ESTABLISHMENT OF 132 KV GRID CONNECTION INFRASTRUCTURE FOR THE HYPERION HYBRID FACILITY NEAR KATHU, NORTHERN CAPE PROVINCE

SOCIAL INPUT FOR BASIC ASSESSMENT PROCESS

October 2020

Prepared by:

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DETAILS OF PROJECT

Report Title	:	Social Input for the Basic Assessment Process for the Establishment of the 132 kV Grid Connection Infrastructure for the Hyperion Hybrid Facility near Kathu, Northern Cape Province
Author	:	Dr Neville Bews
DEA Reference Number	:	To be Allocated
Project Developer	:	Hyperion Solar Hybrid (Pty) Ltd
Environmental Consultant	:	Savannah Environmental (Pty) Ltd
Review Period	:	22 September 2020 – 21 October 2020
Status of Report	:	First Draft Report

EXECUTIVE SUMMARY

INTRODUCTION

The Social Impact Assessment Report was generated for the 132 kV grid infrastructure at the Hyperion Hybrid Facility, proposed on the remaining extent of the Farm Lyndoch 432, Portion 1 of the Farm Selsden 464 and the remaining extent of the Farm Kathu 465; located some 16 km north of the town of Kathu, within Ward 07 of the Gamagara Local Municipality. Gamagara is one of the three local municipalities that fall under the John Taolo Gaetsewe District Municipality in the Northern Cape Province.

APPROACH TO STUDY

Data was gathered through:

- The project description provided by Hyperion Solar Hybrid (Pty) Ltd and Savannah Environmental (Pty) Ltd.
- Via Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates.
- Various discussions with the Environmental Impact Assessment Consultants.
- A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports.
- A broader literature scan.

IMPACTS IDENTIFIED

The social impacts that were identified in associated with the project were as follows:

Construction Phase

Health and social wellbeing:

- Annoyance, dust and noise
- Increase in crime
- Increased risk of HIV infections
- An influx of construction workers and work-seekers
- Hazard exposure

Quality of the living environment:

- Disruption of daily living patterns

- Disruptions to social and community infrastructure

Economic:

- Job creation and skills development
- Socio-economic stimulation

Operational Phase

Quality of the living environment:

- Transformation of the sense of place

Economic:

- Job creation and skills development
- Socio-economic stimulation

Cumulative impacts

Health and social wellbeing:

- Risk of HIV and AID

Quality of the living environment:

- Sense of place
- Service supplies and infrastructure, and

Economic.

These impacts are assessed and pre and post-mitigation assessment, scores are presented in the following table.

PRE AND POST MITIGATION COMPARISON OF IMPACTS

Construction Phase			
Environmental parameter	**Issues**	**Rating before mitigation**	**Rating post-mitigation**
Health & social wellbeing	Annoyance, dust and noise	-30 low negative	-25 low negative
	Increase in crime	-28 low negative	-18 low negative
	Increased risk of HIV infections	-60 high negative	-42 medium negative
	An influx of construction workers	-28 low negative	-18 low negative
	Hazard exposure.	-28 low negative	-24 low negative
Quality of the living environment	Disruption of daily living patterns	-28 low negative	-24 low negative
	Disruptions to social and community infrastructure	-16 low negative	-14 low negative
Economic	Job creation and skills development	+28 low positive	+28 low positive
	Socio-economic stimulation	+35 medium positive	+35 medium positive
Operational Phase			
Quality of the living environment	Transformation of the sense of place	-65 high negative	-65 high negative
Economic	Socio-economic stimulation	+65 high positive	+70 high positive
No-Go Alternative			
No project		-75 high negative	
Cumulative Impacts			
Health & social wellbeing	Risk of HIV	-42 medium negative	-64 high negative
	Increase in crime	-18 low negative	-60 high negative
Quality of the living environment	Sense of place	-65 high negative	-80 high negative
	Services, supplies & infrastructure	-24 low negative	-60 high negative
Economic	Economic	+65 high positive	+80 high positive

CONCLUSION AND RECOMMENDATION

Considering that the project is required to connect the proposed Hyperion Hybrid Facility to the National Grid via the existing Eskom Kalbas substation, it is an integral part of ensuring the functionality of the proposed Hybrid Facility. On this basis, as with the Hyperion PV Solar Energy Facility, the project carries with it a significant benefit associated with the generation of renewable energy and fits with international; national; provincial and municipal policy.

Most impacts associated with the project apply over the short term, in respect of the construction phase, and can be mitigated to within an acceptable range. Considered in isolation the project will have little if any cumulative impact in the area. In addition, the project fits with the Government's requirement for the urgent generation of electricity to be purchased by Eskom Holdings SOC Limited from independent power producers. Consequently, the project is supported on a social basis and should proceed as required.

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
BID	Background Information Document
DBSA	Development Bank of South Africa
DEFF	Department of Environment, Forestry and Fisheries
DEAT	Department of Environmental Affairs and Tourism
DM	District Municipality
EIA	Environmental Impact Assessment
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Virus
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPPPP	Independent Power Producers Procurement Programme
IRP	Integrated Resource Plan
IRR	Issues and Response Report
kV	Kilovolt
LM	Local Municipality
MW	Megawatt
NBA	Dr Neville Bews & Associates
NEMA	National Environmental Management Act (No. 107 of 1998)
NERSA	The National Energy Regulator of South Africa
NGO	Non-Governmental Organisation
OHS	Occupational Health and Safety
OHL	Overhead Line
O&M	Operation and Maintenance
PA	Per Annum (Yearly)
PGDS	Provincial Growth and Development Strategy
PV	Photovoltaic
PVSEF	Photovoltaic Solar Energy Facility
PPE	Personal Protective Equipment
PPP	Public Participation Process
REIPPPP	Renewable Energy Independent Power Producer Procurement Program
SACPVP	South African Council for the Property Valuers Profession
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SDF	Spatial Development Framework

SIA	Social Impact Assessment
SIPs	Strategic Integrated Projects
SMME	Small Medium and Micro Enterprises
Stats SA	Statistics South Africa
STDs	Sexually Transmitted Diseases
ToR	Terms of Reference
WHO	World Health Organisation

QUALIFICATIONS AND EXPERIENCE OF SPECIALIST

Qualifications:

University of South Africa: B.A. (Honours) – 1984

Henley Management College, United Kingdom: The Henley Post-Graduate Certificate in Management – 1997

Rand Afrikaans University: M.A. (cum laude) – 1999

Rand Afrikaans University: D. Litt. et Phil. – 2000

Projects:

The Social Impact Assessment (SIA) for the Gautrain Rapid Rail Link; The impact assessment for the Australian – South African sports development programme; SIA for Kumba Resources, Sishen South Project; Evaluation of a Centre for Violence Against Women for The United Nations Office on Drugs and Crime; SIAs for the following Exxaro Resources Ltd.'s mines, Leeuwpan Coal Mine Delmas, Glen Douglas Dolomite Mine Henley-on-Klip, Grootegeluk Open Cast Coal Mine Lephalale; SIA for the South African National Road Agency Limited (SANRAL) on Gauteng Freeway Improvement Project; SIA for SANRAL on the N2 Wild Coast Toll Highway; Research into research outputs of the University for the University of Johannesburg; SIA for Waterfall Wedge housing and business development in Midrand Gauteng; SIA for the Environmental Management Plan for Sedibeng District Municipality; Social and Labour Plan for the Belfast Project on behalf of Exxaro Resources Ltd; SIA for the Transnet New Multi-Product Pipeline (Commercial Farmers) on behalf of Golder Associates Africa (Pty) Ltd; SIA for the Proposed Vale Moatize Power Plant Project in Mozambique on behalf of Golder Associates Africa (Pty) Ltd; SIA for Kumba Resources Ltd.'s proposed Dingleton Resettlement Project at Sishen Iron Ore Mine on behalf of Water for Africa (Pty) Ltd; SIA for Gold Fields West Wits Project for EcoPartners; SIA for the Belfast Project for Exxaro Resources Ltd; SIA for Eskom Holdings Ltd.'s Proposed Ubertas 88/11kV Substation on behalf of KV3 Engineers (Pty) Ltd; SIA for the Mokolo and Crocodile River (West) Water Augmentation Project for the Department of Water and Sanitation on behalf of Nemai Consulting and the Trans Caledonian Water Authority; Assisted Octagon Consulting with the SIA for Eskom's Nuclear 1 Power Plant on behalf of Arcus GIBB Engineering & Science. SIA for the 150MW Photovoltaic Power Plant and Associated Infrastructure for Italgest Energy (Pty) Ltd, on behalf of Kalahari Survey Solutions cc. SIA for Eskom Holdings Limited,

Transmission Division's Neptune-Poseidon 400kV Power Line on behalf of Nemai Consulting. Ncwabeni Off-Channel Storage Dam for the security of water supply in Umzumbe, Mpumalanga. Social Impact Assessment for Eskom Holdings Limited, Transmission Division, Forskor-Merensky 275kV ±130km Powerline and Associated Substation Works in Limpopo Province. Social impact assessment for the proposed infilling of the Model Yacht Pond at Blue Lagoon, Stiebel Place, Durban.ABC Prieska Solar Project; Proposed 75 MWp Photovoltaic Power Plant and its associated infrastructure on a portion of the remaining extent of ERF 1 Prieska, Northern Cape.Sekoko Wayland Iron Ore, Molemole Local Municipalities in Limpopo Province.Langpan Chrome Mine, Thabazimbi, Limpopo; Jozini Nodal Expansion Implementation Project, Mpumalanga, on behalf of Nemai Consulting; SIA for Glen Douglas Dolomite Burning Project, Midvaal Gauteng, on behalf of Afrimat Limited; SIA for Lyttelton Dolomite mine Dolomite Burning Project, Marble Hall Limpopo on behalf of Afrimat Limited; Tubatse Strengthening Phase 1 – Senakangwedi B Integration for Eskom Transmission on behalf of Nsovo Environmental Consulting; Department of Water and Sanitation, South Africa (2014). Environmental Impact Assessment for the Mzimvubu Water Project: Social Impact Assessment DWS Report No: P WMA 12/T30/00/5314/7. Umkhomazi Water Project Phase 1 – Raw Water Component Smithfield Dam - 14/12/16/3/3/3/94; Water Conveyance Infrastructure - 14/12/16/3/3/3/94/1; Balancing Dam - 14/12/16/3/3/3/94/2. Umkhomazi Water Project Phase 1 – Potable Water Component: 14/12/16/3/3/3/95. Expansion of Railway Loops at Arthursview; Paul; Phokeng and Rooiheuwel Sidings in the Bojanala Platinum District Municipality in the North West Province for Transnet Soc Ltd; Basic Social Impact Assessment for the Cato Ridge Crematorium in Kwazulu-Natal Province; SIA for the Kennedy Road Housing Project, Ward 25 situated on 316 Kennedy Road, Clare Hills (Erf 301, Portion 5); Eskom's Mulalo Main Transmission Substation and Power Line Integration Project, Secunda;

Regularly lecture in the Department of Sociology at the University of Johannesburg and collaborated with Prof.Henk Becker of Utrecht University, the Netherlands, in a joint lecture to present the Social Impact Assessment Masters course via video link between the Netherlands and South Africa. Presented papers on Social Impact Assessments at both national and international seminars. Published on both a national and international level.

DECLARATION OF INDEPENDENCE

I, Neville Bews, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application objectively, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and

- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: Neville Bews

Date: 10 October 2020

1. INTRODUCTION

Hyperion Solar Hybrid (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd to undertake a Basic Assessment Process for the establishment of the 132 kV Grid Connection Infrastructure for the Hyperion Hybrid Facility near Kathu, Northern Cape Province. Dr Neville Bews & Associates were contracted by Savannah Environmental (Pty) Ltd to provide social input for the project.

1.1. PURPOSE OF REPORT

The purpose of the report is to identify the social baseline conditions in which the proposed project will unfold and acquire an understanding of the proposed project. Against this background, the primary objective is to identify the issues and concerns associated with the Hyperion-Kalbas 132 kV Powerline and Associated Substation and identify, assess and propose mitigation measures in respect of the likely social impacts that may occur as a result of the proposed project.

1.2. STRUCTURE OF THE REPORT

This specialist study is undertaken in compliance with Requirements of Appendix 6 – GN R326 EIA Regulations 2014, as amended on 7 April 2017. **Table 1** indicates how the requirements of Appendix 6 have been fulfilled in this report.

Table 1: Report content requirements in terms of EIA Regulations

Requirements of Appendix 6 – GN R326 EIA Regulations 2014, as amended on 7 April 2017	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- (a) details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page xii
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page xiv
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1 & 1.3
(cA) an indication of the quality and age of base data used for the specialist report;	Section: 1.5.2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6, 7 & 9
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.4
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6, 7 & 9
(g) an identification of any areas to be avoided, including buffers;	N/A
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 2 Figure 1
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, **[including identified alternatives on the environment]** or activities;	Sections: 6, 7, 9 & 11
(k) any mitigation measures for inclusion in the EMPr;	Section 7& 10
(l) any conditions for inclusion in the environmental authorisation;	N/A
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section: 7 & 10
(n) a reasoned opinion- (i) **[as to]** whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 11

(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q) any other information requested by the competent authority.	N/A
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

1.3. TERMS OF REFERENCE

To undertake a basic social impact assessment in respect of the proposed grid connection infrastructure and thus consider the effects that the project is likely to have on the social environment within which the project will be placed. Accordingly to identify the potential social impacts that are likely to arise as a result of the project.

1.4. APPROACH TO STUDY

Data was gathered using the following techniques.

1.4.1. COLLECTION OF DATA

Data was gathered through:

- The project description provided by Hyperion Solar Hybrid (Pty) Ltd and Savannah Environmental (Pty) Ltd.
- Via Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates.
- Various discussions with the Environmental Impact Assessment Consultants.
- A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports.
- A broader literature scan.

1.4.2. IMPACT ASSESSMENT TECHNIQUE

The impact assessment technique, which is provided by the lead environmental consultant Savannah Environment, is as follows:

- The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.

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

The **significance** was then calculated by combining the criteria in the following formula:

S = (E+D+M)xP

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

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

1.5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply in respect of this report.

1.5.1. ASSUMPTIONS

It is assumed that the technical information provided by the project proponent, Hyperion Solar Hybrid (Pty) Ltd, as well as by the environmental consultants, Savannah Environmental, was credible and accurate at the time of compiling the report. It is also assumed that the data provided by the various specialists as used in this report are credible and accurate.

