scales and, as such, bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.

2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short-term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium-term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long-term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects.
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects.
3	Medium Cumulative impact	The impact would result in minor cumulative effects.
4	High Cumulative Impact	The impact would result in significant cumulative effects.
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The assessment of alternatives followed the next criteria:

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

REFERENCES

DEAT. (2004). *Integrated Environmental Management Information Series: Cumulative Effects Series 7.*

Dennis Moss Partnership. (2012). *Northern Cape Spatial Development Framework.*

Department of Economic Development. (2011). The New Growth Path: Framework. Pretoria, Gauteng, South Africa.

Hantam IDP. (2015). *Hantam Integrated Development Plan.*

Namakwa DM. (2014). *Namakwa Integrated Development Plan.*

National Planning Comission. (2011). *National Development Plan: Vision for 2030.*

Northern Cape Government. (2008). *Northern Cape Provincial Growth and Development Strategy.*

Northern Cape Province. (2011). *Northern Cape Municipal Local Economic Development Framework.*

Quantec. (2015). Standard Regionalised Data Series.

Quantec. (2016). *Quantec data.*

Stats SA. (2001). 2001 Census.

Stats SA. (2011). *Census.* Stats SA.

Umsebe Development Planners. (2010). *Hantam LM Rural Spatial Development Framework.*

Umsebe Development Planners. (2010). *Khai-Ma LM Rural Spatial Development Framework.*