SOCIAL IMPACT ASSESSMENT

(DRAFT REPORT)

PROPOSED KAKAMAS II PHOTOVOLTAIC SOLAR ENERGY FACILTY NORTHERN CAPE PROVINCE

INCA ENERGY

NOVEMBER 2011

Prepared for

SAVANNAH ENVIRONMENTAL (Pty) Ltd

By

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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

Savannah Environmental (Pty) Ltd was appointed by INCA Kakamas Solar (Pty) Ltd (a subsidiary of INCA Energy) as the lead consultants to manage the Basic Assessment (BA) process for the establishment of photovoltaic solar energy facility (PVSEF) and associated infrastructure on the Farm Remainder of farm 1178 (Kakamas Suid Nedersetting) near the town of Kakamas in the Northern Cape. The northern-most section of photovoltaic (PV) panels was the subject of the original Kakamas Basic Assessment undertaken in May 2011. The PV panels located to the south of the proposed 22kV power represent the focus of the BA for Kakamas II.

Tony Barbour Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a specialist Social Impact Assessment (SIA) as part of the BA process. The terms of reference for the study include a scoping level assessment followed by a detailed assessment of the social issues as part of the BA. This report contains the findings of the Draft SIA undertaken as part of the BA process.

DESCRIPTION OF THE PROPOSED SOLAR ENERGY FACILITY

A broader area of approximately 109ha is being considered for the construction of the photovoltaic solar energy facility. The proposed facility will accommodate an array of photovoltaic (PV) panels with a generating capacity of up to 10 MW.

Solar energy facilities, such as those using PV panels, use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity. The photovoltaic solar facility component of the development is anticipated to of generating capacity of up to 10 MW. Solar PV facilities consist of the following components.

The Photovoltaic Cell

A photovoltaic (PV) cell is made of silicone which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The Inverter

The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

The Support Structure

The PV panels will be fixed to a support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The basic infrastructure associated with the proposed Kakamas II PVSEF would include:

- Photovoltaic solar panels with a generating capacity of 10 MW;
- An on-site generator transformer and a small substation to facilitate the connection between the renewable energy facility and the Eskom electricity grid;
- Foundations to support the PV panels;
- Cabling between the project components, to be lain underground where practical;
- An overhead power line (22kV) of ~1000 m in length feeding into the Eskom electricity network at the existing Taaiput Substation;
- Internal access roads; and
- Workshop area for maintenance and storage.

APPROACH TO THE STUDY

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

- Describing and obtaining an understanding of the proposed intervention (type, scale, location), the communities likely to be affected and determining the need and scope of the SIA;
- Collecting baseline data on the current social environment and historical social trends;
- Identifying and collecting data on the Social Impact Assessment variables and social change processes related to the proposed intervention. This requires consultation with affected individuals and communities;
- Assessing and documenting the significance of social impacts associated with the proposed intervention;
- Identifying alternatives and mitigation measures.

In this regard the study involved:

- Review of demographic data from the 2001 Census Survey;
- Review of relevant planning and policy frameworks for the area;
- Review of issues identified during the SIA for the first Kakamas PVSEF (May, 2011);
- Site specific information collected during the site visit to the area and interviews with key stakeholders[1];
- Review of information from similar projects;
- Identification of social issues associated with the proposed project.

Due to the requirements for the generation of solar energy, no alternative sites were identified within the area. As such, the EIA does not assess any additional site alternatives for the project.

[1] The PV panels associated with the proposed Kakamas II PVSEF are located on the same site as the PV panels associated with the Kakamas PVSEF site, which was assessed in May 2011. The information for the proposed Kakamas II PVSEF is therefore based on the information collected during the site visit undertaken for the first Kakamas PVSEF assessed in May 2011.

SUMMARY OF KEY FINDINGS

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

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

The potential health impacts associated with solar thermal plants are also discussed.

Policy and planning issues
The key documents reviewed included:

- The National Energy Act (2008)
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- The White Paper on Renewable Energy (November 2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- The Kai! Garib Local Municipality Integrated Development Plan (2009).

The findings of the review indicated that solar energy is strongly supported at a national, provincial, and local level. Based on this is it reasonable to assume that the establishment of the proposed Kakamas II PVSEF is supported.

Construction phase
The key social issues associated with the construction phase include:

Potential positive impacts
- Creation of employment and business opportunities, and the opportunity for skills development and on-site training.

The construction phase is expected to extend over a period of 6-12 months and create approximately 30-40 employment opportunities. It is anticipated that approximately 60 % (24) of the employment opportunities will be available to low skilled (construction labourers, security staff etc.) and semi-skilled workers (drivers, equipment operators etc.) and 40% (16) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the skilled and semi-skilled opportunities, are likely to be associated with the contactors appointed to construct the facility and associated infrastructure. In this regard the majority of contractors tend to use their own staff and this will limit the potential for direct employment opportunities for locals during the construction phase. In addition, the low education and skills levels in the area will hamper potential opportunities for local communities. However, members of the local community are likely to benefit from the low skilled employment opportunities associated with the project. In this regard the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community.

The total wage bill for the 6-12 month construction phase will be in the region of R 8-10 million. The injection of income into the area in the form of rental for

accommodation and wages will create opportunities for local businesses in towns such as Kakamas and Keimoes. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site The benefits to the local economy will however be confined to the construction period (6-12 months).

The capital expenditure is anticipated to be in the region of R 120 million for a 10 MW facility. In terms of business opportunities for local companies, the expenditure of these sums during the construction phase will create business opportunities for the regional and local economy. However, given the technical nature of the project and high import content associated with solar thermal plants opportunities for the local Kai! Garib economy and the towns of Upington, Keimoes and Kakamas are likely to be limited. However, opportunities are likely to exist for local contractors and engineering companies in Upington. Implementing the enhancement measures listed below can enhance these opportunities.

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills development and training for members from the local communities are likely to be limited.

Potential negative impacts

- Influx of construction workers employed on the project;
- Increased risk of stock theft, poaching and damage to farm infrastructure associated with construction workers;
- Increased risk of veld fires associated with construction related activities;
- Impact of heavy vehicles, including damage to roads, safety, noise and dust;
- Loss of agricultural land associated with construction related activities.

The significance of the potential negative impacts with mitigation was assessed to be of Low significance. The majority of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. However, the impact on individuals who are directly impacted on by construction workers and or job seekers (i.e. contract HIV/ AIDS) was assessed to be of Medium-High negative significance. In addition, due to the relatively small size of the labour force (30-40) the potential risk to local family structures and social networks is regarded as low.

Table 1 summarises the significance of the impacts associated with the construction phase.

Table 1: Summary of social impacts during construction phase

Impact	Significance No Mitigation	Significance With Mitigation
Creation of employment and business opportunities	Low (Positive impact)	Medium (Positive impact)
Presence of construction workers and potential impacts on family structures and social networks	Low (Negative impact for community as a whole) Medium-High (Negative impact of individuals)	Low (Negative impact for community as a whole) Medium-High (Negative impact of individuals)
Risk of stock theft, poaching and damage to farm infrastructure	Medium (Negative impact)	Low (Negative impact)
Risk of veld fires	Medium (Negative impact)	Low (Negative impact)
Impact of heavy vehicles and construction activities	Low (Negative impact)	Low (Negative impact)
Loss of farmland	High (Negative impact)	Low (Negative impact)

Operational phase
The key social issues affecting the operational phase include:

Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- The establishment of infrastructure to generate renewable energy.

The total number of permanent employment opportunities is estimated to be in the region of 20-30. Given the location of the proposed facility the majority of permanent staff is likely to reside in Kakamas, Keimoes and Upington. In terms of accommodation options, a percentage of the permanent employees may purchase a house in one of these two towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the local economy. The benefits to the local economy will extend over the 25-30 year operational lifespan of the project.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive High social benefit for society as a whole.

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

The visual impacts on landscape character associated with large renewable energy facilities, such as solar thermal plants, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open

spaces that are characteristic of the South African landscape. The impact of large, solar energy plants on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar energy applications.

The significance of the impacts associated with the operational phase are summarised in Table 2.

Table 2: Summary of social impacts during operational phase

Impact	Significance No Mitigation	Significance With Mitigation
Creation of employment and business opportunities	Medium (Positive impact)	Medium (Positive impact)
Promotion of renewable energy projects	Medium (Positive impact)	High (Positive impact)
Visual impact and impact on sense of place	Medium (Negative impact)	Medium (Negative impact)
Impact on tourism	Low (Positive and Negative)	Low (Positive and Negative)

Cumulative Impacts
The cumulative impacts associated with solar energy facilities, such as the proposed Kakamas II PVSEF, are largely linked to the impact on sense of place and visual impacts. In the case of the proposed Kakamas II PVSEF the significance of the potential cumulative social impacts, specifically the impact on the landscape, was rated to be low.

However, it is recommended that the environmental authorities consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of solar thermal plants in the area. In addition, the siting and number of individual components of the plant should be informed by findings of the relevant VIAs, specifically with respect to the visual impact on farmsteads and important roads in the area.

Transmission lines
The findings of the SIA indicate that the impacts associated with the proposed overhead power line will be low.

No-Development Option
The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost.

The no-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed solar thermal plant. This also represents a negative social cost.

Decommissioning phase
Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the solar thermal plants decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 25-30 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

When and if the proposed solar thermal plant is finally decommissioned, the impacts are likely to be limited due to the relatively small number of permanent employees (20-30) affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

INCA should also investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 25-30 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.

RECOMMENDATIONS

The findings of the SIA indicate that the development of the Kakamas II PVSEF will create employment and business opportunities for locals during both the construction and operational phase of the project. While these opportunities are likely to be limited, the mitigation measures listed in the report should be implemented in order to enhance them. INCA, in consultation with the Kai! Garib Municipality, should also investigate the opportunities for establishing a Community Trust. The revenue for the trust would be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Kai! Garib IDP. The mitigation measures listed in the report to address the potential negative impacts during the construction phase should also be implemented.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The establishment of the proposed Kakamas II PVSEF is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities that have been submitted over the last 12 months.

IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Kakamas II PVSEF indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. However, the visual impacts associated with facility will impact on the areas rural sense of place and landscape character. This impact will be for the entire operational lifespan (approximately 25-30 years) of the facility. The potential for cumulative impacts also exists due to the large number of applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw. It is therefore recommended that the facility as proposed be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report.

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SECTION 1: INTRODUCTION

1.1 INTRODUCTION

Savannah Environmental (Pty) Ltd was appointed by INCA Kakamas Solar (Pty) Ltd (a subsidiary of INCA Energy) as the lead consultants to manage the Basic Assessment (BA) process for the establishment of photovoltaic solar energy facility (PVSEF) and associated infrastructure on the Farm Remainder of farm 1178 (Kakamas Suid Nedersetting) near the town of Kakamas in the Northern Cape (Figure 1.1). The northern-most section of photovoltaic (PV) panels was the subject of the original Kakamas Basic Assessment undertaken in May 2011. The PV panels located to the south of the proposed 22kV power represent the focus of the BA for Kakamas II (Figure 1.2).

Tony Barbour Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a specialist Social Impact Assessment (SIA) as part of the BA process. The terms of reference for the study include a scoping level assessment followed by a detailed assessment of the social issues as part of the BA. This report contains the findings of the Draft SIA undertaken as part of the BA process.