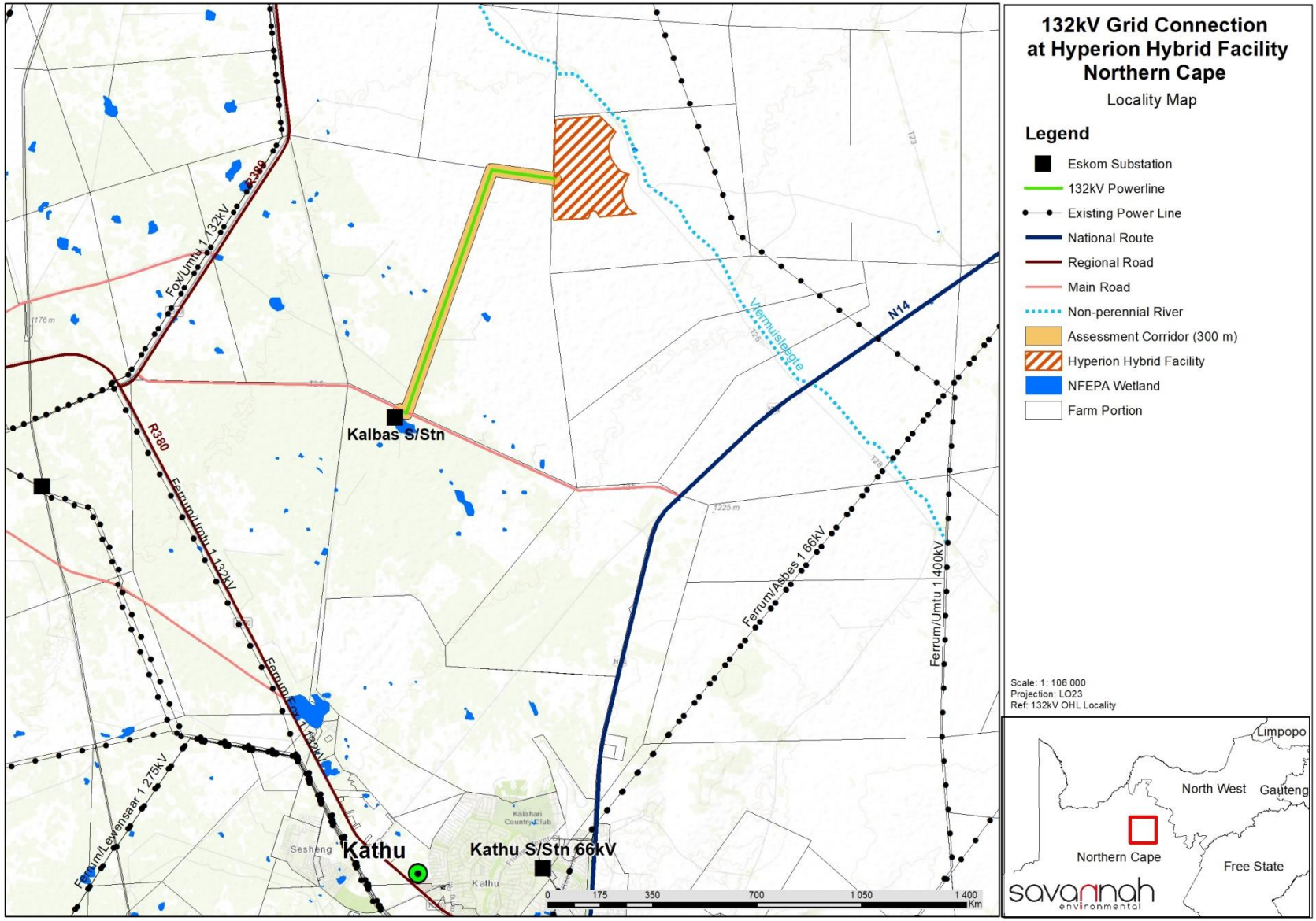
1.5.2. LIMITATIONS

The demographic data used in this report was sourced from Statistics South Africa and is based on data gathered during Census 2011. This data is somewhat outdated but where possible is supplemented with the latest Stats SA's survey data such as the Mid-year population estimates and the Quarterly Labour Force Survey. The limitation of this is that this survey data is restricted to a provincial level and does not extend down to a municipal level.

The study was undertaken during Stage 1 of the State of National Disaster declared in South Africa as a result of the COVID-19 pandemic. Accordingly, the need for social distancing and limiting unnecessary interpersonal contact and travel was respected throughout this study.

2. PROJECT DESCRIPTION

Hyperion Solar Hybrid (Pty) Ltd proposes the development of a 132 kV overhead powerline between the Hyperion Hybrid facility (which consists of the authorised Hyperion 1 & 2 PV SEF facilities and the 75MW thermal generation facility) and the existing Eskom Kalbas Substation located approximately 15 km north of Kathu in the Gamagara Local Municipality (LM) and within the greater John Taolo Gaetsewe District Municipality (DM), in the Northern Cape Province. The powerline is assessed within a 300 m wide corridor (150 m either side of the OHL).



Map courtesy of Savannah Environmental (Pty) Ltd

Figure 1: 132 kV Powerline and associated Hyperion Hybrid facility locality map

2.1. LOCATION

The proposed grid connection infrastructure is located on the Remaining Extent of the Farm Lyndoch 432 and crosses Portion 1 of the Farm Selsden 464 and Remainder of farm Kathu 465. These farms are located approximately 15 km north of Kathu in the Gamagara Local Municipality (LM) and within the greater John Taolo Gaetsewe District Municipality (DM), in the Northern Cape Province.

3. BASIC ASSESSMENT ALTERNATIVES

Apart from the 'no-project' alternative, no other alternative is available. The route is, however, somewhat flexible in that during final pegging adjustments can be made if it is necessary to avoid any obstacles that may become apparent at that point. There is also a certain degree of flexibility in the siting of the pylons.

3.1. NO-PROJECT ALTERNATIVE

It is mandatory to consider the 'no-project' alternative in the EIA process. The 'no-project' alternative assumes that the site remains in its current state, i.e. there is no construction of the power line and collector substation and associated infrastructure in the proposed project area and the status quo would remain in place.

4. APPLICABLE POLICY AND LEGISLATION

Legislation and policy serve to guide the authorities in undertaking and agreeing on projects that are in the interest of the country as a whole. Consequently, the fit of the project with the relevant national, provincial and municipal legislation and policy is an important consideration. In this respect, the project is considered as an integral part of the infrastructure required to connect the proposed Hybrid Facility to the national grid via the Kalbas substation and accordingly the following legislation and policy are applicable in respect of the project.

International

- Climate Change Action Plan, 2016-2020, World Bank Group (2016);
- Renewable Energy Vision 2030 – South Africa; World Wildlife Fund for Nature-SA (formerly World Wildlife Fund-SA) (2014);
- REthinking Energy 2017: Accelerating the global energy transformation. International Renewable Energy Agency, (2017);

- Renewable Energy Policies in a Time of Transition. International Renewable Energy Agency (2018); and
- Global Warming of 1.5 °C. An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Summary for Policymakers. Subject to copy-edit: Intergovernmental Panel on Climate Change (2018).

National

- White Paper on the Energy Policy of the Republic of South Africa (1998)
- White Paper on Renewable Energy (2003)
- A National Climate Change Response Strategy for South Africa (2004)
- National Energy Act (2008)
- Integrated Resource Plan (IRP) for South Africa (2010-2030)
- The Environmental Impact Assessment and Management Strategy for South Africa (2014)
- Government Gazette Vol. 632; 16 February 2018 No. 41445. Department of Environmental Affairs, No. 114, Page No. 92 (2018)
- Government Gazette No. 43734; 25 September 2020, Notice No. 1015; Minister of Mineral Resources and Energy. Determination Under Section 34(1) of the Electricity Regulation Act, 2006 (Act No. 4 of 2006)
- New Growth Path Framework (2010)
- The National Development Plan (2011)
- National Infrastructure Plan (2012).

Provincial

- Northern Cape Provincial Growth and Development Strategy (2004-2014)
- Northern Cape Province Twenty Year Review (2014)
- Northern Cape Climate Change Response Strategy
- Northern Cape Spatial Development Framework
- Northern Cape Department of Environment & Nature Conservation Annual Report (2016/17)
- Northern Cape Department of Economic Development & Tourism Annual Report (2017)
- Northern Cape State of the Province Address (2018).

District and local

- John Taolo Gaetsewe DM Final Draft Integrated Development Plan (IDP) 2018 – 2019 (2017).
- John Taolo Gaetsewe DM Phase 5 Draft Spatial Development Framework (SDF) (2017).
- Gamagara LM IDP 2017 – 2022 (2017).

4.1. POLICY AND LEGISLATION FIT

Considering the nature and location of the project there is a clear fit with international, national, provincial and local, at both district and municipal levels, policy and legislation. For instance the World Wild Life Fund for Nature (WWF):

> "…*calls for a more ambitious plan, suggesting that the IRP* [Integrated Resource Plan for Electricity] *should provide for an 11-19% share of electricity capacity by 2030, depending on the country's growth rate over the next fifteen years*" (Sager, 2014, p. 5).

The issue of climate change is high on the agenda of all levels of government in South Africa with the Department of Environmental Affairs and Tourism indicating that:

> "*The efforts of all stakeholders will be harnessed to achieve the objectives of the Government's White Paper on Renewable Energy (2003) and the Energy Efficiency Strategy, promoting a sustainable development path through coordinated government policy* (Department of Environmental Affairs and Tourism, 2004, p. 23) "

DEAT goes further in specifically listing renewable energy sources, including solar power, wind power and biomass, as a tool in promoting mitigation against climate change.

In terms of the capacity determinations of the Minister of Energy, in consultation with the National Energy Regulator (NERSA), it has been established that South Africa required:

> "*14 725 MW of renewable energy (comprising of solar PV: 6 225 MW, wind: 6 360 MW, CSP: 1 200 MW, small hydro: 195 MW, landfill gas: 25 MW, biomass: 210 MW, biogas: 110 MW and the small scale renewable energy programme: 400 MW)*" (Independent Power Producer Office, 2018a, p. 5).

With the Northern Cape contributing 6 963 GWh in respect of solar PV (Independent Power Producers Procurement Office, 2018b, p. 3)

On 25 September 2020 (Government Notice No. 1015 in Government Gazette No. 43734) the Minister of Mineral Resources and Energy amended the regulations governing the generation of electricity. This created additional capacity to contribute towards energy security with the requirement that Eskom Holdings SOC Limited purchase additional electricity from independent power producers. Of this 6 800 MW should be sourced from renewable energy sources, both wind and solar; 513 MW from storage and 3 000 MW from gas and diesel. The project fits with this requirement.

The Northern Cape Department of Economic Development and Tourism identifies six economic development opportunities, one of which is renewable energy, and states that:

> "*During the financial year* [2017/18] *the intension is to focus on additional opportunities such as, Renewable Energy, a focus area of the 9-Point Plan*" (Northern Cape Province. Department of Economic Development & Tourism, 2017, p. 10 & 15).

The importance of renewable energy facilities within the Northern Cape has been recognised in the province's Twenty Year Review 2014 where it is indicated that:

> "*The New Growth Path that was adopted by national government in 2010 identified the green economy as a new economic sector that will be key to the creation of jobs. The focus of the green economy is on renewable energy and the Northern Cape was identified as the solar hub of the country with a number of solar plants being established across the province*" (Northern Cape Province, 2014, p. 153).

On a municipal level support is also evident. In the John Taolo Gaetsewe District Municipality Integrated Development Plan Revision 2018/2019 (John Taolo Gaetsewe District Municipality, 2019, p. 95) it is stated that:

> "*Serious investment in and exploitation of renewable sources of energy will result in the district becoming self-reliant in the generation of electricity which will provide a sizeable injection into the national electricity grid.*"

The Gamagara Local Municipality identifies solar energy initiatives as one of the drivers of economic growth within the municipal area (Gamagara Local Municipality, 2019, p. 72).

Considering the policy and legislation referred to above the project is in-line with the key planning targets and policy aims on an international; national; provincial and municipal level.

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

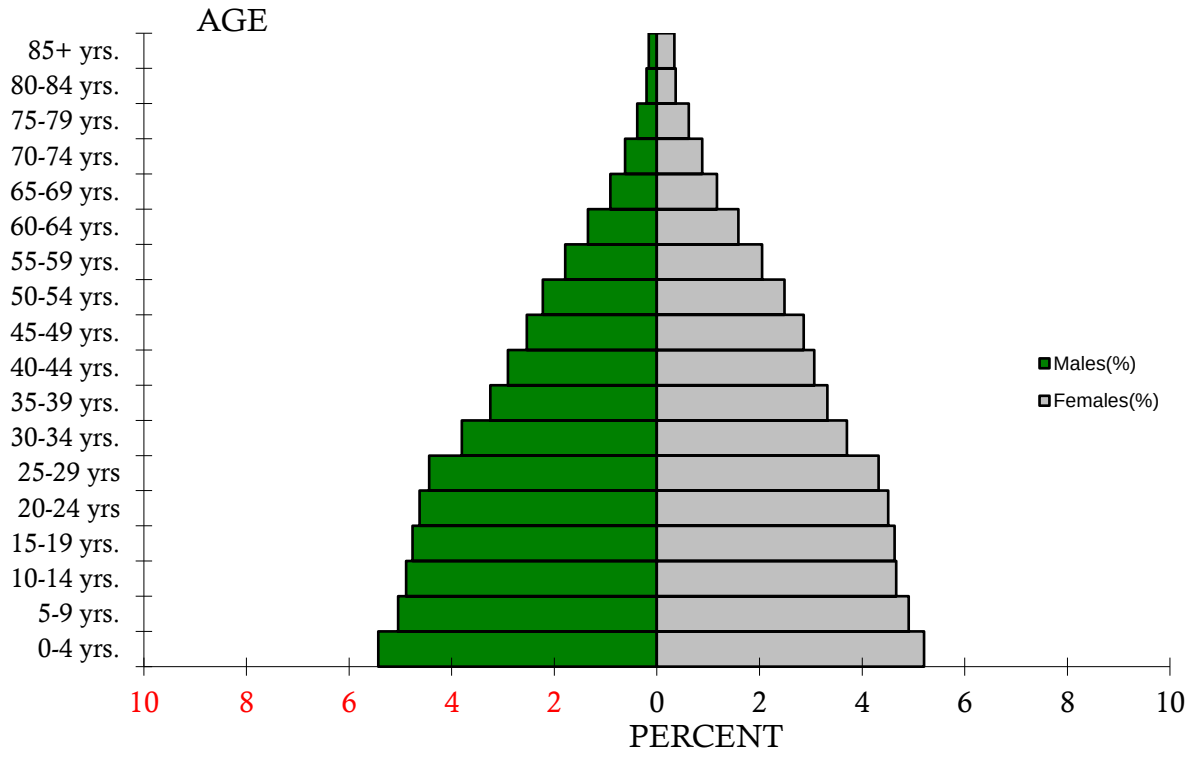
The project falls within the Gamagara non-urban (NU) area, Main Place 362002 (Census, 2011) and Ward 7 of the Gamagara Local Municipality which is located within the John Taolo Gaetsewe District Municipality of the Northern Cape Province. The demographics pertaining to the provincial and municipal areas, as sourced from Statistics South Africa, are described below.

5.1. PROVINCIAL

The Northern Cape is the largest and most sparsely populated of all provinces in South Africa and shares borders with the following provinces:

- North West – northeast
- Free State – east
- Eastern Cape – southeast
- Western Cape – south and southwest.

The province covers a geographical area of 372 889 km² and, with a population of 1 145 861 people in 2011, had a population density of 3.1 people per km² (Statistics South Africa, 2011). By mid-2020 the population of the Northern Cape was estimated at 1 292 789 (Statistics South Africa, 2020a). As the Mid-year population estimates remain at a provincial level and are not projected to the district and local municipal levels, for comparative purposes, data gathered during Census 2011 and Community Survey 2016, will be used where appropriate notwithstanding it being somewhat outdated. On this basis, in respect of age structure, 36% (36% in 2016) of the population of the Northern Cape were below 18 years while 59% (58% in 2016) were between 18 and 64 years of age and 6% (7%) were above 64 years in 2011. The population pyramid of the Northern Cape Provinces is illustrated in **Figure 2**.



Source: (Statistics South Africa, 2011)

Figure 2: Population pyramid Northern Cape Province

In respect of population grouping, the dominant population group in the Northern Cape are black African people at 50.4% (48.1% in 2016) followed by coloured people at 40.3% (43.7% in 2016), white people at 7% (8% in 2016) with Indian or Asian people accounting for 1% (1% in 2016) of the population. The majority of this population, 52.9% (55.7% in 2016), speak Afrikaans followed by Setswana at 32.6% (32.7% in 2016) and isiXhosa at 5.3% (5.1% in 2016).

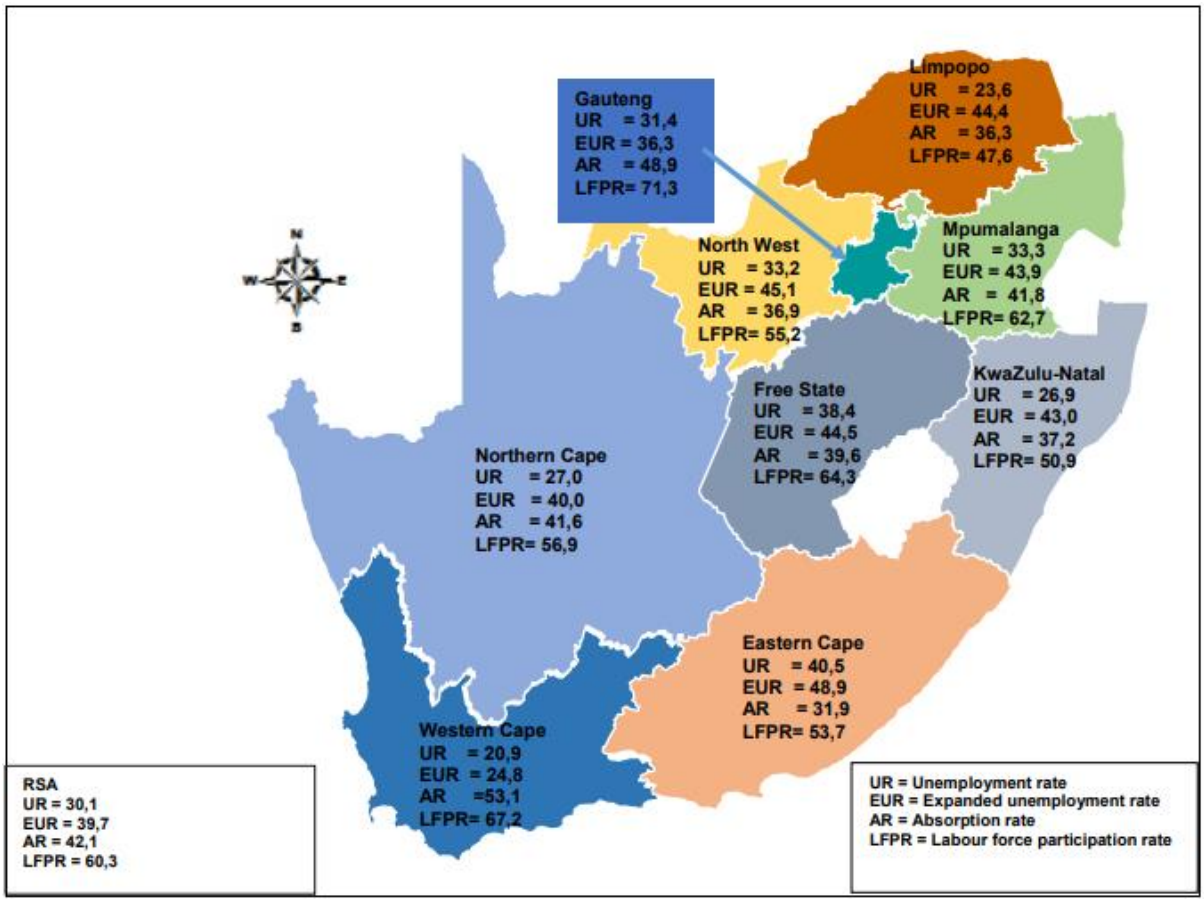
In 2011 the official unemployment rate in the Northern Cape was 27.4% with the official unemployment rate amongst the youth, aged between 15 and 34 years, coming in at 34.5%. In the 1ST Quarter of 2020, the official unemployment rate in the province was 27%. These figures must, however, be considered with caution as the official unemployment rate is defined by Stats SA as follows:

> "*Unemployed persons are those (aged 15–64 years) who:*
>
> *a) Were not employed in the reference week and;*
>
> *b) Actively looked for work or tried to start a business in the four weeks preceding the survey interview and;*

c) Were available for work, i.e. would have been able to start work or a business in the reference week or;

d) Had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were available." (Statistics South Africa, 2020b, p. 18).

In the first quarter of 2020 the expanded unemployment rate of the Northern Cape stood at 40.0%; the labour absorption rate at 48.9% and the labour force participation rate at 56.9%. A summary of the labour market indicators illustrated on a comparative basis across South Africa is provided in **Figure 3**.



Source: (Statistics South Africa, 2020b, p. 10)

Figure 3: Labour market indicators 1st Quarter 2020

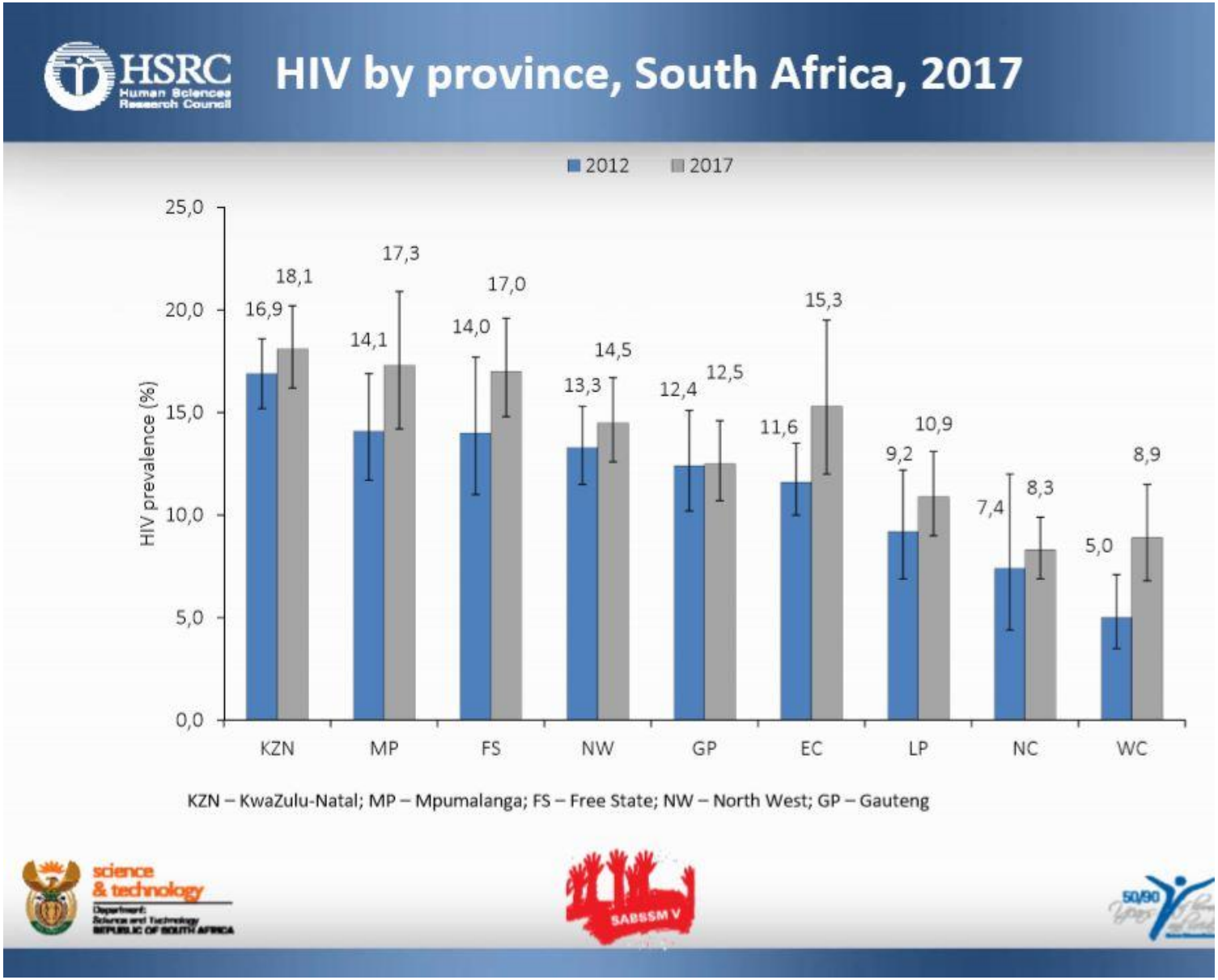
In respect of households, the 2011 Census indicated that there were 313 402 (353 713 in 2016) households in the Northern Cape. Of these households 38.5% were female-headed, 12.6% lived in informal dwellings and 53% either owned or were paying off their dwelling.

Regarding household services in 2011, 60.1% of households in the Northern Cape had flush toilets connected to the sewerage system, 64.0% had their refuse removed weekly, 45.8%

had piped water delivered inside the dwelling and 85.4% used electricity as a means of energy for lighting.

Concerning HIV prevalence the Northern Cape had the lowest prevalence rate across South Africa at 8.3% in 2017 followed by the Western Cape with a prevalence rate of 8.9%. KwaZulu-Natal, with a prevalence rate of 18.1% had the highest rate with the national HIV prevalence rate at 14.0% in 2017. HIV prevalence rate between 2012 and 2017 as it stood across all South African provinces is illustrated in **Figure 4**.

The 2017 National Antenatal Sentinel HIV Survey extended to the district level which indicated that, at the time the survey was undertaken, the Frances Baard district had the highest HIV prevalence rate in the province at 22.3% and the Namakwa district had the lowest rate at 8.5% The incidence of HIV prevalence as it occurred between 2012 and 2017 across the Northern Cape is illustrated in **Table 2** (Woldesenbet, et al., 2019, p. 91).



Source: (Simbayi, et al., 2019)

Figure 4: HIV by province – South Africa 2012 – 2017

Table 2: HIV prevalence by district in the Northern Cape Province; 2012 – 2017

District	2012		2013		2014		2015		2017	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
F. Baard	23.0	18.5 – 28.2	18.2	14.7 – 22.3	19.5	14.5 – 25.6	24.3	20.6 – 28.3	22.3	18.0 – 27.2
J. T. Gaetsewe	14.8	10.4 – 20.5	23.2	17.0 – 30.8	18.5	12.5 – 26.4	21.9	15.1 – 30.7	18.7	15.3 – 22.8
Namakwa	1.5	0.2 – 10.2	2.3	0.5 – 9.1	3.6	1.2 – 10.5	2.9	0.7 – 11.8	8.5	4.2 – 16.5
Pixley ka Seme	18.4	12.7 – 25.9	15.1	9.4 – 23.4	13.6	9.1 – 19.7	15.8	10.0 – 23.9	16.7	12.6 – 21.8
Z. F. Mgcawu	14.3	9.8 – 20.4	20.1	14.3 – 27.5	14.8	9.8 – 21.8	14.5	9.2 – 22.2	16.1	12.1 – 21.1
Northern Cape	**17.8**	**15.3 – 20.7**	**17.5**	**15.0 – 20.4**	**16.1**	**13.5 – 19.2**	**19**	**16.3 – 22.0**	**17.9**	**16.0 – 20.1**

Source: (Woldesenbet, et al., 2019, p. 82)

Attention is now turned towards a demographic describing of the municipalities, ward and small area affected by the project.

5.2. MUNICIPAL

John Taolo Gaetsewe District Municipality (DC45): The district, which was previously known as Kgalagadi, covers an area of 27 283.09 km^2, incorporates the following three local municipalities:

- Ga-Segonyana Local Municipality
- Gamagara Local Municipality
- Joe Morolong Local Municipality.

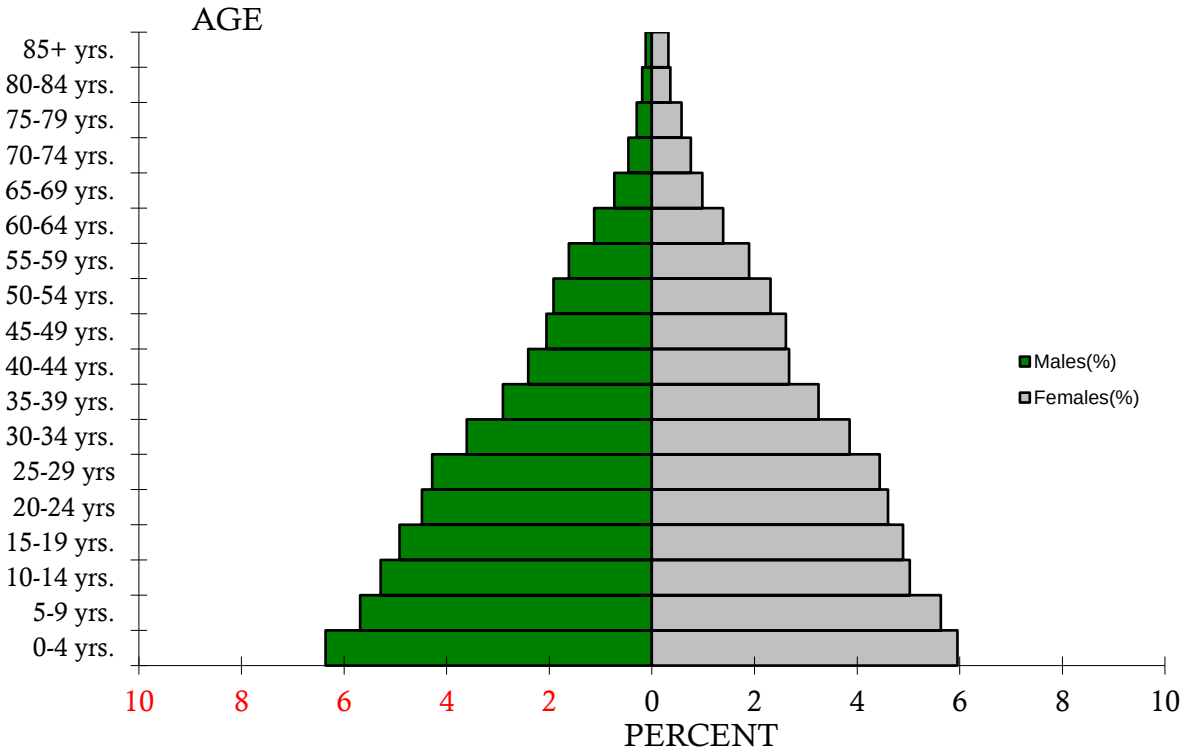
The following towns are also located within the John Taolo Gaetsewe District Municipality:

- Bankhara-Bodulong
- Deben
- Hotazel
- Kathu
- Kuruman
- Mothibistad
- Olifantshoek
- Santoy
- Van Zylsrus.

The district is predominated by mixed land uses with agriculture and mining being the main economic contributors with the potential of a viable tourist industry. There is an established

rail network running from the Sishen South iron ore mine to the port of Saldanha Bay in the Western Cape Province and between Black Rock and Dibeng.

With a population of 224 799 people, the John Taolo Gaetsewe DM has a population density of 8.24/km^2. According to Census, 2011 the district has a sex ratio of 94.1 with 34% of the population being under 15 years; 61.2% being between 15 and 65 years and 4.8% being over 65 years of age. The population pyramid of the John Taolo Gaetsewe District Municipality is illustrated in **Figure 5**.