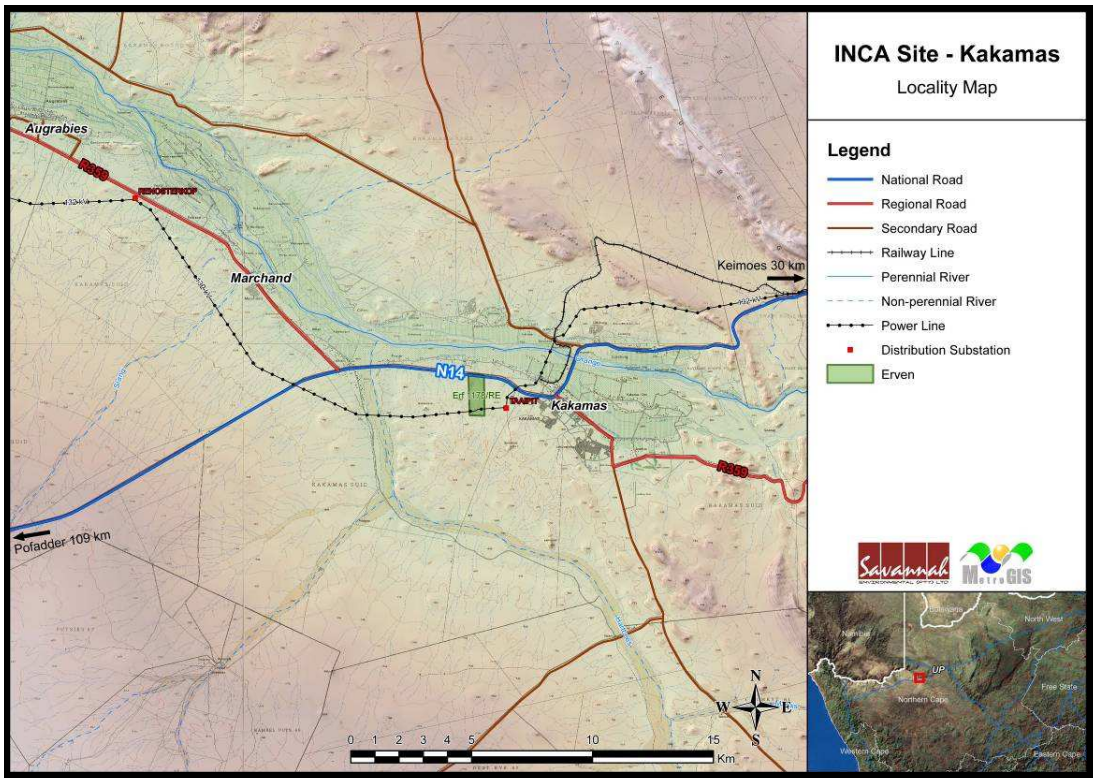


Figure 1.1: Location of the proposed Kakamas II PVSEF (MetroGIS, 2011)

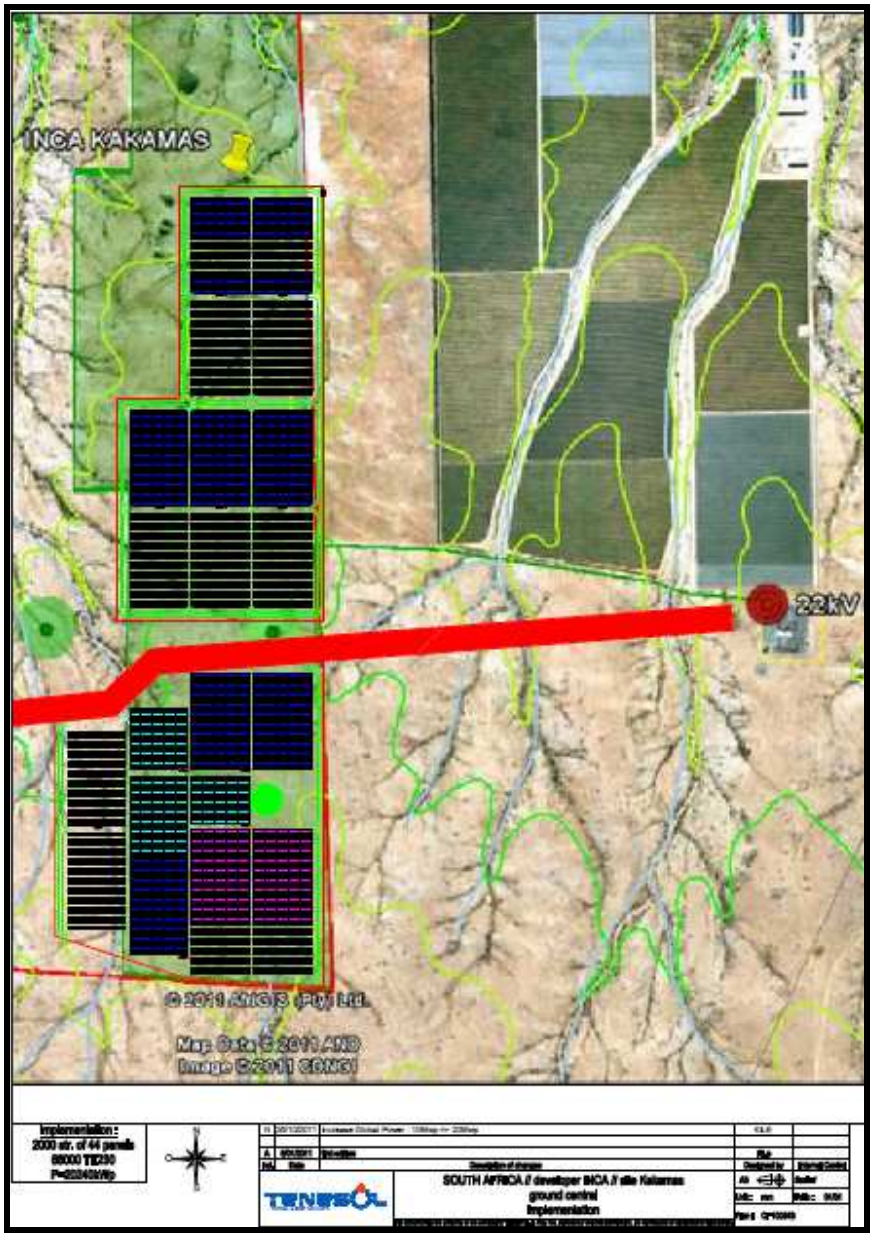


Figure 1.2: Location of the proposed PV associated with Kakamas II PVSEF to the south of the proposed 22kV line (red)

1.2 TERMS OF REFERENCE

The terms of reference for the SIA require:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility
- A description and assessment of the potential social issues associated with the proposed facility

- Identification of enhancement and mitigation aimed at maximising opportunities and avoiding and or reducing negative impacts

1.3 PROJECT LOCATION

The proposed facility is located on the southern bank of the Orange / Gariep River, on the Farm Remainder of farm 1178 (Kakamas Suid Nedersetting), in the Northern Cape Province (Figure 1.1). The nearest towns to the site are Kakamas (approximately 2.5 km east of the site), Keimoes (approximately 44 km south east of the site), and Upington (approximately 85 km north east of the site).

The proposed site falls within the Kai! Garib Local Municipality (NC082), which has its administrative centre at Kakamas. The Kai! Garib Local Municipality is one of 8 local municipalities that fall within the greater Siyanda District Municipality (DC8). Road access to the proposed site is mainly from the N14 to the south and south-east.

1.4 PROJECT DESCRIPTION

A broader area of approximately 109ha is being considered for the construction of the photovoltaic solar energy facility. The proposed facility will accommodate an array (Photograph 1.1) of photovoltaic (PV) panels with a generating capacity of up to 10 MW. As indicated in Figure 1.2, the PV panels associated with the INCA Kakamas II PVSEF are located to the south of the proposed 22kV line on the site.

Source: www.wapa.gov

Photograph 1.1: Photovoltaic array

Solar energy facilities, such as those using PV panels, use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity. The photovoltaic solar facility component of the development is anticipated to of generating capacity of up to 10 MW.

Solar PV facilities consist of the following components:

The Photovoltaic Cell
A photovoltaic (PV) cell is made of silicone which acts as a semiconductor used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel.

The Inverter
The photovoltaic effect produces electricity in direct current. Therefore an inverter must be used to change it to alternating current.

The Support Structure
The PV panels will be fixed to a support structure set at an angle so to receive the maximum amount of solar radiation. The angle of the panel is dependent on the latitude of the proposed facility and the angles may be adjusted to optimise for summer or winter solar radiation characteristics. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The basic infrastructure associated with the proposed Kakamas II PVSEF would include[2]:

- Photovoltaic solar panels with a generating capacity of 10 MW;
- An on-site generator transformer and a small substation to facilitate the connection between the renewable energy facility and the Eskom electricity grid;
- Foundations to support the PV panels;
- Cabling between the project components, to be lain underground where practical;
- An overhead power line (22kV) of ~1000 m in length feeding into the Eskom electricity network at the existing Taaiput Substation;
- Internal access roads; and
- Workshop area for maintenance and storage.

[2] The basic infrastructure associated with the Kakamas II PVSEF is the same as infrastructure associated with the Kakamas PVSEF assessed in May 2011 (Barbour et al, May 2011).

Source: D.Rogatschnig ©

Photograph 1.2: Taaiput Substation

The overall aim of the design and layout of the facility is to maximise electricity production through exposure to the solar radiation, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. The use of solar energy for power generation can be described as a non-consumptive use of natural resources which emits zero greenhouse gas emissions. The generation of renewable energy contributes to South Africa's electricity generating market which has been dominated by coal-based power generation.

Based on the information from other PVSEF projects the construction phase is expected to extend over a period of 6-12 months and create approximately 30-40 employment opportunities. The operational phase will employ approximately 20-30 people full time for a period of up to 20-30 years.

1.5 APPROACH TO STUDY

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

- Describing and obtaining an understanding of the proposed intervention (type, scale, location), the settlements and communities likely to be affected by the proposed project

- Collecting baseline data on the current social and economic environment;
- Identifying the key potential social issues associated with the proposed project. This requires a site visit to the area and consultation with affected individuals and communities. As part of the process a basic information document was prepared and made available to key interested and affected parties. The aim of the document was to inform the affected parties of the nature and activities associated with the construction and operation of the proposed development so as to enable them to better understand and comment on the potential social issues and impacts
- Assessing and documenting the significance of social impacts associated with the proposed intervention
- Identifying alternatives and mitigation measures

In this regard the study involved:

- Review of demographic data from the 2001 Census Survey;
- Review of relevant planning and policy frameworks for the area;
- Site specific information collected during the site visit to the area and interviews with interested and affected parties[3];
- Review of information from similar studies, including the EIAs undertaken for other renewable energy projects, including wind energy facilities;
- Identification and assessment of the social issues associated with the proposed project.

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

1.5.1 Definition of social impacts

Social impacts can be defined as "The consequences to human populations of any public or private actions (these include policies, programmes, plans and/or projects) that alter the ways in which people live, work, play, relate to one another, organise to meet their needs and generally live and cope as members of society. These impacts are felt at various levels, including individual level, family or household level, community, organisation or society level. Some social impacts are felt by the body as a physical reality, while other social impacts are perceptual or emotional" (Vanclay, 2002).

When considering social impacts it is important to recognise that social change is a natural and on-going process (Burdge, 1995). However, it is also important to recognise and understand that policies, plans, programmes, and/or projects implemented by government departments and/or private institutions have the potential to influence and alter both the ***rate*** and ***direction*** of social change. Many social impacts are not in themselves "impacts" but change process that may lead to

[3] The PV panels associated with the proposed Kakamas II PVSEF are located on the same site as the PV panels associated with the Kakamas PVSEF site, which was assessed in May 2011. The information for the proposed Kakamas II PVSEF is therefore based on the information collected during the site visit undertaken for the first Kakamas PVSEF assessed in May 2011.

social impacts (Vanclay, 2002). For example the influx of temporary construction workers is in itself not a social impact. However, their presence can result in range of social impacts, such as increase in antisocial behaviour. The approach adopted by Vanclay stresses the importance of understanding the processes that can result in social impacts. It is therefore critical for social assessment specialists to think through the complex causal mechanisms that produce social impacts. By following impact pathways, or causal chains, and specifically, by thinking about interactions that are likely to be caused, the full range of impacts can be identified (Vanclay, 2002).

An SIA should therefore enable the authorities, project proponents, individuals, communities, and organisations to understand and be in a position to identify and anticipate the potential social consequences of the implementation of a proposed policy, programme, plan, or project. The SIA process should alert communities and individuals to the proposed project and possible social impacts, while at the same time allowing them to assess the implications and identify potential alternatives. The assessment process should also alert proponents and planners to the likelihood and nature of social impacts and enable them to anticipate and predict these impacts in advance so that the findings and recommendations of the assessment are incorporated into and inform the planning and decision-making process.

However, the issue of social impacts is complicated by the way in which different people from different cultural, ethic, religious, gender, and educational backgrounds etc view the world. This is referred to as the "social construct of reality". The social construct of reality informs people's worldview and the way in which they react to changes.

1.5.2 Timing of social impacts

Social impacts vary in both time and space. In terms of timing, all projects and policies go through a series of phases, usually starting with initial planning, followed by implementation (construction), operation, and finally closure (decommissioning). The activities, and hence the type and duration of the social impacts associated with each of these phases are likely to differ.

1.6 ASSUMPTIONS AND LIMITATIONS

1.6.1 Assumptions

Strategic importance of the project and no-go option
It is assumed that the strategic importance of promoting renewable energy, including solar energy, is supported by the national and provincial energy policies.

Technical suitability
It is assumed that the development site identified by INCA Kakamas represents a technically suitable site for the establishment of a PVSEF.

Fit with planning and policy requirements
Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process is to assess the proposed development in terms of its

fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.

However, the study recognises the strategic importance of solar energy and the technical, spatial and land use constraints required for such facilities.