Source: (Statistics South Africa, 2011)

Figure 5: Population pyramid John Taolo Gaetsewe District

The demographic data pertaining to the John Taolo Gaetsewe District Municipality, based on both Census 2011 and Community Survey 2016, is presented below.

	Community Survey 2016	**Census 2011**
Population	242 264	224 799
Age Structure		
Population under 15	31.9%	34.0%
Population 15 to 64	63.3%	61.2%
Population over 65	4.8%	4.8%

	Community Survey 2016	Census 2011
Dependency Ratio		
Per 100 (15-64)	57.9	63.3
Sex Ratio		
Males per 100 females	96.5	94.1
Population Growth		
Per annum	1.70%	n/a
Labour Market		
Unemployment rate (official)	n/a	29.7%
Youth unemployment rate (official) 15-34	n/a	37.2%
Education (aged 20 +)		
No schooling	9.8%	14.6%
Matric	25.5%	20.5%
Higher education	6.8%	8.4%
Household Dynamics		
Households	72 310	61 331
Average household size	3.4	3.5
Female-headed households	40.6%	43.1%
Formal dwellings	80.6%	76.6%
Housing owned	76.1%	55.1%
Household Services		
Flush toilet connected to sewerage	27.3%	26.2%
Weekly refuse removal	24.0%	26.0%
Piped water inside the dwelling	19.2%	22.6%
Electricity for lighting	86.3%	87.0%

Gamagara Local Municipality: Gamagara covers a geographical area of 2 619.42 km^2 making it the smallest local municipality in the John Taolo Gaetsewe district. The following towns are located within Gamagara:

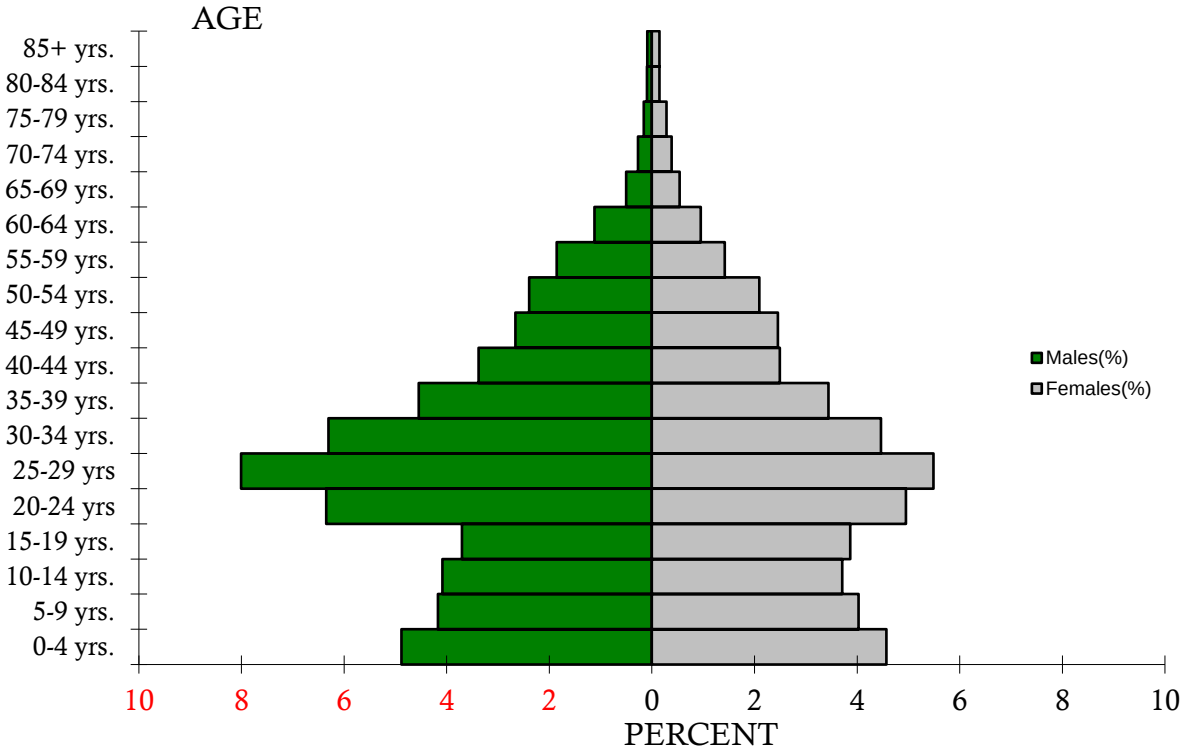
- Deben
- Kathu
- Olifantshoek.

The economic sectors forming the basis of the municipal economy are as follows:

- Mining

- Game farming
- Business services.

With a population of 41 617 people, the Gamagara LM has a population density of 15.89/km^2. According to Census, 2011 the municipal area has a sex ratio of 120.1 with 25.5% of the population being under 15 years; 71.9% being between 15 and 65 years and 2.6% being over 65 years of age. The population pyramid of the Gamagara Local Municipality is illustrated in **Figure 6**.



Source: (Statistics South Africa, 2011)

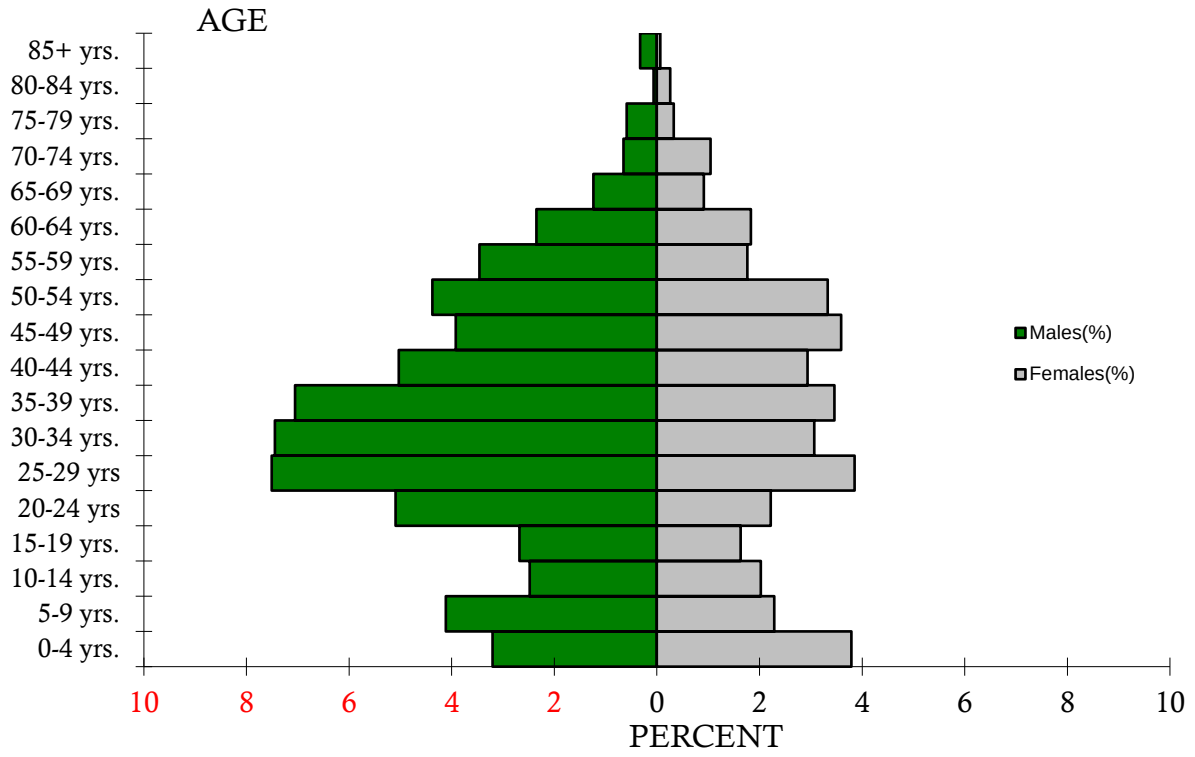
Figure 6: Population pyramid Gamagara Local Municipality

The demographic data pertaining to the Gamagara Local Municipality, based on both Census 2011 and Community Survey 2016, is presented below:

	Community Survey 2016	**Census 2011**
Population	53 656	41 617
Age Structure		
Population under 15	23.2%	25.5%
Population 15 to 64	74.5%	71.9%
Population over 65	2.3%	2.6%

	Community Survey 2016	**Census 2011**
Dependency Ratio		
Per 100 (15-64)	34.2	39.0
Sex Ratio		
Males per 100 females	129.7	120.1
Population Growth		
Per annum	5.77%	n/a
Labour Market		
Unemployment rate (official)	n/a	17.7%
Youth unemployment rate (official) 15-34	n/a	22.4%
Education (aged 20 +)		
No schooling	8.2%	10.5%
Matric	33.0%	26.5%
Higher education	10.8%	12.6%
Household Dynamics		
Households	15 723	10 808
Average household size	3.4	3.4
Female-headed households	21.6%	27.7%
Formal dwellings	79.2%	74.4%
Housing owned	58.5%	34.5%
Household Services		
Flush toilet connected to sewerage	80.8%	77.6%
Weekly refuse removal	78.9%	90.6%
Piped water inside the dwelling	58.2%	59.1%
Electricity for lighting	88.1%	87.9%

Ward 7 Gamagara Local Municipality: Statistics SA data available for Ward 7 of Gamagara LM is only available in respect of Census 2011. On this basis, the Ward 7 covers an area of 1 538.2 km^2 and has a population of 1 529 people resulting in a population density of 1.0/km^2. The median age of the population is 34 years with 20% being under 18; 74% being between 18 and 64 and 6% being 65 and over. With a sex ratio of 160.4, there are a lower proportion of females to males across the ward. The population pyramid for Ward 7 is illustrated in **Figure 7**.



Source: (Statistics South Africa, 2011)

Figure 7: Population pyramid Ward 7, Gamagara Local Municipality

In respect of population group, at 50%, white people are the most prevalent population group in the ward followed by black African and coloured people at 38% and 11% respectively. At 63% Afrikaans is the predominant home language spoken across the ward followed by Setswana at 23%. Regarding education levels, 68.2% of the population has completed Grade 9 or higher and 40.9% have completed Matric or higher with 73.8% of school-aged children, between 5 and 17 years, attending school.

There are 695 households within Ward 7 of which 7.8% live within informal dwellings; 18.1% of dwellings are fully owned or are being paid off and 23.7% are occupied rent-free. The average annual household income of the ward is R 57 300. Of these households 28.1% receive water from a regional or local service provider; 80.1% have access to flush or chemical toilets; 58.3% are receiving a refuse disposal service from a local authority or private company, while 17.2% utilise their own refuse dump. In 2011 77.1% of the population was employed of which 21.9% was employed within the informal and 68.4% within the formal sectors.

5.3. PROJECT FOOTPRINT

At a more project-specific footprint level the project is located within the Gamagara non-urban (NU) area, Sub Place 362002001 (Census, 2011). The area is sparsely populated having a population density of 0.42 people per square kilometre. The demographic data in respect of this area is as follows:

Geographic area = 2,347.57 km²
Population = 992 people
Population density = 0.42/km²
Households = 452
Household density = 0.19/km²

Population group		
Black African	499	50.35%
White	344	34.71%
Coloured	127	12.82%
Other	17	1.72%
Indian or Asian	4	0.40%
First language		
Afrikaans	511	51.77%
Setswana	322	32.62%
isiNdebele	32	3.24%
isiZulu	29	2.94%
English	20	2.03%
Sepedi	20	2.03%
Sesotho	20	2.03%
Other	11	1.11%
Xitsonga	7	0.71%
isiXhosa	7	0.71%
SiSwati	5	0.51%
Tshivenda	3	0.30%
Not applicable	6	
Age		
Young (0-14)		16,5%
Working Age (15-64)		78,6%
Elderly (65+)		4,8%

Dependency ratio	27,2
Sex ratio	176
No schooling aged 20+	20,2%
Higher education aged 20+	12,2%
Matric aged 20+	21,6%
Number of households	452
Average household size	2,1
Female-headed households	18,2%
Formal dwellings	85,1%
Housing owned/paying off	20,6%
Flush toilet connected to sewerage	56,8%
Weekly refuse removal	23,5%
Piped water inside the dwelling	53,9%
Electricity for lighting	87,8%

6. IDENTIFICATION OF POTENTIAL IMPACTS

The social impact variables considered across the project are in accordance with Vanclay's list of social impact variables clustered under the following main categories as adapted by Wong (Vanclay, 2002; Statistics South Africa, 2020a) and include:

1. Health and social well-being
2. Quality of the living environment (Liveability)
3. Economic
4. Cultural.

These categories are not exclusive and at times tend to overlap as certain processes may have an impact within more than one category.

6.1. HEALTH AND SOCIAL WELLBEING

The health and social wellbeing impacts related to the project include:

- Annoyance, dust noise
- Increase in crime
- Increased risk of HIV infections
- An influx of construction workers and work-seekers
- Hazard exposure.

6.1.1. ANNOYANCE, DUST NOISE

Annoyance, dust and noise will be more evident during the construction phase of the project, as construction activities will result in disruptions and the generation of dust and noise from construction vehicles and equipment. Site-specific activities such as site clearance and the deliveries of materials, equipment, plant and the transportation of the workforce along unsealed access roads will generate the most dust and noise. Dust that accumulates on foliage and grasses that is used for grazing may result in that foliage and those grasses becoming unpalatable for livestock and/or game. This may in turn have an effect on farming activities within the vicinity of the project site and along the access road over the construction period.

Over the operational phase of the project far less disruption, dust and noise are expected in the vicinity of the project site, however, along the unsealed access road dust and noise can be generated by traffic travelling to and from the project site.

6.1.2. INCREASE IN CRIME

The project straddles the Kuruman and Kathu police precincts. Both areas have a relatively high crime level as both precincts incorporate urban areas. In this regard, Kuruman had a total of 1 870 crimes reported in 2020[1] with Kathu having a total of 1 397 reported crimes. Because these precincts incorporate urban areas they are not good indicators of crime in the vicinity of the project as the area surrounding the project is more rural. There are, however, no separate crime statistics for the specific area that the project is located in apart from those applying to the Kathu and Kuruman precincts.

It is often opportunistic crimes such as stock theft, the abuse of alcohol and relationship-related crimes that are associated with construction activities. With this in mind, it would be pertinent for the developers to ensure that processes are put in place through which any suspected criminal activities associated with the project can easily be communicated and swiftly addressed. The construction phase carries with it a higher risk of associated criminal activities than would be the case during the operational phase of the project.

[1] These figures are in respect of the 9 month period between 1 January and 5 October 2020 sourced from Crime Stats SA https://www.crimestatssa.com/index.php

6.1.3. INCREASED RISK OF HIV INFECTIONS

With an HIV prevalence rate of 23.2% amongst antenatal women in 2013, the John Taolo Gaetsewe District Municipality had a relatively moderate HIV prevalence rate. This placed the district as the 15th lowest districts of the 52 districts across the country. The fact that sexually transmitted diseases tend to be spread by construction and transport workers, together with the high prevalence of HIV across the rest of South Africa, opens the area to a high risk of HIV infections (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Meintjes, Bowen, & Root, 2007; World Bank Group, 2016; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018). This risk is likely to be at its highest during the construction phase of the project as the construction workforce increases and material and equipment are delivered to site. During the operational phase of the project, when the workforce stabilises at a much lower level, the risk of HIV infections is likely to subside.