Similarity of social impacts
The PV panels associated with the proposed Kakamas II PVSEF are located on the same site as the PV panels associated with the Kakamas PVSEF site which was assessed in May 2011. The information for the assessment of the proposed Kakamas II PVSEF is therefore based on the information collected during the site visit undertaken for the first Kakamas PVSEF assessed in May 2011. In this regard the social impacts associated with the proposed Kakamas II PVSEF are essentially the same as those associated with the first Kakamas PVSEF assessed in May 2011.

Generic issues relating to renewable energy
A number of the key authorities in the area were interviewed in 2010 as part of the SIA for a proposed CSP located near Upington (Barbour and Rogatschnig, October 2010). For the purpose of the SIA it is assumed that the generic comments relating to renewable energy, and specifically solar energy, also apply to the Kakamas II PVSEF.

1.6.2 Limitations

Demographic data
The demographic data used in the study is largely based on the 2001 Census[4]. While this data does provide useful information on the demographic profile of the affected area, the data are dated and should be treated with care. Where possible reference is made to the latest demographic data contained in local Integrated Development Plans and other documents.

In addition, there is no longer any access to Census 2001 data at Ward level via the Municipal Demarcation Board. As such, the social baseline for the Kai !Garib Local Municipality has been described at Local Municipal level only. However, based on information from other work carried out in the area a description of the ward level data for the //Khara Hais Local Municipality is provided. The reason for including this data is due to the key socio-economic role played by the town of Upington in the area. Upington is the administrative center of the //Khara Hais Local Municipality which, along with the Kai! Garib Local Municipality is one of 6 Local Municipalities and one DMA that fall within the greater Siyanda District Municipality. The //Khara Hais Local Municipality is made up of 12 administrative wards. Wards 1-8 constitute the greater Upington area.

[4] The last comprehensive national census was conducted in 2001. Census 2001 provided demographic and socio-economic data from National to Municipal Ward level. An interim Community Survey (sample based) was undertaken in 2007, but provided information only on provincial and municipal levels. The next comprehensive national census is planned for 2011.

1.7 SPECIALIST DETAILS

The lead author of this report is an independent specialist with 20 years of experience in the field of environmental management. His qualifications include a BSc, BEcon (Hons) and an MSc in Environmental Science. In terms of SIA experience Tony Barbour has undertaken in the region of 100 SIA's and is the author of the Guidelines for Social Impact Assessments for EIA's adopted by the Department of Environmental Affairs and Development Planning (DEA&DP) in the Western Cape in 2007.

Daniel Rogatshnig has an MSc in Environmental Science and has five years of experience as an environmental consultant. He has also worked on a number of SIAs with Tony Barbour.

1.8 DECLARATION OF INDEPENDENCE

This confirms that Tony Barbour and Daniel Rogatschnig, the specialist consultants responsible for undertaking the study and preparing the Draft SIA Report, are independent and do not have vested or financial interests in the proposed Kakamas II PVSEF being either approved or rejected.

1.9 REPORT STRUCTURE

The report is divided into five sections, namely:

- Section 1: Introduction
- Section 2: Overview of the study area
- Section 3: Summary of key policy and planning documents relating to solar energy and the area in question
- Section 4: Identification and assessment of key social issues
- Section 5: Summary of key findings and recommendations

SECTION 2: DESCRIPTION OF STUDY AREA

2.1 INTRODUCTION

Section 2 provides an overview of:

- The provincial context;
- The policy and planning environment affecting the proposed solar thermal plant;
- The local socio-economic environment;
- Surrounding land uses.

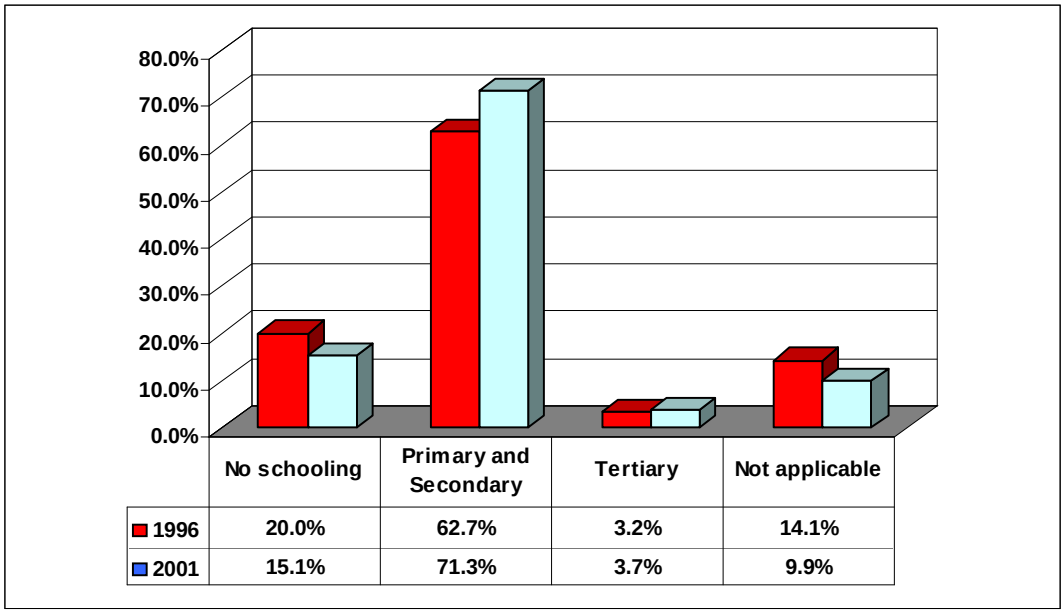
2.2 PROVINCIAL CONTEXT

The proposed solar energy facility is located in the Northern Cape Province, which is the largest province in South Africa and covers an area of 361,830 $km^{2,}$ and constitutes approximately 30% of South Africa. The province is divided into five district municipalities (DM), namely, Frances Baard, Pixley ka Seme, Namakwa, Siyanda, and John Taolo Gaetsewe DM, twenty-six Category B municipalities and five district management areas. The site itself is located in the Kai! Garib Local Municipality (LM) (NC082), which is one of eight local municipalities that fall within the greater Siyanda District Municipality (DC8).

Population
Despite having the largest surface area, the Northern Cape has the smallest population of 822 727 (Census 2001) or 1.8% of the population of South Africa. The population has declined by 2.1% from 1996 (840 321) to 2001 (822 727), resulting in a decrease in the population density, of an already sparsely populated province, from 2.32 to 2.27 persons per km^2. Of the five districts, Frances Baard has the largest population of 303 239. The other districts and their respective populations are Siyanda (209 889), Karoo (164 607), Kgalagadi (36 881) and Namakwa (108 111). The population can be classified as a young population with 57.7% of the population being younger than 30 years old. The female proportion makes up approximately 51.2% of the total with males making up the remaining 48.8%. The 2001 Census data indicates a significant shift in the 20 – 24 cohort occurs, which can possibly be attributed to, amongst others, people in this age group moving to other provinces in search of better career and job opportunities and tertiary education. Research indicates that approximately 36% of the migrants from the Northern Cape moved to the Western Cape, while 19.4% moved to the North West (19.4%), 18.5% to Gauteng and 12.8% to the Free State (12.8%). In addition, there has also been an increase in migration from the rural areas to the larger towns in the province over the last five years. This movement is in response to the improved access to opportunities and services within the larger urban centers. This trend is reflected in the increase in the proportion of people living in urban areas from 75.2% in 1996 to 82.7% in 2001

Education
In terms of education levels 15.1% of the population had no education at all, while 71.3% have primary or secondary education. Those with a higher educational qualification accounted for 3.7% of the population (Figure 2.1). These figures indicate an increase in all categories since 1996, except for the no schooling category, which decreased by 4.9% indicating a higher percentage of people attending school.

The information contained in Figure 2.1, indicates that, in general, there has been an improvement in the educational qualifications of the labour force in the Northern Cape. There has also been an increase in the proportion of the labour force that has a secondary and tertiary education. This would appear to be the result of an increase in access to education since 1994, in particular, amongst new entrants to the labour force.



	No schooling	Primary and Secondary	Tertiary	Not applicable
1996	20.0%	62.7%	3.2%	14.1%
2001	15.1%	71.3%	3.7%	9.9%

Figure 2.1: Percentage of people by level of education for 1996 and 2001 (*Source: Northern Cape Province PGDS)*

Economic development
The Human Development Index[5] (HDI) for the province, which covers four indexed factors – life expectancy, adult literacy, GDP per capita (adjusted for real income) and education attainment, for the Northern Cape as a whole is 0.58, which is substantially below the South African figure of 0.72.

For the Northern Cape, the areas of lowest Human Development Index include the South Eastern region (Noupoort and Richmond) and the hinterland of Kimberley (Griekwastad, Campbell and Douglas) – for these areas the HDI varies between 0.47 to 0.51. Over the past 8 years there has been little to no variance in the HDI figures, indicating no increase or decrease in the overall standard of living. In contrast, the Kimberley and Springbok areas have the highest HDI of 0.63 to 0.62

[5] The closer the HDI to 1.0, the higher the level of "living condition". For example, Sweden has an index of 0.91 defined as high, South Africa at 0.72 is defined as middle and Lesotho at 0.47 is defined as low.

respectively, primarily due to the broader economic opportunities and access to services such as infrastructure, schools, and health facilities. Similarly, there has been no significant change over the past 8 years.

The above trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better off areas.

In terms of per capita income, the Northern Cape Province has the third highest per capita income of all nine Provinces, however, income distribution is extremely skewed, with a high percentage of the population living in extreme poverty. The measure used in the PGDS document to measure poverty is the percentage of people living below the poverty line or breadline is used[6]. The poverty line indicates a lack of economic resources to meet basic food needs. Figure 2.2 indicates the percentage of household income below the poverty breadline of R800 in the Northern Cape Province, the highest being Karoo at 48% and the lowest being Namakwa at 36%.

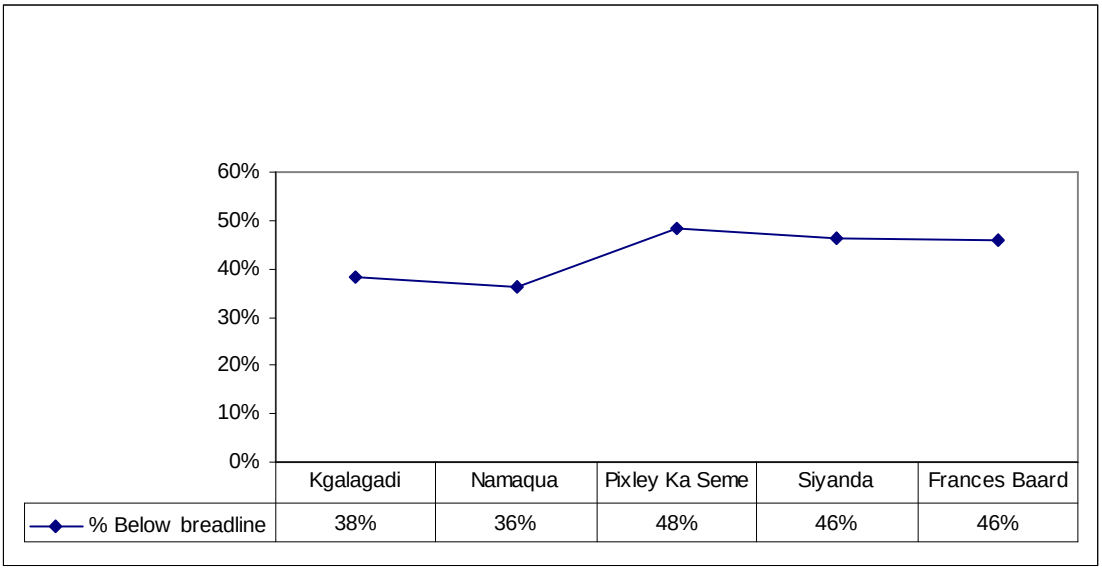


Figure 2.2: Percentage of household income below the poverty breadline by district (*Source: Northern Cape PGDS)*

Economic sectors

In terms of economic importance, the Northern Cape's share of the country's Gross Domestic Product (GDP) in 2002 was 2%, the lowest contribution of the nine provinces. However, although the Northern Cape Province has the smallest economy of the nine provinces, Gross Domestic Product of the Region (GDPR) per capita is higher than the national average. In terms of economic activities, the economy of Northern Cape is heavily dependent on the primary sectors of the economy, which in 2002 made up 31.0% of GDPR. The largest sector is mining which has declined in contribution to the GDPR from 25.8% in 1996 to 23.7% in 2002. Agriculture, on the other hand, increased in its contribution from 6.2% to 7.3%.

[6] In terms of the poverty line, a person is considered poor if his or her consumption or income level falls below some minimum level necessary to meet basic needs. The minimum level is usually called the poverty line. In South Africa the poverty income level is set at R800/month.

A worrying characteristic of the economy is the limited amount of processing of the primary commodity output in mining and agriculture that takes place in the Northern Cape. This is reflected in the fact that manufacturing contributes only 4.2% towards GDPR. All the industries in the secondary sector have decreased in their contribution to the GDPR, with electricity and water sector showing the greatest decrease of 0.7% and the construction industry making the lowest contribution of 1.9% to the GDPR of the Northern Cape. At the same time the contribution to regional GDPR by industries in the tertiary sector increased, with the exception of the wholesale and retail industry, which decreased by 1.1%. Figure 2.3 illustrates the percentage contribution of the various economic sectors to the GDPR of the Northern Cape

Employment

Of the economically active population in the Northern Cape, 55.5% were employed while 26.1% could not find employment. This unemployment figure is lower than the national figure of 29.5%. Significant for this province, however, is that a third of the total population is younger than 15 years old and approximately 45% of the potential labour force is younger than 30 years. At the same time, unemployment is the highest among the youth with unemployment rates of 54% and 47% in the 15 - 19 and 20 – 24 year-old age groups. There has been an increase in the economically active population from 35.9% in 1996 to 38.1% in 2001. The unemployment rate for the same period has increased from 28.3% to 33.4%. In terms of employment there has been a decrease in the number of people that are formally employed from 196 219 in 1996 to 193 980 in 2001. The largest decrease was in the private household sector, showing a loss of 4 859 jobs.

The most important sectors in terms of employment in 2002 were agriculture, hunting, forestry and fishing (28.4%), community, social and personal services (19.8%), wholesale and retail trade (12.7%) and private households (11.4%) (Figure 2.3).

Sectors	1996	1996 % of persons employed per sector	2001	2001 % of persons employed per sector
Primary				
Agriculture, hunting; forestry and fishing	48646	24.8	55016	28.4
Mining and quarrying	18556	9.5	15493	8.0
Secondary				
Manufacturing	8812	4.5	10598	5.5
Electricity; gas and water supply	2397	1.2	1385	0.7
Construction	10402	5.3	8971	4.6
Tertiary				
Wholesale and retail trade	23099	11.8	24671	12.7
Transport; storage and communication	9963	5.1	6366	3.3
Financial, insurance, real estate and business services	7733	3.9	10989	5.7
Community, social and personal services	39724	20.2	38463	19.8
Private Households	26887	13.7	22028	11.4
Total	**196219**		**193980**	

Table 2.3: Formal employment by sector (Source: Northern Cape PGDS)

2.3 SOCIO-ECONOMIC OVERVIEW OF THE PROPOSED PROJECT AREA

As indicated in Section 1.6.2 Limitations, it is no longer possible to access Census 2001 data at Ward level via the Municipal Demarcation Board. As a result it was not possible to obtain ward level data for the Kai! Garib Local Municipality. The social baseline for this part of the study area is therefore described at Local Municipal level only. However, for the town of Upington, which falls within the //Khara Hais Local Municipality, it was possible to source ward level information from previous work undertaken by the consultants in the area.

2.3.1 Kai! Garib Municipality

The proposed facility is located in the Kai! Garib Municipality (Figure 2.4), a category-B municipality[7], which forms part of the greater Siyanda District Municipality (DC8, category-C municipality). The municipality is located in the north-central portion of the Northern Cape, approximately 428 km west of the provincial capital of Kimberley.

[7] A category-B municipality is defined as a municipality that shares executive and legislative authority in its area with a category- C municipality within whose area it falls.

The municipality is approximately 7 445 km² in size (~7.2% of the Siyanda District Municipality) and is bordered to the north, south and west by a District Management Area (NCDMA08) and in the east by the //Khara Hais and !Kheis Local Municipalities. In terms of land use, the Kai! Garib Local Municipality is largely rural and agricultural with three urban/semi-urban nodes at Kakamas, the designated administrative centre of the municipality, Keimoes and Kenhardt (Kai! Garib IDP, 2009).

Figure 2.4: The location of the Kai! Garib Local Municipality with respect to the towns of Kakamas, Keimoes, Kanoneiland and Upington. The site is located immediately to the west of the town of Kakamas (Source: Municipal Demarcation Board, Garmin, Google Earth)

The population the Kai! Garib Municipality is estimated at 56 501 (2007), which makes up approximately 10% of the total population of the greater Siyanda District Municipality (238 063 [2007]). The average population growth for the local municipality (2001-2007) is estimated at ~1.4% (Community Survey, 2007).

The majority of the population is Coloured (66.5%), followed by Black Africans (22.2%) and Whites (7.8%). The dominant language is Afrikaans (78.8%) followed by Setswana (20.2%) with the remainder made up of isiXhosa (0.4%), English (0.2%) and other African languages (0.2%).

In terms of education levels, based on the data from Census 2001, approximately 14.7% of the population has no formal education, while approximately 42% have less than a Grade 7 (standard 5). When these totals are added to figures for people with no formal education they indicate that over half of people in the Kai !Garib Local

Municipality (~58%) have less than a Grade 7 (standard 5) qualification. Only 11.1% of the population have a matric qualification, while less than 4% having a tertiary qualification.

Employment data for Kai! Garib Local Municipality indicates that 57.8% of the population between the economically active ages of 15 and 65 are employed in the formal sector and the unemployment rate is 12%. The agricultural sector provides ~28% of the formal employment, followed by the community services, wholesale and retail sectors which employ ~6% and ~2% of the employed population in the area respectively. According to the 2001 Census data, the majority of employment is characterised as 'undetermined' (~62%).

Based on the data from the 2001 Census, 48.8% of the population have no formal income and 93.7% of the population earn less than R 800 per month (This is the figure used by the South African Government as the official breadline figure). The low-income levels reflect the limited formal employment opportunities highlighted above. According the Kai! Garib Local Municipality IDP (2009), 22% of the population is dependent on social grants, of which 52% are child support grants. A total 2 706 households are subsidised by the services subsidy scheme.

2.3.2 Upington

While the town of Upington falls outside of the Kai !Garib Local Municipality, it functions as a key economic center for the area and is the administrative center of the //Khara Hais Local Municipality which, along with the Kai! Garib Local Municipality is one of 6 Local Municipalities and one DMA that fall within the greater Siyanda District Municipality. The //Khara Hais Local Municipality is made up of 12 administrative wards. Wards 1-8 constitute the greater Upington area.

Population

According to Census 2001 data, the total population of Ward 1-8 was 56 400. It is assumed that the population would have increased substantially given the large positive population growth rate (33.4%) within the //Khara Hais Local Municipality between 2001 and 2007[8] (Community Survey, 2007)

Table 2.7: Ward 1-8 - Population figures

Population Group	//Khara Hais LM Ward 1-8 (%)
Black African	22.0
Coloured	64.6
Indian or Asian	0.1
White	13.3
Total	100

Source: Census 2001

Table 2.7 indicates that the Coloured population group make the dominant opulation group within the wards, accounting for ~65% of the total population. The Black African population group represents a sizable 22% of the total population while White

[8] According to the StatsSA Community Survey of 2007, the population of the //Khara Hais Local Municipality increased from 75 671 in 2001 to 100 920 in 2007.

population group constitutes a minority 13.3%. The Asian population group accounts for only 0.1% of the total population in Wards 1-8.

Age distribution

Table 2.8 indicates that the <15 years age bracket in Ward 1-8 is relatively high at ~32%. The post retirement cohort (>64) is moderate at 5.5%. The dependency ratio[9] is 0.6, which means that approximately 2 working individuals support 1 non-working/unemployed individual.

Table 2.8: Ward 1-8 - Age distribution

Age Group	//Khara Hais LM Ward 1-8 (number)
0-4	5767
5-9	6135
10-14	6193
[Youthful dependents]	[18095]
15-19	6579
20-24	4731
25-29	4289
30-34	4273
35-39	3896
40-44	3396
45-49	2686
50-54	2152
55-59	1664
60-64	1518
65-69	1194
70-74	787
75-79	548
80 and over	592

Source: Census 2001

Education levels

Table 2.9 indicates that, based on 2001 Census data, 28% (corresponding to an absolute total of 8 895 people) of the population of in Ward 1-8 aged 15 and older are estimated to be functionally illiterate/innumerate in 2001.

Approximately 36% of the population have less than a Standard 5/Grade 7 education and 22.1% of the school going age population have a matric qualification, while just over 6% have a tertiary qualification. Given the strong correlation between education and skills levels, it may be assumed that a significant portion of the study area's working age population have only sufficient skills for elementary jobs. However, with relatively high Matric and tertiary education qualifications a significant

[9] The dependency ratio is calculated as the number of 0 to 14-year olds, plus the number of 65-year olds and older, divided by the number of people in the 15 to 64-year old age cohort. This is to give a rough indication of dependency.

portion of the population will be employed in more skilled position with respect to the proposed facility.

Table 2.9: Ward 1-8 - Education levels

Description	//Khara Hais LM Ward 1-8 (number)
No schooling	3717
Some primary	5178
[% functional illiteracy/ innumeracy][10]	28% [8895]
Complete primary	2621
Some secondary	11244
Std 10/Grade 12	7000
Higher	1967

Source: Census 2001

Employment levels

The employment statistics (2001) presented in Table 2.10 below indicates that 36.6% of Ward 1-8's population was employed. The unemployment rate was relatively high, estimated at ~23%. Approximately 40% of the population is not economically active[11]. According to StatsSA the unemployment figure for South Africa (4th Quarter 2009) is currently estimated at 24.3%.

Table 2.10: Ward 1-8 - Employment levels (15 – 64 age groups)

Description	//Khara Hais LM Ward 1-8 (%)
Employed[12]	36.6
Unemployed	23.1
Not Economically Active	40.3

Source: Census 2001

Sectoral employment

Table 2.11 below provides an overview of proportional employment per economic sector by head of household for Ward 1-8 within the //Khara Hais Local Municipality. The largest employer in Ward 1-8 is the Community and Social Services sector which provides ~27% of the formal employment in the area. This sector is followed by the Wholesale and Retail trade sector (21.3%), Private Households (10%), the Financial, Real Estate and Business Services sector (8.9%), the Manufacturing sector (8.1%), the Transport, Storage and Communication sector (5.7%) and the Construction sector (5.4%). Agriculture, while a dominant activity in the //Khara Hais Local Municipality, accounts for only 3.7% of the employment opportunities in Wards 1-8.

[10] In the South African context, having obtained a primary qualification (i.e. having successfully passed Grade 7) is generally held as the absolute minimum requirement for functional literacy/ numeracy. The National Department of Education's ABET (Adult Basic Education and Training) programme provides education and training up to the equivalent of Grade 9. In this more onerous definition, Grade 9 is required as the minimum qualification for having obtained a basic education (www.abet.co.za).

[11] The term "not economically active" refers to people of working age not actively participating in the economy, such as early retirees, students, the disabled and home-makers.

[12] Census 2001 official definition of *an unemployed person*: "A person between the ages of 15 and 65 with responses as follows: 'No, did not have work'; 'Could not find work'; 'Have taken active steps to find employment'; 'Could start within one week, if offered work'." (www.statssa.gov.za).

Table 2.11: Sectoral contribution to employment

Description	//Khara Hais LM Ward 1-8 (%)
Agriculture, hunting, forestry and fishing	3.7
Mining and quarrying	0.4
Manufacturing	8.1
Electricity, gas and water supply	0.7
Construction	5.4
Wholesale and retail trade	21.3
Transport, storage and communication	5.7
Finance, real estate and business services	8.9
Community, social and personal services	27.4
Other and not adequately defined	8.5
Private households[13]	10

Source: Census 2001

Household income

Census data on household income for 2001 (Table 2.12) indicates that the vast majority of households (~87%) in Ward 1-8 were living on less than the R800/ month minimum subsistence level. Significantly, the 'no formal income' category is the most pronounced at ~65%. Only 12% of household heads were earning an income clustered in the R800-R3200/ month range.

Table 2.12: Ward 1 - 8 - Household income (by head of household)

Income per month	//Khara Hais LM Ward 1-8 (%)
No formal income	64.5
R 1 – R 400	4.4
R 401 – R 800	12.3
R 801 - R 1 600	6.1
[% households below minimum subsistence level]	[87.3]
R1 601 - R 3 200	5.9
R 3 201 – R 6 400	4.1
R 6 401 – R 12 800	1.8
R 12 801 – R 25 600	0.4
R 25 601 and higher	0.5

Source: Census 2001

[13] This category mainly comprises domestic workers and gardeners.