Due to the relatively low prevalence of HIV in the area and the risks associated with construction and transport workers, it is important that this issue is given serious attention and that the appropriate mitigation measures are implemented and the situation is closely monitored throughout the construction and operational phases of the project. The risk of the spread of HIV is most prevalent on a cumulative basis and is addressed as such under Section 6: Cumulative Impacts below.

6.1.4. AN INFLUX OF CONSTRUCTION WORKERS

During construction the workforce is likely to peak at approximately 50 workers of which 60% will be low skilled, 24% semi-skilled and 16% skilled with construction workers being sourced locally as far as is feasible. During the operational phase, the workforce will comprise of a total of 65 workers of which 70% will be semi-skilled and 30% skilled.

The influx of construction workers could have an impact on the family structures and social networks of local communities. This is particularly relevant in situations where workers are accommodated amongst local communities and/or where they frequent the same recreational facilities as local communities. These risks may be associated with:

- Alcohol and/or drug use
- Relationship formation and/or the disruption of existing relationships
- Prostitution
- Pregnancies, and the
- Spreading of sexually transmitted diseases.

6.1.5. HAZARD EXPOSURE

The use of heavy equipment and vehicles and an increase in vehicle traffic within the vicinity of all construction sites will result in an increased risk to the personal safety of people and animals. Of particular concern are increased hazards faced by pedestrians, cyclists and motorists with emphasis on vulnerable groups such as children and the elderly. Excavation work and trenches also pose a hazard to the safety of people, particularly children and animals, who may fall into these works and who may have difficulty in getting out.

There will also be an increased risk of fires due to the likelihood of construction workers lighting fires for cooking and warmth during cold periods. Nevertheless, with the recommended mitigation measures being successfully put in place this can be controlled.

6.2. QUALITY OF THE LIVING ENVIRONMENT

The following quality of the living environment impacts are related to the project.

- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Transformation of the sense of place.

6.2.1. DISRUPTION OF DAILY LIVING PATTERNS

Disruptions to daily living patterns are likely to be minimal and restricted to the construction phase of the project. This impact will mainly be associated with the site and the main access road. These disruptions are only likely to be associated with the delivery of materials and machinery to site and the transportation of workers to and from the site.

6.2.2. DISRUPTION TO SOCIAL AND COMMUNITY INFRASTRUCTURE

With the workforce associated with the construction phase peaking at approximately 50 workers, it is unlikely that in isolation the project will have any significant effect on social and community infrastructure in the area. However, on a cumulative basis, considering the activities currently taking place and planned for the area, there is likely to be a significant impact with regard to the disruption of social and community structures in the region. This impact is dealt with in greater depth under Section 5 Cumulative Impacts below.

6.2.3. TRANSFORMATION OF THE SENSE OF PLACE

Powerlines are highly visible and often local communities perceive these structures as having a negative impact on the landscape and as such limiting to their quality of life as a result of the transforming of the sense of place of the area. In respect of this powerline, however, it is related to the delivery of renewable energy and some researchers have found mixed reactions to the visual impacts of renewable energy facilities with those who link positive economic benefits to nearby large-scale facilities tending to see these projects in a more positive light (Carlislea, Kaneb, Solan, & Joed, 2014; Visschers & Siegrist, 2014). It seems a more reliable indication of public opinion towards renewable energy sources is attached to the evaluation process. In this regard when people evaluate renewables on an abstract level they tend to be more positive than when evaluating them at a more concrete level (Sütterlin & Siegrist, 2017).

The visual specialist concluded that:

> " *…the visual environment surrounding the power line, especially within a 0.5km radius, may be visually impacted upon for the anticipated operational lifespan of the 132kV power line.*
>
> *This impact is applicable to the proposed grid connection infrastructure and to the potential cumulative visual impact of the power line in association with existing electricity distribution and generation infrastructure within the region"* (Logis, 2020, p. 32).

6.3. ECONOMIC

The economic impacts related to the project include.

- Job creation and skills development and
- Socio-economic stimulation.

6.3.1. JOB CREATION AND SKILLS DEVELOPMENT

The project will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region. In this regard, there are approximately 50 direct jobs associated with the construction phase of the project. Off these, approximately 60% will be for low and non-skilled workers with ~24% going to semi-skilled and ~16% to skilled workers.

The powerline will become an Eskom asset and as such is unlikely to result in any additional jobs being created as maintenance and repairs can be undertaken by existing staff.

6.3.2. SOCIO-ECONOMIC STIMULATION

Apart from these jobs, the project is also likely to stimulate the local economy which will be most significant at a cumulative level. This contribution will be in the form of disposable salaries and the purchases of services and supplies from the local communities in and around the region. In addition and on a national scale there will be economic benefit attached to connecting the Hyperion PV Solar Energy Facility complex and proposed Hybrid Thermal Power Facility to the national grid in accordance with governmental requirements (Government Notice No. 1015, 2020).

Projects which form part of the DoE's Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) are required as part of their bidding requirements to contribute towards local economic development (LED) and social upliftment initiatives within the area in which they are proposed. In addition, they are required to spend a percentage of their revenue on socio-economic and enterprise development, as well as allocate ownership shares to local communities that benefit previously disadvantaged communities around the project. A portion of the dividends generated by each development also needs to be invested into LED projects and programmes. The proposed development, therefore, has the potential to contribute positively towards socio-economic development and improvements within the local area.

6.4. CULTURAL IMPACTS

At a social level, it is likely that any cultural impacts would be associated with sensitive archaeological and/or heritage sites that may be found and as such are addressed in the heritage assessment. In this regard the heritage specialist indicates that:

> "*Because the potential impacts to heritage resources can be easily managed with implementation of appropriate mitigation measures, it is the opinion of the heritage specialist that the proposed powerline development should be authorised in full*" (ASHA Consulting (Pty) Ltd, 2019, p. 21).

7. IMPACT ASSESSMENT

The impacts as they apply to both the construction and operational phase of the project will be assessed below and mitigation and optimisation measures will be suggested as is appropriate.

7.1. PLANNING AND DESIGN PHASE

It is evident that the project fits with legislation and key planning and policy documentation. In this regard, renewable energy facilities are supported on a national, provincial and municipal level.

7.2. CONSTRUCTION PHASE

Most of the impacts discussed above apply over the short-term to the construction phase of the project and include:

- Annoyance, dust and noise
- Increase in crime
- Increased risk of HIV infections
- An influx of construction workers
- Hazard exposure
- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Economic
    - Socio-economic stimulation.

Each of these impacts is assessed below with mitigation and optimisation measures being suggested in **Table 3** to **Table 11**.

Table 3: Annoyance dust and noise

Nature: Annoyance dust and noise generated through construction activities.		
	Without mitigation	**With mitigation**
Extent	Local = 1	Local = 1
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Minor to Low = 3
Probability	Definite = 5	Definite = 5
Significance	**Low (-30)**	**Low (-25)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes

Mitigation:

- Wet gravel roads regularly;
- Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
- Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues;
- Appoint a community liaison officer to deal with complaints and grievances from the public.

Cumulative impacts:

Other construction activities in the area will heighten the nuisance impacts, such as noise, dust and wear and tear on roads

Residual impacts:

- Dust may settle on vegetation discouraging livestock and game from browsing in the area affected by dust.

Table 4: Increase in crime

Nature: Increase in crime		
	Without mitigation	**With mitigation**
Extent	Regional = 2	Regional = 2
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Minor to Low = 3
Probability	Highly probable = 4	Probable = 3
Significance	**Low (-28)**	**Low (-18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes

Mitigation:

- Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing;
- Fence off the construction site and control access to these sites;
- Appoint an independent security company to monitor the site;
- Appoint a community liaison officer;
- Encourage local people to report any suspicious activity associated with the construction site to the community liaison officer;
- A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC Contractor, and sub-contractors remain responsible and accountable, and to facilitate the identification and implementation of additional mitigation measures if required;
- Prevent loitering within the vicinity of the construction camp as well as construction sites by recruiting off-site in visa an offsite recruiting office/agent, whatever is most appropriate.

Cumulative impacts: With the various projects planned for the area it is possible that on a cumulative basis this would increase crime levels in the region.

Residual impacts:

- If crime levels do rise in the area it may take some time before they are restored to the previous low level;
- Depending on the crimes committed victims may suffer long-term effects as a result of their experience.

Table 5: Increased risk of HIV infections

***Nature:* Increased risk of HIV infections.**		
	Without mitigation	**With mitigation**
Extent	Regional = 4	Regional = 4
Duration	Long-term = 4	Long-term = 4
Magnitude	Moderate to High = 7	Moderate = 6
Probability	Highly probable = 4	Probable = 3
Significance	**High (-60)**	**Medium (-42)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes	Yes

Mitigation:

- Ensure that an onsite HIV and AIDS policy is in place and that construction workers are expose to a health and HIV/AIDS awareness educational programme within the first month of construction;
- Provide voluntary and free counselling, free testing and condom distribution services to the workforce;
- Where feasible extend the HIV/AIDS programme into the community with a specific focus on schools and youth clubs.

Cumulative impacts:

The development of other facilities and associated infrastructure would increase the risk of HIV in the area and would need to be addressed.

Residual impacts:

- The area currently has a relatively low HIV prevalence rate and any increase in this rate would have serious consequences that could last over an extended period;
- People contracting HIV and their families will suffer life-changing consequences.

Table 6: Influx of construction workers

***Nature:* Influx of construction workers**		
	Without mitigation	**With mitigation**
Extent	Regional = 2	Regional = 2
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Low to Minor= 3
Probability	Probable = 4	Probable = 3
Significance	**Low (-28)**	**Low (-18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: • Communicate the limitation of opportunities created by the project through Community leaders and Ward Councillors to prevent an influx of job seekers; • Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work; • Draw up a recruitment policy in conjunction with the Community Leaders and Ward Councillors of the area and ensure compliance with this policy.		
Cumulative impacts: With the various projects being undertaken in the area the influx of workers could reach a significant level which could lead to an increase in crime in the area.		
Residual impacts: • There is the risk that some workers remain in the area in the hope of finding employment with other projects planned for the region. This risk is, however, reduced as most workers will be recruited locally.		

Table 7: Hazard exposure

***Nature:* Hazard exposure**		
	Without mitigation	**With mitigation**
Extent	Regional = 2	Regional = 2
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Minor to Low = 3
Probability	Highly probable = 4	Highly probable = 4
Significance	**Low (-28)**	**Low (-24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes

Mitigation:

- Ensure all construction equipment and vehicles are properly maintained at all times;
- Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly;
- Ensure that fires lit by construction staff are only ignited in designated areas and that the appropriate safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to;
- Make staff aware of the dangers of fire during regular toolbox talks;
- A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC Contractor, and sub-contractors remain responsible and accountable, and to facilitate the identification and implementation of additional mitigation measures if required;
- Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably knowledgeable on how to raise concerns and have these addressed;
- Compile and implement a Fire Management and Emergency Preparedness and Response Plan;
- Follow the recommendations in the Traffic Management Plan.

Cumulative impacts: With a possible increase in heavy vehicle traffic and an increase in workers associated with the various projects planned for the area there is likely to be an increased risk of hazard exposure including fire risk.

Residual impacts:

- With an increased risk of hazard exposure, there is the possibility that people may be injured or killed which will place a burden on their families.

Table 8: Disruption of daily living patterns

***Nature:* Disruption of daily living patterns**		
	Without mitigation	**With mitigation**
Extent	Regional = 2	Regional = 2
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Minor to Low = 3
Probability	Highly probable = 4	Highly probable = 4
Significance	**Low (-28)**	**Low (-24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: • Follow the recommendations in the Traffic Management Plan; • Ensure that, at all times, people have access to their properties as well as to social facilities; • All vehicles must be roadworthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues; • Heavy vehicles should be inspected regularly to ensure their road safety worthiness; • Avoid heavy vehicle activity during “peak” hours (when children are taken to school, or people are driving to work); • The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged due to construction activities.		
Cumulative impacts: With the various projects planned for the area there may be an increase in the disruptions of living patterns, especially due to an increase in traffic.		
Residual impacts: • It is unlikely that any disruption of community patterns will persist after construction.		

Table 9: Disruption to social and community infrastructure

***Nature:* Disruptions to social and community infrastructure**		
	Without mitigation	**With mitigation**
Extent	Regional = 3	Regional = 3
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Minor to Low = 3
Probability	Improbable = 2	Improbable = 2
Significance	**Low (-16)**	**Low (-14)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: • Regularly monitor the effect that construction is having on infrastructure and immediately report any damage of infrastructure to the appropriate authority; • Ensure that where communities' access is obstructed that this access is swiftly restored to an acceptable state.		
Cumulative impacts: There is a risk that social and community infrastructure in the area will be disrupted due to the increase in similar projects in the area.		
Residual impacts: • If disrupted social and community infrastructure is not swiftly restored there is a risk that local communities may experience an extended loss in this respect.		

Table 10: Job creation and skills development

***Nature:* Job creation and skills development**		
	Without enhancement	**With enhancement**
Extent	Regional = 3	Regional = 3
Duration	Short-term = 1	Short-term = 1
Magnitude	Minor to low = 3	Minor to low = 3
Probability	Highly probable = 4	Highly probable = 4
Significance	**Medium (+28)**	**Medium (+28)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be optimised	Yes	Yes
Enhancement: • Wherever feasible, local residents should be recruited to fill semi and unskilled jobs; • Women should be given equal employment opportunities and encouraged to apply for positions; • A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction; • A procurement policy promoting the use of local business should, where possible, be put in place and applied throughout the construction phase; • As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used.		
Cumulative impacts: Job creation and skills development in the region could rise as a result of the various projects planned for the area.		
Residual impacts: • Job creation and skills development may help in addressing poverty and low living standards in the region and improve skills and experience in the local area.		

Table 11: Socio-economic development

***Nature:* Socio-economic development.**		
	Without mitigation	**With mitigation**
Extent	Regional = 2	Regional = 2
Duration	Short-term = 1	Short-term = 1
Magnitude	Low = 4	Low = 4
Probability	Definite = 5	Definite = 5
Significance	**Medium (+35)**	**Medium (+35)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be optimised	Yes	Yes
Enhancement: • A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase; • A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.		
Cumulative impacts: The various projects planned for the area could have a positive impact on the regional economy due to the opportunity for local capital expenditure.		
Residual impacts: • The project could assist in upgrading the skills of local community members and growth in local business.		

7.3. OPERATIONAL PHASE

The social impacts that apply to the operational phase of the project are:

- Transformation of the sense of place and
- Economic
  - Socio-economic stimulation

These impacts are assessed below in **Table 12** to **Table 13** and mitigation and optimization measure are suggested in each case.

Table 12: Transformation of the sense of place

***Nature:* Transformation of the sense of place.**		
	Without mitigation	**With mitigation**
Extent	Regional = 4	Regional = 4
Duration	Long-term = 4	Long-term = 4
Magnitude	Low to moderate = 5	Low to Moderate = 5
Probability	Definite = 5	Definite = 5
Significance	**High (-65)**	**High (-65)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: • Apply the mitigation measures suggested in the Visual Impact Assessment Report; • Communicate the benefits associated with renewable energy to the broader community; • Ensure that all affected landowners and tourist associations are regularly consulted; • A Grievance Mechanism should be put in place and all grievances should be dealt with transparently; • The mitigation measures recommended in the Visual and Heritage and Palaeontology Impact Assessments should be followed.		
Cumulative impacts: There is a significantly high risk that the projects planned for the area will transform the sense of place of the area.		
Residual impacts: • Once the project has been decommissioned it will take some time and effort to restore the area's original sense of place.		