2.4 SURROUNDING LAND USES

As indicated above, the site falls within the Kai! Garib Local Municipality (NC082), which has its administrative centre at Kakamas. The Kai! Garib Local Municipality is one of 8 local municipalities that fall within the greater Siyanda District Municipality (DC8). Road access to the proposed site is mainly from the N14 to the north. The Kai! Garib Municipality is characterised by semi-arid plains, rolling hills and the Gariep River (Photograph 2.1) which bisects the Municipality from the east to the north-west.

Photograph 2.1: View of the Gariep River (Orange River) near Kakamas

The site itself is located to the south of the N14 on the Farm Remainder of farm 1178 *(*Kakamas Suid Nedersetting*),* approximately 2.5 km west of Kakamas, ~44 km south-west of Keimoes and 84.5 km south-west of Upington. Photograph 2.2 illustrates the topography of the site. Photograph 2.3 illustrates a typical street scene in Kakamas.

Photograph 2.2: View of the proposed site, Remainder of Farm 1178 (Kakamas Suid Nedersetting) looking north

Photograph 2.3: 11th Avenue, Kakamas

The Orange River supports intensive irrigation agriculture in the area and the cultivation of grapes, raisins, wine as well as lucern, cotton, corn, and nuts (Kai! Garib IDP, 2009). Photograph 2.4 shows vineyards in the study area.

Photograph 2.4: Vineyards cultivated along the banks of the Gariep River (Orange River)

Small-scale stock farming is practiced in those areas away from the fertile banks of the Orange River (Kai! Garib IDP, 2009). The proposed site on farm *Remainder of farm 1178 (Kakamas Suid Nedersetting)* is not under any cultivation and no livestock are kept on site. The landowner does keep Nguni cattle and some game on an adjoining property south of the proposed site. Road access to the proposed PVSEF site is mainly from the N14 and internal farm roads (Photograph 2.5 and 2.6).

Photograph 2.5: N14 Road in the vicinity of Kakamas

Photograph 2.6: Internal gravel access road on Remainder of Farm 1178 (Kakamas Suid Nedersetting)

There are no farmsteads within and/or bordering the proposed PVSEF site. However, there is a packing facility (Chargo), adjacent to the proposed development area (at the northern end of the site) and a workshop/compound at the northern extent of the proposed site (Photograph 2.7 and 2.8 respectively).

Photograph 2.7: Chargo packing facility

Photograph 2.8: Workshop

SECTION 3: POLICY AND PLANNING CONTEXT

3.1 INTRODUCTION

Section 3 provides an overview of the policy and planning environment affecting the proposed solar thermal plant. For the purposes of the meeting the objectives of the EIA the following policy and planning documents were reviewed, namely:

- The National Energy Act (2008);
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- The White Paper on Renewable Energy (November 2003);
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- Kai! Garib Local Municipality IDP (2009).

The section also provides a summary some of the key social issues associated with solar facilities based on international experience.

3.2 NATIONAL LEVEL ENERGY POLICY

3.2.1 NATIONAL ENERGY ACT (ACT No 34 OF 2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble).

3.2.2 White Paper on the Energy Policy of the Republic of South Africa

Investment in renewable energy initiatives, such as the proposed solar thermal plant, is supported by the White Paper on Energy Policy for South Africa (December1998). In this regard the document notes:

"Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly ***solar*** and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and,
- Addressing constraints on the development of the renewable industry.

The White Paper also acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive and many appropriate applications exist.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered. Advantages include:

- Minimal environmental impacts in operation in comparison with traditional supply technologies;
- Generally lower running costs, and high labour intensities.

Disadvantages include:

- Higher capital costs in some cases
- Lower energy densities
- Lower levels of availability, depending on specific conditions, especially with sun and wind based systems

3.2.3 White Paper on Renewable Energy

This White Paper on Renewable Energy (November, 2003) (further referred to as the White Paper) supplements the *White Paper on Energy Policy*, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes, that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol, Government is determined to make good the country's commitment to reducing greenhouse gas emissions. To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.

Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is:

10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW) (Executive Summary, ix).

3.2.4 Integrated Resource Plan for Electricity (2010-2030)

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9,6 GW; 6,3 GW of coal; 11,4 GW of renewables; and 11,0 GW of other generation sources.

A second round of public participation was conducted in November/December 2010, which led to several changes to the IRP model assumptions. The main changes were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP) and wind options; the inclusion of learning rates, which mainly affected renewables; and the adjustment of investment costs for nuclear units, which until then represented the costs of a traditional technology reactor and were too low for a newer technology reactor (a possible increase of 40%).

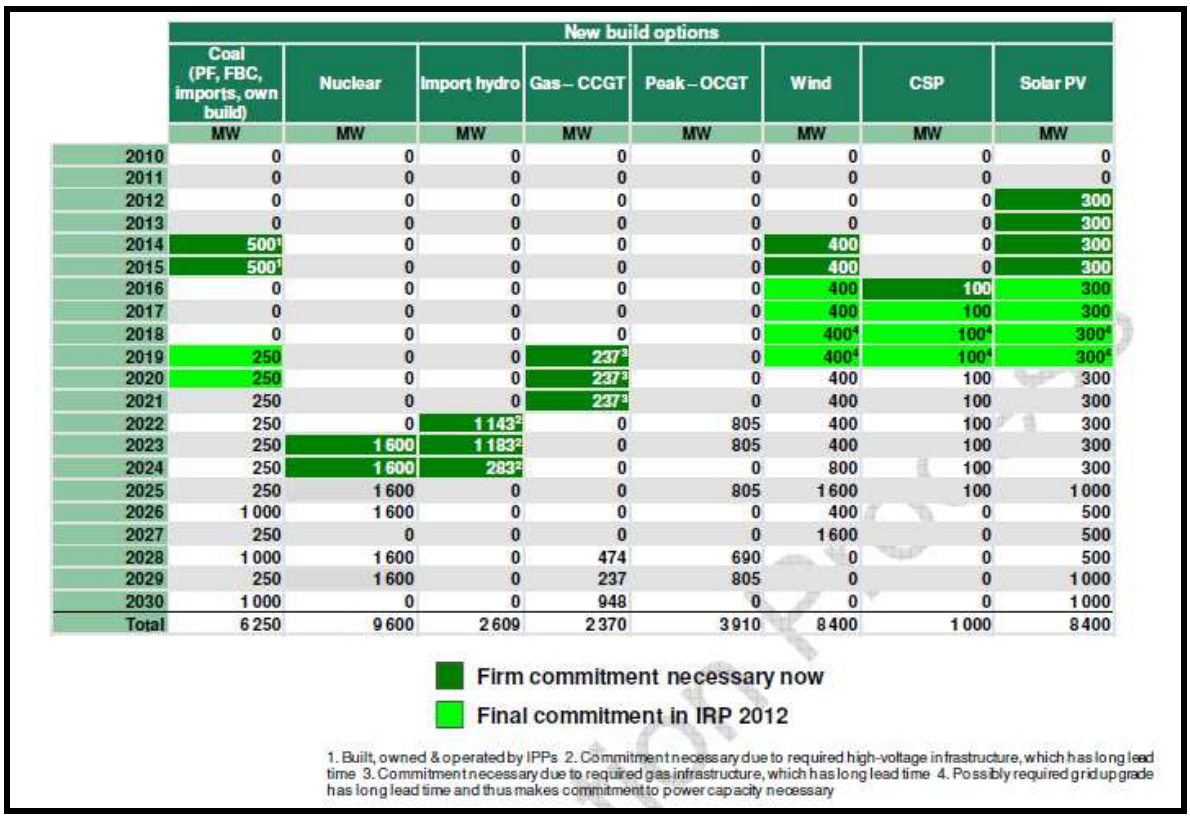
Additional cost-optimal scenarios were generated based on the changes. The outcomes of these scenarios, in conjunction with the following policy considerations, led to the Policy-Adjusted IRP:

- The installation of renewables (solar PV, CSP and wind) were brought forward in order to accelerate a local industry;
- To account for the uncertainties associated with the costs of renewables and fuels, a nuclear fleet of 9,6 GW was included in the IRP;
- The emission constraint of the RBS (275 million tons of carbon dioxide per year after 2024) was maintained;
- Energy efficiency demand-side management (EEDSM) measures were maintained at the level of the RBS.

The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables.

In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from renewables from 11,4 GW to 17,8 GW.

Table 3.1 indicates the new capacities of the Policy commitment. The dates shown in Table 3,1 indicate the latest that the capacity is required in order to avoid security of supply concerns. The document notes that projects could be concluded earlier than indicated.



	New build options							
	Coal (PF, FBC, imports, own build)	Nuclear	Import hydro	Gas – CCGT	Peak – OCGT	Wind	CSP	Solar PV
	MW	MW	MW	MW	MW	MW	MW	MW
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500[1]	0	0	0	0	400	0	300
2015	500[1]	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300
2018	0	0	0	0	0	400[4]	100[4]	300[4]
2019	250	0	0	237[3]	0	400[4]	100[4]	300[4]
2020	250	0	0	237[3]	0	400	100	300
2021	250	0	0	237[3]	0	400	100	300
2022	250	0	1 143[2]	0	805	400	100	300
2023	250	1 600	1 183[2]	0	805	400	100	300
2024	250	1 600	283[2]	0	0	800	100	300
2025	250	1 600	0	0	805	1 600	100	1 000
2026	1 000	1 600	0	0	0	400	0	500
2027	250	0	0	0	0	1 600	0	500
2028	1 000	1 600	0	474	690	0	0	500
2029	250	1 600	0	237	805	0	0	1 000
2030	1 000	0	0	948	0	0	0	1 000
Total	6 250	9 600	2 609	2 370	3 910	8 400	1 000	8 400

Source: Integrated Resource Plan (IRP) for South Africa

Table 3.1: Commitments before next IRP

The key recommendations contained in the Policy-Adjusted IRP Final Report (March 2011) that have a bearing on the renewable energy sector include:

General

- The dark shaded projects in Table 3.1 need to be decided before the next IRP iteration, with the identified capacities thereafter assumed as "committed" projects;
- The light shaded options should be confirmed in the next IRP iteration:
- All non-shaded options could be replaced during the next, and subsequent, IRP iterations if IRP assumptions change and thus impact on the quantitative model results.

Solar energy

- Solar PV programme 2012-2015: In order to facilitate the connection of the first solar PV units to the grid in 2012 a firm commitment to this capacity is necessary. Furthermore, to provide the security of investment to ramp up a sustainable local industry cluster, the first four years from 2012 to 2015 require firm commitment;
- Solar PV 2016 to 2019: As with wind, grid upgrades might become necessary for the second round of solar PV installations from 2016 to 2019, depending on their location. To trigger the associated tasks in a timely manner, a firm commitment to these capacities is necessary in the next round of the IRP at the latest. By then, the assumed cost decreases for solar PV will be confirmed;
- CSP 2016: The 100 MW of CSP power, planned for 2016, needs firm commitment because of the long lead time of these projects;
- CSP 2017 to 2019: Because of the long lead time for CSP plants, a commitment to the capacity planned for 2017 to 2019 is necessary in the next round of the IRP at the latest. By then, the cost and technical assumptions for CSP plants will also be grounded on more solid empirical data;

Conclusions

The key conclusions that are relevant to the renewable energy sector include:

- An accelerated roll-out of renewable energy options should be allowed in order to derive the benefits of localisation in these technologies;
- A solar PV programme as envisaged in the Policy-Adjusted IRP should be pursued (including decentralised generation).

3.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

3.3.1 Northern Cape Province Provincial Growth and Development Strategy

The Provincial Growth and Development Strategy (PGDS) notes that the most significant challenge that the government and its partners in growth and development are confronted with is the **reduction of poverty**. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The PGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include:

- Agriculture and Agro-processing
- Fishing and Mariculture
- Mining and mineral processing
- Transport
- Manufacturing
- Tourism

However, the PGDS also notes that economic development in these sectors also requires:

- Creating opportunities for lifelong learning
- Improving the skills of the labour force to increase productivity
- Increasing accessibility to knowledge and information

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

- Developing requisite levels of human and social capital
- Improving the efficiency and effectiveness of governance and other development institutions
- Enhancing infrastructure for economic growth and social development

Of specific relevance to the SIA the NCPGDS make reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "the development of energy sources such as ***solar energy***, the natural gas fields, bio-fuels, etc, could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The NCPGDS also highlights the importance of enterprise development, and notes that the current levels of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed solar energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

In this regard care will need to be taken to ensure that the proposed solar thermal plant and other renewable energy facilities do not negatively impact on the regions natural environment. In this regard the NCPGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed solar energy facility, do not affect the tourism potential of the province.

The NCPGDS also notes that the Northern Cape Provincial Government will promote the preservation of agricultural biodiversity and the sustainable use of soil and water through the application of legislation and related regulations where this is necessary. In this regard the proposed solar thermal plant will consume relatively large volumes of water, which is a scarce resource in the area. The water required for the project may also impact on the provincial government's commitment to land reform through the allocation of water rights to emerging black farmers. .

3.3.2 Kai! Garib Local Municipality Integrated Development Plan (2009)

The Constitution of South Africa ascribes major developmental responsibilities to Local Municipalities to ensure that the quality of life for its citizens is improved

through the provision of basic services, creation of jobs, promotion democracy and a culture of accountability as well as the accountability and eradication of poverty. The Integrated Development Plan (IDP) enables Local Municipalities like the Kai! Garib Municipality to manage and measure their progress in fulfilling their developmental responsibilities.

The Kai! Garib Local Municipality IDP (2009) identifies 6 Key Priority Areas (KPA) in line with the National standards to address the municipality's development objectives:

- KPA 1: Spatial Development
- KPA 2: Service Delivery
- KPA 3: Economic Development and LED
- KPA 4: Financial Viability
- KPA 5: Institutional Arrangements and PMS
- KPA 6: Good Governance and Public Participation

With focus on these KPAs an analysis of the status quo across numerous sectors within the Municipality was undertaken highlighting 8 priority issues and their related or contributing factors. Those priority issues that are relevant to the proposed facility include:

- Poverty alleviation employment and capacity building
- Health and HIV/AIDS (specifically relevant to the potential impact of construction workers on local communities during the construction phase)
- Infrastructure development (including electricity, water and roads) and service delivery

In terms of these issues, the IDP sets out some specific critical targets that are summarised below:

- Poverty alleviation employment and capacity building:
  - Provide permanent employment for 100 people per annum over the next 5 years across all sectors (60 youth, 20 women, 10 disabled, 10 community)
  - Provide skills development/training for at least 100 people per annum over the next 5 years across all sectors
  - Provide land and improve infrastructure on farms for 100 emerging farmers over the next 5 years
- Health and HIV/AIDS:
  - Update the existing policy and implement accordingly by June 2010
  - Establish a Forum to develop a plan for the Kai !Garib area by June 2010
  - Facilitate awareness campaigns by Department of Health in all communities of Kai !Garib by 2010
  - Facilitate the upgrading of health services and facilities by dept of Health in all 8 wards in Kai !Garib by 2014
- Infrastructure development (including electricity, water and roads) and service delivery:
  - Ensure that all households in Kai !Garib have access to basic water services by 2011/12
  - Ensure that all households have access to basic sanitation by 2011/12
  - Ensure that all households in Kai !Garib have access to electricity by 2011/12
  - Ensure that all communities in Kai !Garib can access refuse removal services by 2011/12

- Eradicate the bucket system in Kai !Garib

The exploitation of the region's high rates of insolation for the generation of energy through solar technology has been identified as a potential driver for economic growth within the Local Municipality.

3.4 INTERNATIONAL EXPERIENCE WITH SOLAR ENERGY PLANTS

The proposed facility is a PV facility as opposed to a Concentrating Solar Power (CSP) plant. In this regard the majority of the international experience is based on CSPs as opposed to PV facilities. In this regard the key differences in terms of potential impacts relate to the use of water and the visual impacts associated with the large tower structures associated with CSP plants. CSP plants (like most conventional power plants) require large volumes of cooling water, which make them less suited to arid, water scarce environments, such as the Karroo. PV facilities on the other hand, such as the proposed PV facility, on the other hand, do not require cooling water, and as such are more suited to areas where water is a scarce resource.

In terms of visual impacts, parabolic troughs and power towers, where the solar energy from the solar reflectors is concentrated, as are associated with CSP facilities, are likely to have a higher visual impact than the solar panels associated with PV facilities.

SECTION 4: ASSESSMENT OF KEY SOCIAL ISSUES

4.1 INTRODUCTION

Section 4 identifies the key social issues identified during the SIA study. The identification of social issues was based on:

- Social Impact Assessment for a proposed Kakamas PVSEF (May, 2011);
- Review of project related information, including other specialist studies;
- Interviews with key interested and affected parties[14];
- Experience of the authors of the area and the local conditions;
- Experience with similar projects, including renewable energy projects such as wind farms.

In identifying the key issues the following assumption is made:

- The area identified for the proposed solar thermal plant meets the technical criteria required for such facilities.

4.2 IDENTIFICATION OF KEY SOCIAL ISSUES

The key social issues identified during the SIA can be divided into:

- The policy and planning related issues
- Local, site-specific issues

The local site-specific issues can in turn be divided into construction and operational related issues. These issues are discussed and assessed below. The potential impacts associated with the associated infrastructure (access road, pipeline and power line routes_ are also assessed.

4.3 POLICY AND PLANNING ISSUES

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

The review of the relevant planning and policy documents was undertaken as a part of the SIA. The key documents reviewed included:

- The National Energy Act (2008)

[14] As indicated above,

- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- The White Paper on Renewable Energy (November 2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- Northern Cape Provincial Growth and Development Strategy (2004-2014)
- The Kai! Garib Local Municipality Integrated Development Plan (2009)

The findings of the review indicated that solar energy was strongly supported at a national and local level. At a national level the While Paper on Energy Policy (1998) notes:

- Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future;
- The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly ***solar*** and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

At a provincial level the NCPGDP notes that availability of inexpensive energy is a key requirement in order to promote economic growth in the Northern Cape. The NCGDS goes onto indicate that "the development of energy sources such as ***solar energy***, the natural gas fields, bio-fuels, etc, could be some of the means by which new economic opportunity and activity is generated in the Northern Cape".

Based on this is it reasonable to assume that the establishment of solar thermal plants is supported. However, the NCPGDS also states that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile ecosystems and vulnerability to climatic variation. The document also indicates that due to the Province's exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed solar energy facility, do not impact on the tourism potential of the Province. However, the representative from WESSA NC (T. Andersen) indicted that provided the project was located in a habitat of low significance and due consideration was given to the potential impact on red lists plants, birds and animals and well as the impact of the heliostat reflection and the potential collision impact with the power town on birds, WESSA would have little objection noting that "solar is the way to go." The potential impact on birds has been addressed in the avifauna specialist study.

The NCPGDS also notes that the Northern Cape Provincial Government will promote the preservation of agricultural biodiversity and the sustainable use of soil and water through the application of legislation and related regulations where this is necessary. In this regard the proposed solar thermal plant will consume relatively large volumes of water, which is a scarce resource in the area.

At the local level the Kai! Garib Municipality IDP indicates that the exploitation of the region's high rates of insolation for the generation of energy through solar technology has been identified as a potential driver for economic growth within the Local Municipality.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that solar energy and the establishment of solar

thermal plants are supported at a national, provincial, and local level. It is therefore the opinion of the authors that the establishment of a solar thermal plant on the proposed site is supported by national, provincial and local policies and planning guidelines.

4.4 SOCIAL IMPACTS ASSOCIATED WITH THE CONSTRUCTION PHASE

The key social issues associated with the construction phase include:

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

Potential negative impacts
- Impacts associated with the presence of construction workers on site
- Increased risk of stock theft, poaching and damage to farm infrastructure associated with presence of construction workers on the site
- Increased risk of veld fires associated with construction-related activities
- Threat to safety and security of farmers associated with the presence of construction workers on site
- Impact of heavy vehicles, including damage to roads, safety, noise and dust
- Potential loss of grazing land associated with construction-related activities.

Annexure C contains the management plan for addressing social impacts.

4.4.1 Creation of employment and business opportunities

Based on the information from work carried out on the Touw's River PVSEF the construction phase is expected to extend over a period of 6-12 months and create approximately 40 employment opportunities, depending on the final design. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the PVSEF and the associated components, including, access roads, services and power line.

Based on other renewable energy projects it is anticipated that approximately 60% (24) of the employment opportunities will be available to low (construction labourers, security staff etc) and semi-skilled (drivers, equipment operators etc.) and 40% (16) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the skilled and semi-skilled opportunities, are likely to be associated with the contactors appointed to construct the proposed PVSEF and associated infrastructure. In this regard the majority of contractors tend to use their own staff and this will limit the potential for direct employment opportunities for locals during the construction phase. The low education and skills levels in the area will also hamper potential opportunities for local communities. However, members of the local community are likely to benefit from the low skilled employment opportunities associated with the project. In this regard the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community.

Based on information from the Touws River PVSEF the capital expenditure is anticipated to be in the region of R 120 million for a 10 MW facility. In terms of

business opportunities for local companies, the expenditure of these sums during the construction phase will create business opportunities for the regional and local economy. However, given the technical nature of the project and high import content associated with solar thermal plants opportunities for the local Kai! Garib economy and the towns of Upington, Keimoes and Kakamas are likely to be limited. However, opportunities are likely to exist for local contractors and engineering companies in Upington. Implementing the enhancement measures listed below can enhance these opportunities.

The implementation of the proposed enhancement measures listed below would enable the establishment of the proposed PVSEF to support co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised. In this regard the NCPGDS highlights the importance of enterprise development, and notes that the current levels of private sector development and investment in the Northern Cape are low. The proposed PVSEF therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site. The majority of construction workers are likely to be accommodated in the nearest local towns, specifically Kakamas, Keimoes and Upington. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. In addition, a proportion of the total wage bill earned by construction workers over the 6-12 month construction phase is also likely to be spent in the regional and local economy. Based on information from other renewable energy facilities, the total wage bill for the 6-12 month construction phase will be in the region of R 8-10 million. The injection of income into the area in the form of rental for accommodation and wages will create opportunities for local businesses in towns such as Upington, Keimoes, and Kakamas. The benefits to the local economy will however be confined to the construction period (6-12 months).

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for meaningful skills development and training for members from the local communities are likely to be limited.

The hospitality industry in the local towns is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other large construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

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

Nature: Creation of employment and business opportunities during the construction phase		
	Without Mitigation	**With Enhancement**
Extent	Local – Regional (2) (Rated as 2 due to potential opportunities for local communities and businesses)	Local – Regional (3) (Rated as 3 due to potential opportunities for local communities and businesses)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	Low (28)	Medium (32)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	
Enhancement : See below **Cumulative impacts:** Opportunity to up-grade and improve skills levels in the area. However, due to relatively small number of local employment opportunities this benefit is likely to be limited.		
Residual impacts: Improved pool of skills and experience in the local area. However, due to relatively small number of local employment opportunities this benefit is likely to be limited.		

Assessment of No-Go option

There is no impact as it maintains the current status quo. The potential employment and economic benefits associated with the proposed PVSEF would therefore be forgone. The potential opportunity costs in terms of the capital expenditure, employment, skills development, and opportunities for local business are therefore regarded as a negative.

Recommended enhancement measures

In order to enhance local employment and business opportunities associated with the construction phase the following measures should be implemented:

Employment

- Where reasonable and practical, INCA should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
- Where feasible, efforts should be made to employ local contactors that are compliant with Black Economic Empowerment (BEE) criteria;
- Before the construction phase commences INCA should meet with representatives from the Kai! Garib Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.

- The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that INCA intends following for the construction phase of the project.
- Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

- INCA should seek to develop a database of local companies, specifically BEE companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;
- Where possible, INCA should assist local BEE companies to complete and submit the required tender forms and associated information.
- The Kai! Garib Municipality, in conjunction with the local Chamber of Commerce and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

4.4.2 Presence of construction workers in the area

In terms of affected farmsteads, there are a relatively small number of farmsteads that will be affected and it would appear that very few of the farmers live on their farms. In this regard there appear to be no farmsteads within and/or bordering the proposed plant site. However, there are a number of potentially vulnerable farming activities, such as livestock farming. The potential threat to farming activities is discussed below. In addition, the presence of construction workers also poses a potential risk to family structures and social networks in the area. The most vulnerable communities include the communities of Kakamas and Keimoes.

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to the potential behaviour of male construction workers, including:

- An increase in alcohol and drug use
- An increase in crime levels
- The loss of girlfriends and or wives to construction workers
- An increase in teenage and unwanted pregnancies
- An increase in prostitution
- An increase in sexually transmitted diseases (STDs)

Given the relatively small labour force (100) during the construction phase, of which approximately 20-25 can be sourced from the local area, the potential risk to local family structures and social networks is regarded as low.