Table 13: Socio-economic stimulation

***Nature:* Socio-economic stimulation**		
	Without enhancement	**With enhancement**
Extent	Regional = 4	Regional = 4
Duration	Long-term = 4	Long-term = 4
Magnitude	Low to Moderate = 5	Moderate = 6
Probability	Definite = 5	Definite = 5
Significance	**High (+65)**	**High (+70)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be optimised	Yes	Yes
Mitigation: • Ensure that the procurement policy supports local enterprises; • Establish a social responsibility programme either in line with the RMIPPPP BID guidelines or equivalent; • Work closely with the appropriate municipal structures with regard to establishing a social responsibility programme; • Ensure that any trusts or funds are strictly managed in respect of outcomes and funds.		
Cumulative impacts: The various projects planned for the area could have a positive impact on the regional economy and the contribution towards the national grid could have a significant positive national impact.		
Residual impacts: • The project could assist in upgrading the skills of local community members and in strengthening the national grid.		

7.4. DECOMMISSIONING PHASE

The powerline will become an Eskom asset and considering the relatively long time period to decommissioning, the uncertainty of what would exactly occur, and the significance of the impact in isolation it would be rather meaningless to attach assessment criteria to decommissioning at this point. However, prior to decommissioning the following mitigation measures are suggested.

8. ASSESSMENT OF NO-GO ALTERNATIVE

The no project alternative would mean that the social environment is not affected as the status quo remains. On a negative front it would also mean that all the positive aspects associated

with the project would not materialise. Consequently, there would be no job creation, no revenue streams into the local economy and municipal coffers and a lost opportunity to enhance the national grid with a renewable source of energy. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not global level. The Intergovernmental Panel on Climate Change (6 October 2018, p. 15) has warned that that Co^2 emissions need to be reduce by 45% from 2010 levels by 2030 and to zero by 2050. This means that the countries heavy reliance on coal-powered energy generation must be replaced with more environmentally friendly modes of energy generation. The no-go alternative is assessed in **Table 14**.

Table 14: No project alterative

***Nature:* No project alternative**	
	Without mitigation
Extent	Regional = 5
Duration	Long-term = 4
Magnitude	Moderate = 6
Probability	Definite = 5
Significance	**High (-75)**
Status (positive or negative)	Negative
Reversibility	Yes
Irreplaceable loss of resources	Yes
Can impacts be optimised	No

9. CUMULATIVE IMPACTS

Over the last five years, South Africa has experienced a proliferation in the number of renewable energy facilities and infrastructure being constructed across the country. Accordingly, the government has identified eight Renewable Energy Development Zones (REDZs) and embarked on an initiative, the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) and Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) in an effort to channel private sector expertise and investment into grid-connected energy in South Africa. Although the project does not fall within one of these REDZ, it is surrounded by a number of other PV facilities. Apart from these PV facilities Sishen Airport at ~10 KM, Kathu at ~12 km and Kumba Iron Ore Mine at ~14 km, all fall within a 14 km radius of the project.

On a more project-specific basis, the following projects listed in **Table 15** have been identified within the region and as such are illustrated in **Figure 8**; while the existing grid connection infrastructure is illustrated in **Figure 9**. Although surrounded by industrial and urban areas the project falls within a rural setting and is close to the PV facilities listed below. Consequently, the following social issues need to be considered on a cumulative basis:

Health and social wellbeing

- Risk of HIV

Quality of the living environment

- Sense of place
- Service supplies and infrastructure and

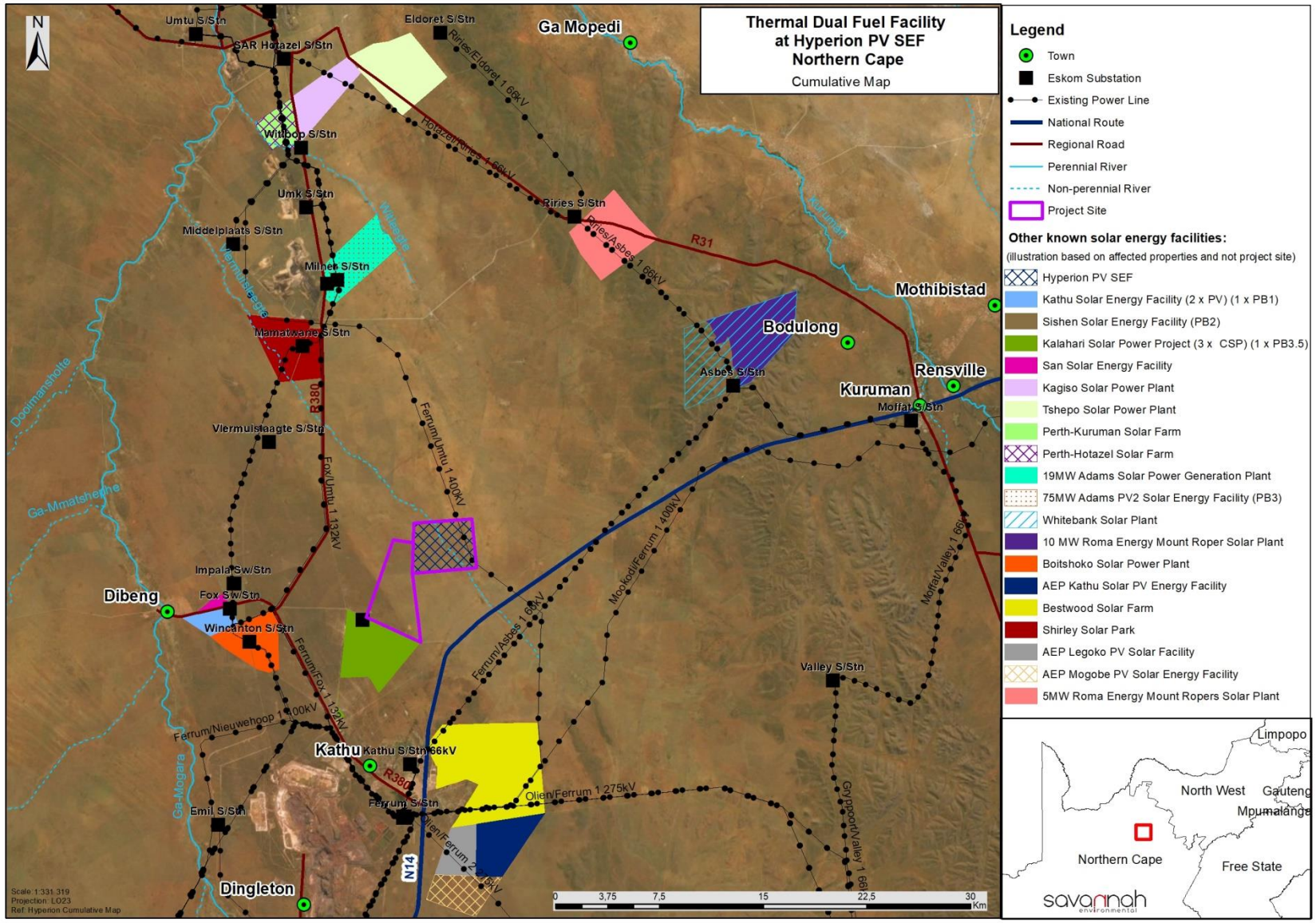
Economic.

These impacts are considered and assessed below.

Table 15: Renewable energy projects within a 30 km radius of the proposed project

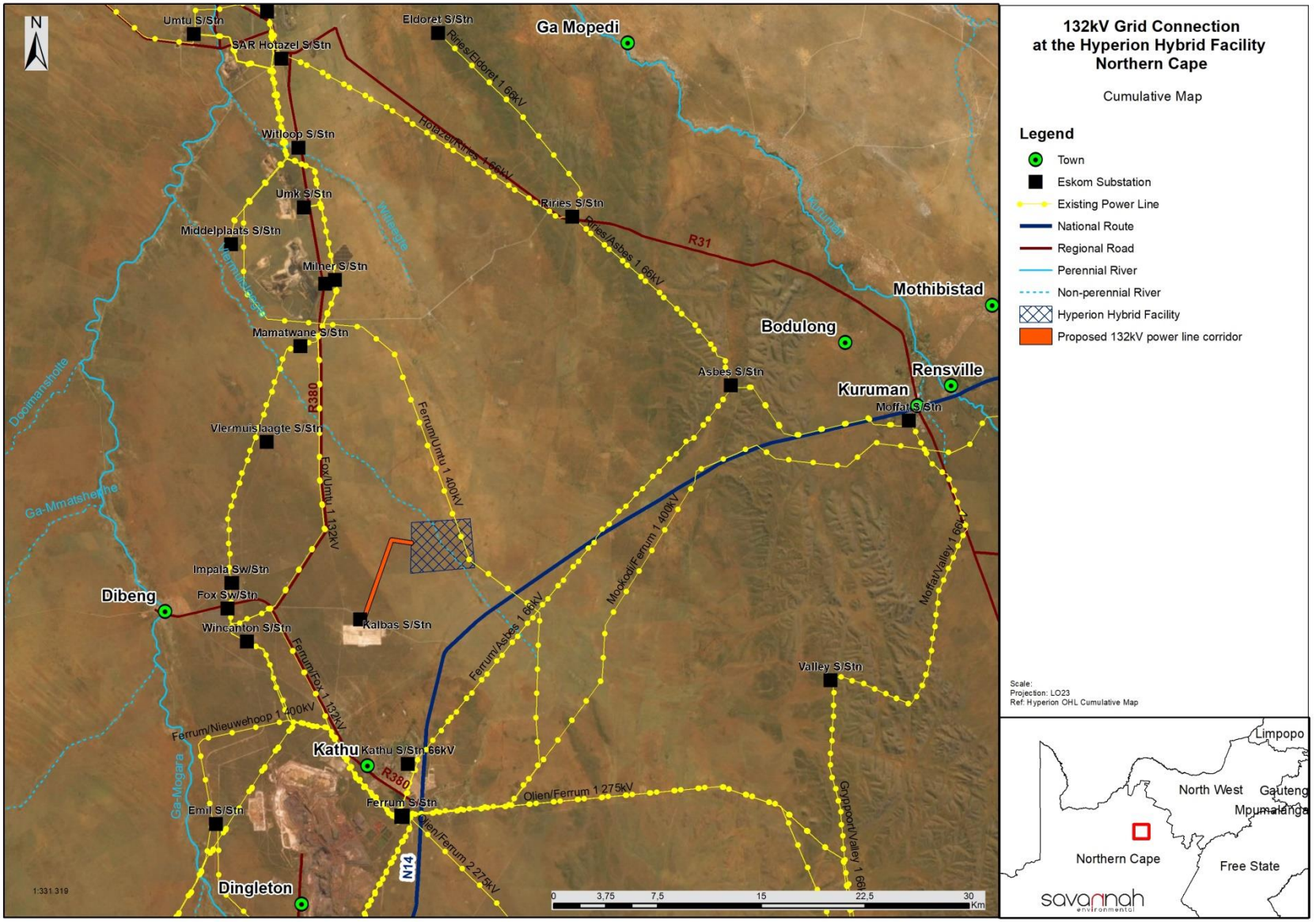
Project Name	DEA Reference Number(s)	Location	Approximate distance from Hyperion Hybrid Facility	Project Status
Kalahari Solar Power Project (CSP) (1 x 100 MW project)	12/12/20/1994/1	Remaining Extent of the Farm Kathu 465	~9.3 km south-west	Preferred Bidder (already constructed)
Kalahari Solar Power Project (CSP) (1 x 150 MW project)	12/12/20/1994/2	Remaining Extent of the Farm Kathu 465	~9.3 km south-west	Approved
Kalahari Solar Power Project (CSP) (1 x 150 MW project)	12/12/20/1994/3	Remaining Extent of the Farm Kathu 465	~9.3 km south-west	Approved
Bestwood Solar Farm (PV)	12/12/20/1906	Remaining Extent of the Farm Bestwood 459	~14 km south	Approved
Boitshoko Solar Power Plant (PV) (1 x 115 MW project)	14/12/16/3/3/2/935	Remaining Extent of Portion 1 of the Farm Lime Bank 471	~15.4 km south-west	Approved
Sishen Solar Farm (PV) (1 x 75 MW project)	12/12/20/1860	Portion 6 of the Farm Wincanton 472	~15.8 km west	Preferred Bidder (already constructed)
Kathu SEF (PV) (1 x 75 MW project)	12/12/20/1858/1	Portion 4 of the Farm Wincanton 472	~15.8 km west	Preferred Bidder (already constructed)
Kathu SEF (PV) (1 x 25 MW project)	12/12/20/1858/2	Portion 4 of the Farm Wincanton 472	~15.8 km west	Approved
Shirley Solar Park (PV) (1 x 75 MW project)	14/12/16/3/3/2/616	Portion 1 of the Farm Shirley 367	~17.9 km north-west	Approved
Adams Solar Power Generation Plant (PV) (1 x 19 MW project)	12/12/20/2566	Remaining Extent of the Farm Adams 328	~22 km north	Approved
Adams PV SEF (PV) (1 x 75 MW project)	12/12/20/2567	Remaining Extent of the Farm Adams 328	~22 km north	Preferred Bidder (already constructed)

Project Name	DEA Reference Number(s)	Location	Approximate distance from Hyperion Hybrid Facility	Project Status
AEP Kathu Solar PV Energy Facility (PV) (1 x 75 MW project)	14/12/16/3/3/2/911	Remaining Extent of the Farm Legoko 460	~22.4 km south	Approved
AEP Legoko PV Solar Facility (PV) (1 x 75 MW)	14/12/16/3/3/2/819	Portion 2 of the Farm Legoko 460	~22.4 km south	Approved
Roma Energy Mount Roper Solar Plant (PV) (1 x 10 MW project)	14/12/16/3/3/1/474	Portion 4 of the Farm Whitebank 379	~25 km northeast	Approved
Whitebank Solar Plant (PV) (1 x 10 MW project)	14/12/16/3/3/1/475	Portion 4 of the Farm Whitebank 379	~25 km northeast	Approved
Mogobe PV SEF (1 x 75 MW project)	14/12/16/3/3/2/820	Portion 1 of the Farm Legoko 460	~25 km south	Approved
Roma Energy Mount Ropers Solar Plant (PV) (1 x 5 W project)	14/12/16/3/3/1/1753	Remaining Extent of the Farm Mount Roper 321	~25.7 km northeast	Approved
Perth – Kuruman Solar Farm (PV) (1 x 75 MW project)	14/12/16/3/3/2/761	Remaining Extent of the Farm Pert 276	~30 km north	Approved
Perth – Hotazel Solar Farm (PV) (1 x 75 MW project)	14/12/16/3/3/2/762	Remaining Extent of the Farm Pert 276	~30 km north	Approved
Kagiso Solar Power Plant (PV) (1 x 115 MW project)	14/12/16/3/3/2/934	Remaining Extent of the Farm Pert 276	~30 km north	Approved
Tshepo Solar Power Plant (PV) (1 x 115 MW project)	14/12/16/3/3/2/936	Remaining Extent of Farm 275	~30 km north	Approved



Map courtesy of Savannah Environmental (Pty) Ltd

Figure 8: Renewable energy developments in the area



Map courtesy of Savannah Environmental (Pty) Ltd

Figure 9: Grid connection infrastructure in the area

9.1. RISK OF HIV INFECTIONS[2]

With an HIV prevalence rate of 17.5%, when compared to all other provinces across the country as assessed in 2013, the Northern Cape Province is the province with the lowest HIV prevalence rates. At a district level the John Taolo Gaetsewe District Municipality had the fifteenth lowest HIV prevalence rate across all districts in South Africa, with the HIV prevalence rate amongst antenatal women being at 23.2%. Consequently, the district within which the project is located, and some of the neighbouring districts, ZF Mgcawu (formally Siyanda) at 20.1% and Dr Ruth Segomotsi Mompati at 23.4%, have some of the lowest HIV prevalence rates across the country.