Employing members from the local community to fill the low-skilled job categories can help to reduce the risk and mitigate the potential impacts on the local communities. These workers will be from the local community and form part of the local family and social network and, as such, the potential impact will be low. The use of local residents to fill the low skilled job categories will also reduce the need to house construction workers on the site. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities may be low.

Table 4.2: Assessment of impact of construction workers on local communities

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	**With Mitigation**
Extent	Local (3) (Rated as 3 due to potential severity of impact on local communities)	Local (2) (Rated as 1 due to potential severity of impact on local communities)
Duration	Very Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STD's etc (5)	Very Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STD's etc (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STD's etc (10)
Probability	Probable (3)	Probable (3)
Significance	Low for the community as a whole (24) Moderate-High for specific individuals who may be affected by STD's etc (57)	Low for the community as a whole (21) Moderate-High for specific individuals who may be affected by STD's etc (51)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation: See below		
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS,		

the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
Residual impacts: See cumulative impacts.

Assessment of No-Go option
There is no impact as it maintains the current status quo. The potential positive impacts on the local economy associated with the additional spending by construction workers in the local economy will also be lost.

Recommended mitigation measures
The potential risks associated with construction workers can be mitigated. The aspects that should be covered include:

- Where possible, INCA should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories. This will reduce the potential impact that this category of worker could have on local family and social networks;
- INCA should consider the establishment of a Monitoring Forum (MF) for the construction phase which should be established before the construction phase commences and should include key stakeholders, including representatives from the local community, local councillors, farmers, and the contractor. The role of the MF would be to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should also be briefed on the potential risks to the local community associated with construction workers;
- INCA and the contractor should, in consultation with representatives from the MF, develop a Code of conduct for the construction phase. The code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the code of good conduct should be dismissed. All dismissals must comply with the South African labour legislation;
- INCA and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis;
- The contractor should make the necessary arrangements for allowing workers from outside the area to return home over weekends and or on a regular basis during the 6-12 month construction phase. This would reduce the risk posed by construction workers to local family structures and social networks;
- It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site. This will make it possible to manage the potential impacts effectively.

4.4.3 Increased risk of stock theft, poaching and damage to farm infrastructure

The presence of construction workers on the site increases the potential risk of stock theft and poaching. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. Stock and game losses may also result from gates being left open and/or fences being damaged.

Table 4.3: Assessment of impact of stock theft and damage to farm infrastructure

Nature: Potential loss of livestock, poaching and damage to farm infrastructure associated with the presence of construction workers on site		
	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (21)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses etc	Yes, compensation paid for stock losses etc
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes
Mitigation: See below		
Cumulative impacts: No**,** provided losses are compensated for		
Residual impacts: See cumulative impacts.		

Assessment of No-Go option
There is no impact as it maintains the current status quo.
Recommended mitigation measures
The mitigation measures that can be considered to address the potential impact on livestock, game, and farm infrastructure include:

- INCA should enter into an agreement with the affected landowners whereby the company will compensate for damages to farm property and disruptions to farming activities. This includes losses associated with stock theft and damage to property etc;
- INCA should investigate the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. Should such a MF be required it should be established prior to commencement of the construction phase. The Code of Conduct should be signed by INCAand the contractors before the contractors move onto site;
- INCA should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between INCA, the contractors and neighbouring landowners. The

agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);
- The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by INCA should ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by INCA should ensure that construction workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- The housing of construction workers on the site should be limited to security personnel.

4.4.4 Increased risk of veld fires

The presence of construction workers and construction-related activities on the site poses an increased risk of veld fires that in turn pose a threat to the livestock, wildlife, and farmsteads in the area. In the process, farm infrastructure may also be damaged or destroyed and human lives threatened.

- The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, winter months.
- A number of farms away from the Gariep River farm cattle. As such, their livelihoods are dependent on grazing on their farms. Any loss of grazing due to a fire would therefore impact negatively on the affected farmers livelihoods;
- The risk of fire related damage is exacerbated by the distance to fire-fighting vehicles located in the nearest towns of Upington, Keimoes and Kakamas.

Table 4.4: Assessment of impact of increased risk of veld fires

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of veld fires		
	Without Mitigation	**With Mitigation**
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2) (Rated as 2 due to potential severity of impact on local farmers)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Moderate-High due to reliance on livestock for maintaining livelihoods (8)	Low-Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	Medium (39)	Low (27)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc	
Irreplaceable loss of resources?	No	No

Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative impacts: No, provided losses are compensated for.		
Residual impacts: See cumulative impacts.		

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

Recommended mitigation measures
As indicated above, INCA should enter into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated veld fires. In addition, the potential increased risk of veld fires can be effectively mitigated. The detailed mitigation measures are outlined in the EMP for the construction and operation phases. The aspects that should be covered include:

- Contractor to ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months;
- Contractor to provide adequate fire fighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- As per the conditions of the Code of Good Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.

In addition the landowner should also ensure that they join the local fire protection agency.

4.4.5 Impact of construction vehicles

The movement of heavy construction vehicles during the construction phase has the potential to damage roads and create noise, dust, and safety impacts for other road users and local communities in the area, specifically the residents Kakamas. However, the findings of the SIA indicate that the current road use frequency is low. The social impacts associated with the movement of construction related traffic are therefore likely to be low.

Table 4.5: **Assessment of the impacts associated with construction vehicles**

Nature: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Very Short Term (1)	Very Short Term (1)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (12)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation: See below		
Cumulative impacts: If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were no responsible for the damage. **Residual impacts:** See cumulative impacts		

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

Recommended mitigation measures
INCAhave entered into an agreement with the affected landowners whereby the company will compensate for damages. This includes losses associated with damage to local internal farm roads that are affected by the site. In addition, the potential impacts associated with heavy vehicles and dust can be effectively mitigated. The aspects that should be covered include:

- The contractor must ensure that damage caused to roads by the construction related activities, including heavy vehicles, is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor;
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
- All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.

4.4.6 Damage to and loss of farmland

The activities associated with the construction phase have the potential to damage farmlands and result in a loss of land available for grazing. The significance of the impacts is to some extent mitigated by the fact that the farming activities on the site

are confined to cattle farming as opposed to crops. In addition, only one landowner is affected and it is assumed that he has entered into a lease or purchase agreement with INCA. The loss of production farmland has therefore been offset by such an agreement. In addition, the final disturbance footprint can also be reduced by careful site design and placement of components. The impact on farmland associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

Mr. Boy Lubbe, and his son, Mr. Johan Lubbe are the owners of the affected farm. Mr. Boy Lubbe has been farming in the area for the last 70 years, while his son has farmed in the area for the last 17 years. Both father and son indicated that they felt that the construction activities would not impact on their farming activities. However, Mr. Johan Lubbe did express dissatisfaction with INCA for proposing to use the full 100ha for construction and then changing this to 10ha after the landowner had sold 40ha water rights for the site thinking that the entire site would be under solar.

Table 4.6: Assessment of impact on farmland due to construction related activities

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the PVSEF and power lines will damage farmlands and result in a loss of farmlands for future farming activities.		
	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Moderate, due to importance of farming in terms of local livelihoods (4)	Minor (2)
Probability	Definite (5)	Highly Probable (4)
Significance	High (60)	Low (16)
Status	Negative	Negative
Reversibility	No, in case of footprint associated with solar thermal plant	No, in case of footprint associated with solar thermal plant
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	Yes, however, loss of farmland cannot be avoided
Mitigation: See below		
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.		
Residual impacts: See cumulative impacts.		

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

Recommended mitigation measures
The potential impacts associated with damage to and loss of farmland can be effectively mitigated. The aspects that should be covered include:

- The footprint associated with the construction related activities (access roads, construction platforms, workshop etc) should be minimised;
- An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc, should be rehabilitated at the end of the construction phase;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA (Savannah Environmental);
- The implementation of the Rehabilitation Programme should be monitored by the ECO.

4.5 SOCIAL IMPACTS ASSOCIATED WITH OPERATIONAL PHASE

The key social issues affecting the operational phase include:

Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- The establishment of renewable energy infrastructure.

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

Annexure C contains the management plan for the addressing social impacts.

4.5.1 Creation of employment and business opportunities

Based on information from the Touws River PVSEF the proposed solar thermal plant is likely to employ approximately 20-30 full time employees over a 25-30 year period. Based on other renewable projects approximately 3 - 6% of the posts will be managerial, 12 - 18% engineers, 35 - 40% technicians and 40 - 50% craftsmen. The proposed facility will therefore create potential employment opportunities in the Northern Cape Province and the Kai! Garib Municipality. However, given that the solar energy sector in South Africa is relatively new, it may be necessary to import the required operational and maintenance skills from other parts of South Africa or even overseas. However, it will be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting local employment and skills development contained in the Kai! Garib IDP.

Given the location of the proposed facility the majority of permanent staff is likely to reside in the towns of Upington, Keimoes or Kakamas. In terms of accommodation options, a percentage of the permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns. The benefits to the local economy will extend over the 30-year operational lifespan of the project.

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

The Kai !Garib Municipal Manager (MM) (Mr McKay) who was interviewed in 2010 during the SIA for a Concentrated Solar Plan (CSP) located near Upington indicated that renewable the development represented a positive investment in the local Municipality, and as such, it was fully supported.

Table 4.7: Impact assessment of employment and business creation opportunities

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Medium (33)
Status	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts		

Assessment of No-Go option
There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the loss of employment and skills and development training would be lost which would also represent a negative impact.

Recommended enhancement measures
The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition:

- INCA should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;
- INCA, in consultation with the Kai! Garib Municipality, should investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the PVSEF. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Kai! Garib IDP.

4.5.2 Development of clean, renewable energy infrastructure

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions (Cape Times, 15 November 2007). The establishment of a clean, renewable energy facility will therefore reduce, albeit minimally, South Africa's reliance on coal-generated energy and the generation of carbon emissions into the atmosphere.

The overall contribution to South Africa's total energy requirements of the proposed solar thermal plant is relatively small. However, the 10 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Table 4.8: Development of clean, renewable energy infrastructure

Nature: Promotion of clean, renewable energy		
	Without Mitigation	**With Mitigation** (The provision of renewable energy infrastructure is in itself a mitigation measure)
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (48)	High (48)
Status	Positive	Positive
Reversibility	Yes	

Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
The establishment of the proposed facility is a mitigation measure in itself. In order to maximise the benefits of the proposed project INCA should:

- Use the project to promote and increase the contribution of renewable energy to the national energy supply;
- Maximise the public's exposure to the project via an extensive communication and advertising programme;
- Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project;
- Investigate the opportunities for establishing a Community Trust. The revenue for the trust should be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Kai! Garib IDP.

4.5.3 Visual impact and impact on sense of place

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. As indicated previously, the NCPGDS does indicate that the province does have the potential to become the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects not impact on visual character and sense of place of the landscape.

The key findings of the specialist visual impact assessment (VIA) (MetroGIS, November, 2011) indicate that the PV plant is likely to be visually exposed to a primary area within approximately 7km of the proposed facility. This includes the site itself, and the areas predominantly to the north, north-west and east. Areas to the direct south of the facility appear to fall outside of the viewshed.

The visually exposed areas tend to be concentrated along the lower lying Orange River valley, and become patchy and sparse further away from the drainage line. The south west facing slopes of the ridges in the north east of the study area may also be

visually exposed. Further afield to the south west, larger areas are evident within the viewshed, but it is unlikely that the facility will be visible from such a distance.

Specific key findings of the VIA are summarised below.

Potential visual impact on users of national, arterial and secondary roads in close proximity to the proposed facility
Potential visual impact on users of the N14 national road bypassing the site on its northern boundary (within 2,5km) is expected to be **high**.

Potential visual impact on residents of urban areas in close proximity to the proposed facility
The visual impact of the proposed facility on the western outskirts of Kakamas and the southern outskirts of Cillie (within 2,5km) is expected to be of **high** significance.

Potential visual impact on residents of farms and homesteads in close proximity to the proposed facility
The visual impact of the proposed facility on the farms on homesteads along the Orange River, and within 2,5km of the site is expected to be of **high** significance.

Potential visual impact on sensitive visual receptors (users of roads and residents of urban areas, farms and homesteads) within the region
The visual impact on users of roads and on residents of urban areas, farms and homesteads within the region (i.e. beyond the 2,5km radius) is expected to be of **moderate** significance.

Potential visual impact of the substation and workshop on observers in close proximity to the proposed facility
The significance of the impact is rated to be of **low** significance.

The overall findings of the VIA indicate that the anticipated visual impacts associated with the PVSEF are not considered to be fatal flaws from a visual perspective, considering the relatively contained area of potential visual exposure and the low occurrence of visual receptors.