These figures are relatively low compared to other areas of the country which range from a rate of 20.3% in Limpopo and 40.1% in KwaZulu-Natal with the iLembe District Municipality having an HIV prevalence rate of 45.9% in 2013. Apart from the Western Cape, that had an HIV prevalence rate of 18.7% in 2013, the rest of the provinces sharing common borders with the Northern Cape Province all have relatively high HIV prevalence rates as indicated below:

North West = 28.2%
Free State = 29.8%
Eastern Cape = 31.1%.

With the influx of labour, particularly following the construction of the various renewable energy and mining projects within the region, the risk of HIV infections in the area is likely to rise significantly. It is well documented on both an international and local basis that the construction industry carries a high level of HIV which can be spread amongst the local communities, particularly through the spread of prostitution that follows the availability of disposable income (Meintjes, Bowen, & Root, 2007; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Wasie, et al., 2015; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018). It is also well documented on both an international and local level that HIV is also spread by truck drivers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Strauss, et al., 2018) and there is likely to be an increase in truck drivers in the area as equipment and material is delivered to the various construction sites.

With the area being extremely poor and the associated disposable income that will follow the construction workers and truck drivers to the area will heighten the risk of the spread of HIV

[2] HIV prevalence rates are at 2013 figures based on The 2013 National Antenatal Sentinel HIV Prevalence Survey, South Africa.

infections across what is a relatively isolated region. In this regard, The World Bank (2009, pp. 367-368) had indicated a strong link between infrastructure projects and health as:

> "*Transport, mobility, and gender inequality increase the spread of HIV and AIDS, which along with other infectious diseases, follow transport and construction workers on transport networks and other infrastructure into rural areas, causing serious economic impacts.*"

9.2. INCREASE IN CRIME

It is possible that due to increased construction activities in the area the perception may be created that there is an associated increase in job opportunities. This may result in job seekers descend on the region in the hope of gaining employment. These activities across the area may also attract entrepreneurs to set up small businesses aimed at servicing the growing population. All this activity could also attract opportunists who may take advantage of the emerging situation which may lead to an increase in crime in the area. In 2018 Kuruman had a total of 3 760 crimes reported with Kathu having a total of 2 634 reported crimes. The issue of crime associated with construction sites is of growing concern across the country and needs serious attention to prevent it from getting out of hand. In this regard, it has been reported that:

> "*Armed gangs recently disrupted the R1.65bn Mtentu Bridge project in the Eastern Cape, and a R2.4bn oil-storage investment project at Saldanha in the Western Cape was halted on March 13 after people demanding to be part of the project burnt down properties, the SA Forum of Civil Engineering Contractors (Safcec) said in a March 18 letter addressed to finance minister Tito Mboweni*" (Monteiro & Prinsloo, 2019)[3].

Consequently, the increase in crime associated with developments in the area becomes a risk on a cumulative basis.

9.3. TRANSFORMATION OF SENSE OF PLACE

Within a social context, a sense of place includes a wide range of criteria, all or some of which add meaning to a particular area for individuals and groups. These criteria may include the vista, geography, urban layout, flora and fauna, community, history and fragrance of a place amongst many others and are interpreted uniquely on an individual basis. Some individuals may embrace changes to the sense of place that others may reject and for some, it may merely be a change in the demographics of an area that leaves them feeling threatened, vulnerable

[3] In this regard also see Creamer Media's Engineering News, 2019 and SAFCEC's "Letter to the Minister of Finance the Honourable Tito Mboweni, 2019" amongst others.

and insecure. Groups and group membership can help to reinforce the sense of place of an area and can also serve to reinforce fears and suspicions associated with pending changes to the sense of place. A sense of place has much to do with unique individual perceptions attached to the location and is subjective by nature.

With the number of PV facilities, sub-stations and transmission lines in the vicinity the sense of place of the area is transforming from what had more of a rural farming aura to take on more of an industrial character. The project, considered along with the various other projects in the area, is likely to accelerate this transformation thus changing the sense of place of the region. Some of the concerns associated with this change to the environment relate to glare and aircraft interference, particularly considering the proximity of Sishen Airport; the visual impact both static and dynamic along the N14 and R380 and land use transformation from farming to industrial. As this change will be associated with the clustering of several projects in the area it will need to be considered on a cumulative basis.

9.4. DISRUPTION OF SERVICES, SUPPLIES AND INFRASTRUCTURE

With the proliferation of renewable energy facilities in the area, it is quite likely that the local authorities, currently hard-pressed to deliver services due largely to the growth in mining activities in the area, according to the Gamagara LM IDP 2017 – 2022, will find it difficult to keep up with these developments. The influx of construction workers is likely to place pressure on accommodation and the need for both services and supplies. The urban area of Kathu, some 12 km south, southwest of the project is likely to bear the brunt of the demand for accommodation, services and supplies. On this basis market demands could inflate costs that may have a negative effect on local communities, particularly the poor, who may be forced to pay higher prices for essential supplies resulting in an escalation of the cost of living in the area. Social services such as medical and educational facilities could also be placed under pressure due to increased demand. Although this may reach its peak during the construction phase it should be mitigated somewhat by the fact that the construction of the various project will be spread across different timelines, with some project commencing while other reach completion. Where numerous projects are entering into construction phase simultaneously, the project companies should engage to align efforts. Employing local people across the various projects and project phases may also assist in reducing the stress placed on services, supplies and infrastructure in the area.

During the operational phases, it is likely that these demands will continue as operational staff take up more long-term residency in the area and are supported by service and maintenance

personnel who may spend some time on-site on a contractual basis. An influx of temporary maintenance and service workers is likely to last over the operational phase of the projects but is likely to settle within the medium term as the economy adjusts and the municipal authorities are able to respond to this growth.

9.5. ECONOMIC

The cumulative economic impact of the project will be both positive and negative. The negative economic impacts, associated with a possible rise in living costs driven by market demand, are considered under the section above. Under this section, the positive economic impacts will be addressed.

From a positive perspective, the proliferation of renewable energy facilities within the region is likely to result in significant and positive cumulative impacts in the area in terms of both direct and indirect job creation, skills development, training opportunities, and the creation of business opportunities for local businesses. In this regard it is indicated in the IPPPP Quarterly Report, as at 31 March 2018, that in respect of South Africa as a whole and through the Independent Power Producers Procurement Programme, " ..*the REIPPPP is targeting broader economic and socio-economic developmental benefits*" and that "[t]*o date, a total of 35 702 job years have been created for South African citizens, of which 30 763 were in construction and 4 938 in operations*" (Independent Power Producer Office, 2018a, p. 36 & 40). In addition to this R20.6 billion has been committed to socio-economic development while the projected procurement spend is "…*R147.6 billion of which R55.5 billion has been spent to date.*" The municipalities within the area have identified renewable energy as a strategic economic opportunity in a region that previously had few such opportunities. This is indicated in the various IDPs and LEDs pertaining to the affected municipalities.

9.6. ASSESSMENT OF CUMULATIVE IMPACTS

With the project generating a maximum of 50 jobs over the construction phase and, being an Eskom asset, no additional operational jobs; it will have minimal cumulative impact if considered in isolation. However, the cumulative impacts assessed in **Table 16** to **Table 20** below are considered against the background of all projects planned and being executed in the area. It must also be noted that this assessment is at a superficial level as any in-depth investigation of the cumulative effects of the various developments being planned and executed in the region are beyond the scope of this study as that would require a broad-based investigation on a far larger scale.

Table 16: Risk of HIV

Nature: Risk of HIV		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional = 4	Regional = 4
Duration	Long-term = 4	Long-term = 4
Magnitude	Moderate = 6	High = 8
Probability	Probable = 3	Highly probable = 4
Significance	**Medium (-42)**	**High (-64)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes	Yes

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense, the following mitigation measures would need to be considered.

- Ensure that all companies coming into the area have and are implementing an effective HIV/AIDS policy;
- Introduce HIV/ADS awareness programs to schools and youth institutions;
- Carefully monitor and report on the HIV status of citizens in the region;
- Be proactive in dealing with any increase in the HIV prevalence rate in the area.

Table 17: Increase in crime

Nature: Increase in crime		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional = 2	Regional = 5
Duration	Short-term = 1	Long-term = 4
Magnitude	Low = 3	Moderate = 6
Probability	Probable = 3	Highly probable = 4
Significance	**Low (-18)**	**Medium to high (-60)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense, the following mitigation measures would need to be considered.

- Encourage contractors and local people to report any suspicious activity associated with crime to the appropriate authorities.
- Ensure that the local municipalities, police, security companies, and policing forums are alerted to the increased construction activities in the region and the risk it posse in respect of crime.
- Prevent loitering within the vicinity of the construction camp as well as construction sites.
- Manage the growth of informal settlements that may arise as a response to growing job opportunities by promptly alerting the appropriate authorities.
- Set up a community forum consisting of contractors, local and national government officials and

Table 18: Transformation of Sense of place

Nature: Sense of place.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional = 4	Regional = 4
Duration	Long-term = 4	Long-term = 4
Magnitude	Low moderate = 5	High = 8
Probability	Definite = 5	Definite = 5
Significance	**High (-65)**	**High (-80)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	Yes
Can impacts be mitigated	Yes	Yes

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense, the following mitigation measures would need to be considered.

- Consider undertaking a cumulative impact assessment to evaluate the changes taking place across the area on a broader scale;
- Form a regional workgroup tasked with addressing the effect of changes to the sense of place of the region;
- Establish grievance mechanisms to deal with complaints associated with changes to the area;
- Enlighten the public about the need and benefits of renewable energy;
- Engage with tourism businesses and authorities in the region to identify any areas of cooperation that may exist.

Table 19: Disruption of service, supplies and infrastructure

***Nature:* Service supplies and infrastructure**		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional = 2	Regional = 4
Duration	Short-term = 1	Long-term = 4
Magnitude	Minor to Low = 3	Moderate to high = 7
Probability	Highly probable = 4	Highly probable = 4
Significance	**Low (-24)**	**High(-60)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	Yes
Mitigation: Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense, the following mitigation measures would need to be considered. • Engage with the municipal authorities to ensure that they are aware of the expansion planned for the area and the possible consequences of this expansion; • Ensure that local labour is recruited in respect of these developments in the area.		

Table 20: Economy

***Nature:* Positive economic impacts**		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional = 4	Regional = 5
Duration	Long-term = 4	Long-term = 4
Magnitude	Low to Moderate = 5	Moderate to High = 7
Probability	Definite = 5	Definite = 5
Significance	**High (+65)**	**High (+80)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources	No	No
Can impacts be optimised	Yes	Yes

Enhancement:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense, the following mitigation measures would need to be considered.

- Implement a training and skills development programme for locals;
- Ensure that the procurement policy supports local enterprises;
- Establish a social responsibility programme in line with the REIPPP;
- Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme;
- Ensure that any trusts or funds are strictly managed in respect of outcomes and funds allocated.

The assessment of the cumulative impacts takes into consideration the impacts associated with solar energy facilities in the area and on this basis; no fatal flaws associated with the cumulative impacts are evident at a social level. The impacts assessed above are summarised and a pre and post-mitigation comparison is presented in **Table 21**.

Table 21: Impact summary

Construction Phase			
Environmental parameter	**Issues**	**Rating before mitigation**	**Rating post-mitigation**
Health & social wellbeing	Annoyance, dust and noise	-30 low negative	-25 low negative
	Increase in crime	-28 low negative	-18 low negative
	Increased risk of HIV infections	-60 high negative	-42 medium negative
	Influx of construction workers	-28 low negative	-18 low negative
	Hazard exposure.	-28 low negative	-24 low negative
Quality of the living environment	Disruption of daily living patterns	-28 low negative	-24 low negative
	Disruptions to social and community infrastructure	-16 low negative	-14 low negative
Economic	Job creation and skills development	+28 low positive	+28 low positive
	Socio-economic stimulation	+35 medium positive	+35 medium positive
Operational Phase			
Quality of the living environment	Transformation of the sense of place	-65 high negative	-65 high negative
Economic	Socio-economic stimulation	+65 high positive	+70 high positive
No-Go Alternative			
No project		-75 high negative	
Cumulative Impacts			
Health & social wellbeing	Risk of HIV	-42 medium negative	-64 high negative
	Increase in crime	-18 low negative	-60 high negative
Quality of the living environment	Sense of place	-65 high negative	-80 high negative
	Services, supplies & infrastructure	-24 low negative	-60 high negative
Economic	Economic	+65 high positive	+80 high positive

10. ENVIRONMENTAL MANAGEMENT PLAN

The following measures pertaining to the social impacts are to be included in the draft Environmental Management Plan.

OBJECTIVE: To ensure, as far as is reasonable and practical, an environment that is safe and without risk to the health of employees and the general public who come into contact with activities associated with the project.			
Project component/s	Project site including laydown areas and access road. Deliveries on public roads to and from the project site.		
Potential Impact	Hazards exposure to the public and employees associated with construction and operational activities and construction and operational related traffic.		
Activity/risk source	Construction and operational activities and project-related traffic.		
Mitigation: Target/Objective	Safety of the workforce, visitors to the site and the general public who may come into contact with project-related components and/or activities.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Restrict public access to construction areas,. Only allow site access after appropriate induction and use of appropriate personal protective equipment. Impose vehicle speed restrictions and display appropriate signage. Ensure use and storage of hazardous materials is in accordance with Health and Safety regulations. Keep a record of all accidents or transgressions of safety in accordance with the OHS Act and implement corrective action. Ensure that fires are not permitted on site. Engage a safety officer.		Project developer in association with contractors.	Over the construction and operational phase of the project
Performance Indicator	Accident and incident tally and compliance with the OHS Act.		
Monitoring	A comprehensive record of accidents and incidence and related investigations, findings and corrective action in accordance with the OHS Act.		

OBJECTIVE: Reduce dust generation and emissions from site works, plant and vehicle movements along access road.

Project component/s	Clearing of site, construction activities, deliveries and daily traffic to and from the site.
Potential Impact	Degraded air quality and potential impact on human and animal health and accumulation of dust on vegetation used for grazing.
Activity/risk source	Site clearance, construction activities and project-related construction and operational traffic. Emissions from project-related traffic.
Mitigation: Target/Objective	To reduce and manage the potential exhaust emissions and dust impacts associated with construction activities and traffic travelling to and from the site.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Wet gravel roads regularly. Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues. Ensure that drivers adhered to speed limits. Re-vegetate disturbed areas as soon as is practical after construction. Appoint a community liaison officer to deal with complaints and grievances from the public. If complaints reach unacceptable levels an air quality survey should be undertaken to assess the situation, identify the source and rectify.	Project developer in association with contractors.	Over the construction and operational phase of the project.

Performance Indicator	Frequency of complaints from the public and time-lapse between receiving and resolving complaints. Public satisfaction in having their complaints addressed. Overall public satisfaction.
Monitoring	Maintain a record of complaints containing full details including dates and times of significant events.

OBJECTIVE: Control of the nuisance factor for surrounding communities.

Project component/s	Project site including laydown areas and access road.		
Potential Impact	General nuisance factor resulting from construction and operational activities and associated traffic.		
Activity/risk source	Movement of heavy vehicles in delivering plant, equipment and pylon components.		
Mitigation: Target/Objective	To minimise the nuisance factor experienced by surrounding communities.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Schedule the delivery hours to avoid peak hour traffic, weekends and evenings. Limit the need for transportation over long distances by sourcing as much materials and goods as is feasible from local suppliers. Alert traffic authorities well in advance of any heavy loads that will be transported on local roads and elicit their assistance in controlling traffic associated with the transportation of these loads. Alert the workforce to the need to behave in a socially responsible manner, being considerate towards local residents. Establish a code of conduct for the workforce. Restrict work activities that require power tools and plant that generates noise to normal working hours and limit such activities over weekends. Ensure that local by-laws are always adhered to. Appoint a community liaison officer. Ensure that a grievance/complaint reporting procedure is in place, appropriately implemented and that all submissions received are managed by: ➢ Recording grievance submission date. ➢ Keeping complainant informed of progress towards corrective action. ➢ Keeping a record of corrective action taken and recording closure date. Introduce an incident reporting system to be tabled at weekly/monthly project meetings.		Project developer in association with contractors.	Over the construction and operational phase of the project.
Performance Indicator	The frequency of complaints laid and the time lag between notification of the complaint and resolution. Level of public satisfaction.		
Monitoring	Monitor and evaluate performance at weekly/monthly site meetings and report to the contract manager.		

OBJECTIVE: Controlling the spread of STDs and HIV			
Project component/s	Migrant labour and transport workers.		
Potential Impact	The spread of STDs and HIV.		
Activity/risk source	The arrival of construction and transportation workers carrying STDs and/or HIV interacting with local communities during leisure hours. An increase in prostitution driven by an increase in exposable income in the area.		
Mitigation: Target/Objective	To minimise the risk of the spread of STDs and HIV in the area.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Implement an HIV/AIDS Awareness and Training Programme for the Contractor's workforce and if feasible the local community within two weeks of commencement of construction. Ensure that the HIV/AIDS Awareness and Training Programme is consistent with national guidelines and/or IFC's Good Practice. Focus on the recruitment of local labour which may help to stabilise the risk of the spread of HIV/AIDS by avoiding the need to introduce migrant labour during the construction phase. Provide voluntary and free counselling, free testing and condom distribution services.		Human resource department and project manager. Contractors.	Over the construction and operational phase of the project.
Performance Indicator	The stability of STDs and HIV infections amongst the workforce.		
Monitoring	This is difficult to monitor on an individual level as HIV status is confidential so can only be monitored voluntarily. Consultations with local clinics may provide some insight but this will depend on the availability of resources in the area and cooperation from the relevant health authorities.		

OBJECTIVE: Maximise the employment of local people and the services of local business during construction.

Project component/s	Construction of the OHPL.		
Potential Impact	Employment opportunity for local people and business opportunity for local businesses.		
Activity/risk source	External contractors are likely to use their existing labour source and their existing supplier/service network resulting in lost opportunities for local workers and businesses.		
Mitigation: Target/Objective	Project developers should enter into agreements with contractors to support the use of local labour and businesses where ever feasible.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Ensure that the majority of the low-skilled workforce is recruited locally, where possible. Undertake a skills audit to determine the level of skills and establish the development and training requirements. Commence with skill development programmes within the first month of construction. Identify employment opportunities for women and ensure that women are employed on the construction site and are trained. Identify opportunities for local businesses and ensure that the services from local businesses are prioritised.		Human Resources, Project developer and contractors.	From the appointment of contractors and throughout the construction and operational phases.
Performance Indicator	Composition of the labour force and value of procurement from local businesses. Level of skills imparted to the local workforce.		
Monitoring	Human Resources and Finance function to monitor and report on through audits.		

OBJECTIVE: Minimising the risk of increased crime associated with the project.			
Project component/s	Construction and laydown areas.		
Potential Impact	Construction activities may result in opportunities for criminal activities, such as theft, damage to property, stock theft and alcohol-related crime amongst others.		
Activity/risk source	Increased activity and human traffic in the area may lead to opportunistic crime.		
Mitigation: Target/Objective	To minimise the risk potential for local communities.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Encourage contractors and local people to report any suspicious activity associated with crime to the appropriate authorities. Inform workers that trespassing onto adjoining private properties is not permitted. Ensure that the local municipalities, police, security companies, and policing forums are alerted to the increased construction activities in the region and the risk it posse in respect of crime. Prevent loitering within the vicinity of the construction camp as well as construction sites. Manage the growth of informal settlements that may arise as a response to perceived job opportunities by promptly alerting the appropriate authorities.		Project developer and contractors.	Over the construction phase of the project.
Performance Indicator	Frequency of incidents of project-related crime experienced.		
Monitoring	Keep a record of criminal incidents associated with the project and table it at weekly/monthly project meetings and report to the project manager.		

OBJECTIVE: To manage the impact of the influx of construction workers on family structures and social networks.			
Project component/s	The workforce employed over the construction phase.		
Potential Impact	The behaviour of the workers who are accommodated within the local community.		
Activity/risk source	The after-work hours interaction between the workers and local communities.		
Mitigation: Target/Objective	To minimise the disruptive effect that the workforce may pose for local communities.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
As far as possible source low-skilled workers from local communities and surrounding areas. If feasible employ local contractors.		Project developer and contractors.	Over the construction phase of the project.
Performance Indicator	The frequency of complaints and incidents between the workforce and local communities.		
Monitoring	Maintain a full incident record and monitor and evaluate performance at weekly/monthly site meetings and report to the contract manager.		

11. CONCLUSION AND RECOMMENDATIONS

Considering that the project is required to connect the proposed Hybrid Thermal Power Facility to the National Grid via the existing Eskom Kalbas substation, it is an integral part of ensuring the functionality Hyperion Hybrid Power Facility if authorised. On this basis, as with the Hyperion PV Solar Energy Facility, the project carries with it a significant benefit associated with the generation of renewable energy and fits with international; national; provincial and municipal policy.

Most impacts associated with the project apply over the short term, in respect of the construction phase, and can be mitigated to within an acceptable range. Considered in isolation the project will have little if any cumulative impact in the area. In addition, the project fits with the Government's requirement for the urgent generation of electricity to be purchased by Eskom Holdings SOC Limited from independent power producers (Government Notice No. 1015, 2020). Consequently, the project is supported on a social basis and should proceed as required.

12. BIBLIOGRAPHY

ASHA Consulting (Pty) Ltd. (2019). *Heritage Impact Assessment: Proposed Hyperion Solar Development 2, Lyndoch 432/Rem, Kuruman Magisterial District, Northern Cape.* Lakeside: ASHA Consulting (Pty) Ltd.

Bowen, P., Dorrington, R., Distiller, G., Lake, H., & Besesar, S. (2008). HIV/AIDS in the South African construction industry: an empirical study. *Construction Management and Economics, 26(8)* , 827-839.

Bowen, P., Govender, G., Edwards, P., & Cattell, K. (2016). An explanatory model of attitudinal fear of HIV/AIDS testing in the construction industry. *Engineering, Construction and Architectural Management, 23(1)* , 92-112.

Bowen, P., Govender, R., Edwards, P., & Lake, A. (2018). HIV infection in the South African construction industry. *Psychology, Health & Medicine: 23(5)*, 612-618.

Carlislea, J. E., Kaneb, S. L., Solan, D., & Joed, J. C. (2014). Support for solar energy: Examining sense of place and utility-scale development in California. *Energy Research & Social Science, Volume 3, September*, 124-130.

Chiabrando, R., Fabrizio, E., & Garnero, G. (2011). On the applicability of the visual impact assessment OAISPP tool to photovoltaic plants. *Renewable and Sustainable Energy Reviews, Volume 15, Issue 1*, 8454-850.

Creamer Media's Engineering News. (2019, March 20). Criminals hinder South African building projects. *Creamer Media's Engineering News*.

Department of Energy Republic of South Africa. (2018). *Draft Integrated Resource Plan, 2018 for public comments.* Pretoria: Department of Energy Republic of South Africa.

Department of Environmental Affairs and Tourism. (2004). *South African National Climate Change Response Strategy, September 2004.* Pretoria: Department of Environmental Affairs and Tourism.

Environmental Planning and Design. (2019). *Hyperion Solar Development 2, Landscape & Visual Impact Assessment Report.* Westville: Environmental Planning and Design.

Fourie, D., Kritzinger-van Niekerk, L., & Nel, M. (2015). *An overview of the renewable energy independent power producers procurement programme (REIPPPP) .* Centurian: Department of Energy IPP Office .

Gamagara Local Municipality. (2019). *Final Second Review IDP Gamagara Local Municipality 2019-2022.* Kathu: Gamagara Local Municipality.

Government Gazette No. 41445. (2018). *Notice 114, page 92-96.* Pretoria: Government Printing Works.

Government Notice No. 1015. (2020, September 25). *Government Gazett No. 43734*. Pretoria: Government Publishers.

Independent Power Producer Office. (2018a). *Independent Power Producers Procurement Programme. An Overview.* Centurion: Independent Power Producers Office.

Independent Power Producer Office. (2018a). *Independent Power Producers Procurement Programme. An Overview.* Centurion: Independent Power Producers Office.

Independent Power Producers Procurement Office. (2018b). *Provincial Report Volume 1: Northern Cape Overview.* Centurion: Independent Power Producers Procurement Office.

Intergovernmental Panel on Climate Chang (Approved SPM – copyedit pending). (6 October 2018). *Global Warming of 1.5 °C an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate chan .* Intergovernmental Panel on Climate Chang.

John Taolo Gaetsewe District Municipality. (2019). *John Taolo Gaetsewe District Municipality Integrated Development Plan, Reiew 2019-20.* Kuruman: John Taolo Gaetsewe District Municipality.

Kikwasi, G. J., & Lukwale, S. R. (2017). HIV/AIDS and Construction Workers: Knowledge, Risk Sexual Behaviours and Attitude. *Global Journal of Health Science 10(1):37*.

Logis. (2020). *Proposed 132kV Grid Connection Infrastructure for the Hyperion Thermal Hybrid Facility Near Kathu, Northern Cape Province Visual Impact Assessment.* La Montagne: Logis.

Meintjes, I., Bowen, P., & Root, D. (2007). HIV/AIDS in the South African construction industry: Understanding the HIV/AIDS discourse for a sector-specific responce. *Construction Managment and Economics, 25(3)*, 255-266.

Monteiro, A., & Prinsloo, L. (2019). *Builders plead for help as crime hampers projects worth R25.5bn .* Port Elizabeth: Daily Dispatch.

National Department of Health. (2015). *The National Antenatal Sentinel HIV prevalence Survey, South Africa, 2013.* Pretoria: National Department of Health.

Northern Cape Province. (2014). *Northern Cape Province Twenty Year Review 2014.* Kimberly: Northern Cape Province.

Northern Cape Province. Department of Economic Development & Tourism. (2017). *Annual Report for the year ended 31 March 2017.* Kimberly: Northern Cape Province.

Ramjee, G., & Gouws, E. (2002). Prevalence of HIV Among Truck Drivers Visiting Sex Workers in KwaZulu-Natal, South Africa. *Sexually Transmitted Diseases: Volume 29 - Issue 1*, 44-49.

Rycroft, M. (2015). Renewable energy development zones (REDZ) . *Energize RE: Renewable Energy Supplement - June*, 15-17.

Sager, M. (2014). *Renewable Energy Vision 2030– South Africa.* World Wide Fund for Nature (formerly World Wildlife Fund), South Africa.

Simbayi, L., Zuma, K., Zungu, N., Moyo, S., Marinda, E., Jooste, S., . . . (2019), a. t. (2019). *South African National HIV Prevalence, Incidence, Behaviour and Communication Survey, 2017.* Cape Town: HSRC Press.

Singh, Y. N., & Malaviya, A. N. (1994). Long distance truck drivers in India: HIV infection and their possible role in disseminating HIV into rural areas. *International Journal of STD & AIDS 5(2|)*, 137-138.

South African Government. (2003). *White Paper on Renewable Energy.* Pretoria: Government Printing Works.

South African Government. (2008). *National Energy Act. No 34 of 2008.* Pretoria: Government Printing Works.

South African Government. (2010a). *Integrated Resource Plan 2010-2030.* Pretoria: Government Printing Works.

South African Government. (2010b). *New Growth Path Framework.* Pretoria: Government Printing Works.

South African Government. (2012). *National Infrastructure Plan.* Pretoria: Government Printing Works.

Statistics South Africa. (2011). *Census 2011 Municipal Fact Sheet.* Pretoria: Statistics South Africa.

Statistics South Africa. (2020a). *Mid-year population estimates 2020.* Pretoria: Statistics South Africa.

Statistics South Africa. (2020b). *Quarterly Labour Force Survey: Quarter 4: 2019.* Pretoria: Statistics South Africa.

Strauss, M., George, G., Lansdell, E., Mantell, J. E., Govender, K., Romo, M., . . . Kelvin, E. A. (2018). HIV testing preferences among long distance truck drivers in Kenya: a discrete choice experiment. *AIDS Care. 30(1)*, 72-80.

Sütterlin, B., & Siegrist, M. (2017). Public acceptance of renewable energy technologies from an abstract versus concrete perspective and the positive imagery of solar power. *Energy Policy, Volume 106, July*, 356-366.

The World Bank. (2009). *Gender in Agriculture Sourcebook.* Washington: The World Bank.

Vanclay, F. (2002). Conceptualising social impacts. *Environmental Impact Assessment Review, 22*, 183-211.

Vanclay, F., Esteves, A. M., Aucamp, I., & Franks, D. (2015). *Social Impact Assessment: Guidance document.* Fargo ND: International Association for Impact Assessment.

Visschers, V. H., & Siegrist, M. (2014). Find the differences and the similarities: Relating perceived benefits, perceived costs and protected values to acceptance of five energy technologies. *Journal of Environmental Psychology, Volume 40, December*, 117-130.

Wasie, B., Tiruneh, K., Gebeyehu, W., Desalegn, E., Tadesse, F., & Kiros, K. (2015). HIV prevalence, risk perception, and correlates of risky sexual practice among migrant workers in Northwest Ethiopia. *Ethiopian Journal of Health Development Vol.29 No.2* , 90-98.

Woldesenbet, S. A., Kufa, T., Lombard, C., Manda, S., Ayalew, K., Cheyip, M., & Puren, A. (2019). *The 2017 National Antenatal Sentinel HIV Survey, South Africa, National Department of Health.* Pretoria: National Department of Health South Africa.

Wong, B. (2013). Social Impact Assessment: The principles of the US and International Version, Criticisms and Social Impact Variables. *Proceeding of the Global Conference on Business, Economics and Social Sciences 2013 (e-ISBN 978-967-12022-0-3) 25-26 June 2013* (pp. 137-147). Kuala Lumpur: Organized by: WorldResearchConference.com.

World Bank Group. (2016). *Climate Change Action Plan 2016-2020.* Washington: International Bank for Reconstruction and Development / The World Bank.