Table 4.9: Visual impact and impact on sense of place

Nature: Visual impact associated with the proposed solar facility and the potential impact on the areas rural sense of place.		
	Without Mitigation	**With Mitigation**
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (56)	Medium (56)
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of	No	

resources?		
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Potential impact on current rural sense of place		
Residual impacts: See cumulative impacts		

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

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

4.5.4 Impact on tourism

The NCPGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile ecosystems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Therefore caution must be taken to ensure that the development of large renewable energy projects, such as the proposed solar energy facility, do not affect the tourism potential of the Province. However, based on the findings of the site visit, the proposed facility is not likely to impact on the tourism sector in the area or the Province. The significance of this issue is therefore rated as low negative. In some instances the plant may also attract tourists to the area. However, the significance of this potential benefit is also rated as low positive.

The findings of the VIA indicate that the anticipated visual impact of the facility on existing tourist routes, as well as on the tourism potential of the region, is expected to be **low**.

Table 4.10: Impact on tourism

Nature: Potential impact of the solar thermal plant on local tourism		
	Without Mitigation	**With Enhancement / Mitigation**
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24) (Applies to both – and +)	Low (27) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	
Irreplaceable	No	

loss of resources?		
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: Potential negative and or positive impact on tourism in the Kai! Garib Municipality Area.		
Residual impacts: See cumulative impacts		

Assessment of No-Go option
The No-Development option would represent a lost opportunity to create a facility that has the potential to attract visitors to the area. This would represent a negative opportunity cost.

Recommended enhancement measures
In terms of mitigating the visual impacts, it is virtually impossible to hide the facility. The impact on the sense of place of the area cannot therefore be effectively mitigated. In terms of efforts to enhance the proposed benefits to tourism:

- INCA should liaise with representatives from the Kai! Garib Municipality and local tourism representatives to raise awareness of the proposed facility;
- INCA should investigate the option of establishing a renewable energy interpretation centre at entrance to the site. The centre should include a viewing area where passing visitors can stop and view the site;
- In order to maximise the benefits of the interpretation centre to the broader community, it is recommended that the information on the project and solar energy be presented in the three main languages of the Northern Cape Province, namely Afrikaans, English and Setswana.

4.6 ASSESSMENT POWER LINE OPTIONS

The proposed facility includes the establishment of an overhead power line (22kV) of ~1000 m in length feeding into the Eskom electricity network at the existing Taaiput Substation. The findings of the SIA indicate that the social impacts associated with the overhead power line are linked to the visual impact and associated impact on the sense of place and landscape character of the area. However, the significance of the impact is rated as low negative. This is due to the short length of the line and presence of an existing substation and power lines that traverse the site.

The findings of the VIA indicate that the visual impact associated with the new power line is rated to be of **low** significance after mitigation. The proposed mitigation is that the new 22kV power line should follow the alignment of the existing transmission lines that traverses the site.

Table 4.11: Assessment of transmission line options

Nature: Potential visual impact and impact on sense of place associated with power lines		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Limited visual and impact on sense of place		
Residual impacts: See cumulative impacts		

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

Recommended mitigation measures
The recommendations contained in the VIA should be implemented. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the power line.

4.7 ASSESSMENT OF NO-DEVELOPMENT OPTION

As indicated above, South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions (Cape Times, 15 November 2007).

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost.

Table 4.12: Assessment of no-development option

Nature: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy		
	Without Mitigation	**With Mitigation**
Extent	Local-International (5)	Local-International (5)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	High (60)	High (60)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.		
Residual impacts: See cumulative impacts		

Recommended enhancement measures
The proposed facility should be developed and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented. However, the impact of large solar facilities on the sense of place and landscape are issues need to be addressed in the location, design and layout of the proposed plant.

4.8 ASSESSMENT OF CUMULATIVE IMPACTS

Although there appear to be no guidelines for solar facilities, the Australian Wind Farm Development Guidelines (Draft, July 2010) indicate that the cumulative impact of multiple wind farm facilities is likely to become an increasingly important issue for wind farm developments in Australia. This finding is also likely to apply to solar thermal plants and is also likely to be the case in South Africa. The key concerns in terms of cumulative impacts are, as in the case of wind farms, also likely to be linked to visual impacts and the impact on rural, undeveloped landscapes.

The Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues raised in these guidelines as to what defines a cumulative impact are also regarded as pertinent to solar facilities, specifically given that the key issue of concern is likely to relate to the impact on rural, undeveloped landscapes. The relevant issues raised in the by Scottish Natural Heritage include:

- Combined visibility (whether two or more wind farms (solar facilities) will be visible from one location).

- Sequential visibility (e.g. the effect of seeing two or more wind farms (solar facilities) along a single journey, e.g. road or walking trail).
- The visual compatibility of different wind farms (solar facilities) in the same vicinity.
- Perceived or actual change in land use across a character type or region.
- Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

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

Research on wind farms undertaken by Warren and Birnie (2009) also highlights the visual and cumulative impacts on landscape character. The paper notes that given that aesthetic perceptions are a key determinant of people's attitudes, and that these perceptions are subjective, deeply felt and diametrically contrasting, it is not hard to understand why the arguments become so heated. Because landscapes are often an important part of people's sense of place, identity and heritage, perceived threats to familiar vistas have been fiercely resisted for centuries. The paper also identifies two factors that important in shaping people's perceptions of wind farms' landscape impacts. The first of these is the cumulative impact of increasing numbers of wind farms (Campbell, 2008). The research found that if people regard a region as having 'enough' wind farms already, then they may oppose new proposals. The second factor is the cultural context. This relates to people's perception and relationship with the landscape. In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The concerns raised with regard to wind farms and the impact on landscapes are also likely to apply to solar facilities.

The impact of solar facilities on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar plant applications. With regard to the area, a number of CSP have been proposed for the area in and around Upington. The Northern Cape Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications.

Table 4.13: Cumulative impacts on sense of place and the landscape

Nature: Visual impacts associated with the establishment of more than one solar thermal plant and the potential impact on the areas rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (24)
Status	Negative	Negative
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Enhancement: See below		
Cumulative impacts: Impact on other activities whose existence is linked to linked to rural sense of place and character of the area, such as tourism, bird watching, and hunting.		
Residual impacts: See cumulative impacts		

Assessment of No-Go option

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

Recommended mitigation measures

The establishment of a number of large solar facilities in the area does have the potential to have a negative cumulative impact on the areas sense of place and the landscape. The environmental authorities should consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of such plants in an area.

4.9 ASSESSMENT OF DECOMMISSIONING PHASE

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 25 - 30 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

In addition, the social impacts associated with final decommissioned are likely to be limited due to the relatively small number of permanent employees (20-30) affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

Recommended mitigation measures

The following mitigation measures are recommended:

- INCA should investigate the option of relocating employees to other solar facilities when the Kakamas plant is decommissioned;
- INCA should ensure that retrenchment packages are provided for all staff who stand to lose their jobs when the plant is decommissioned;
- All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning;
- INCA should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 30 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.

SECTION 5: KEY FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

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

- A review of the issues identified during the Scoping Process;
- A review of key planning and policy documents pertaining to the area;
- Semi-structured interviews with interested and affected parties[15];
- A review of social and economic issues associated with similar developments;
- A review of selected specialist studies undertaken as part of the EIA;
- A review of relevant literature on social and economic impacts;
- The experience of the authors with other wind energy projects in South Africa.

5.2 SUMMARY OF KEY FINDINGS

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

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

The section also comments on the potential health impacts associated with solar facilities.

5.2.1 Policy and planning issues

The key documents reviewed included:

- The National Energy Act (2008)
- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- The White Paper on Renewable Energy (November 2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- The Kai! Garib Local Municipality Integrated Development Plan (2009).

[15] The PV panels associated with the proposed Kakamas II PVSEF are located on the same site as the PV panels associated with the Kakamas PVSEF site which was assessed in May 2011. The information for the proposed Kakamas II PVSEF is therefore based on the information collected during the site visit undertaken for the first Kakamas PVSEF assessed in May 2011.

The findings of the review indicated that solar energy is strongly supported at a national, provincial, and local level. Based on this is it reasonable to assume that the establishment of the proposed Kakamas II PVSEF is supported.

5.2.2 Construction phase

The key social issues associated with the construction phase include:

Potential positive impacts

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

The construction phase is expected to extend over a period of 6-12 months and create approximately 30-40 employment opportunities. It is anticipated that approximately 60 % (24) of the employment opportunities will be available to low skilled (construction labourers, security staff etc.) and semi-skilled workers (drivers, equipment operators etc.) and 40% (16) to skilled personnel (engineers, land surveyors, project managers etc.). The majority of the employment opportunities, specifically the skilled and semi-skilled opportunities, are likely to be associated with the contactors appointed to construct the facility and associated infrastructure. In this regard the majority of contractors tend to use their own staff and this will limit the potential for direct employment opportunities for locals during the construction phase. In addition, the low education and skills levels in the area will hamper potential opportunities for local communities. However, members of the local community are likely to benefit from the low skilled employment opportunities associated with the project. In this regard the majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community.

The total wage bill for the 6-12 month construction phase will be in the region of R 8-10 million. The injection of income into the area in the form of rental for accommodation and wages will create opportunities for local businesses in towns such as Kakamas and Keimoes. The sector of the local economy that is most likely to benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the construction workers on the site The benefits to the local economy will however be confined to the construction period (6-12 months).

The capital expenditure is anticipated to be in the region of R 120 million for a 10 MW facility. In terms of business opportunities for local companies, the expenditure of these sums during the construction phase will create business opportunities for the regional and local economy. However, given the technical nature of the project and high import content associated with solar thermal plants opportunities for the local Kai! Garib economy and the towns of Upington, Keimoes and Kakamas are likely to be limited. However, opportunities are likely to exist for local contractors and engineering companies in Upington. Implementing the enhancement measures listed below can enhance these opportunities.

In terms of training, the contractors are likely to provide on-site training and skills development opportunities. However, the majority of benefits are likely to accrue to personnel employed by the relevant contractors. In the absence of specific commitments from the developer to employ local contractors the potential for

meaningful skills development and training for members from the local communities are likely to be limited.

Potential negative impacts
- Influx of construction workers employed on the project;
- Increased risk of stock theft, poaching and damage to farm infrastructure associated with construction workers;
- Increased risk of veld fires associated with construction related activities;
- Impact of heavy vehicles, including damage to roads, safety, noise and dust;
- Loss of agricultural land associated with construction related activities.

The significance of the potential negative impacts with mitigation was assessed to be of Low significance. The majority of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. However, the impact on individuals who are directly impacted on by construction workers and or job seekers (i.e. contract HIV/ AIDS) was assessed to be of Medium-High negative significance. In addition, due to the relatively small size of the labour force (30-40) the potential risk to local family structures and social networks is regarded as low.

Table 5.1 summarises the significance of the impacts associated with the construction phase.

Table 5.1: Summary of social impacts during construction phase

Impact	Significance No Mitigation	Significance With Mitigation
Creation of employment and business opportunities	Low (Positive impact)	Medium (Positive impact)
Presence of construction workers and potential impacts on family structures and social networks	Low (Negative impact for community as a whole) Medium-High (Negative impact of individuals)	Low (Negative impact for community as a whole) Medium-High (Negative impact of individuals)
Risk of stock theft, poaching and damage to farm infrastructure	Medium (Negative impact)	Low (Negative impact)
Risk of veld fires	Medium (Negative impact)	Low (Negative impact)
Impact of heavy vehicles and construction activities	Low (Negative impact)	Low (Negative impact)
Loss of farmland	High (Negative impact)	Low (Negative impact)

5.2.3 Operational phase

The key social issues affecting the operational phase include:

Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;

- The establishment of infrastructure to generate renewable energy.

The total number of permanent employment opportunities is estimated to be in the region of 20-30. Given the location of the proposed facility the majority of permanent staff is likely to reside in Kakamas, Keimoes and Upington. In terms of accommodation options, a percentage of the permanent employees may purchase a house in one of these two towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the local economy. The benefits to the local economy will extend over the 25-30 year operational lifespan of the project.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive High social benefit for society as a whole.

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

The visual impacts on landscape character associated with large renewable energy facilities, such as solar thermal plants, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The impact of large, solar energy plants on the landscape is therefore likely to be a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of solar energy applications.

The significance of the impacts associated with the operational phase are summarised in Table 5.2.

Table 5.2: Summary of social impacts during operational phase

Impact	Significance No Mitigation	Significance With Mitigation
Creation of employment and business opportunities	Medium (Positive impact)	Medium (Positive impact)
Promotion of renewable energy projects	Medium (Positive impact)	High (Positive impact)
Visual impact and impact on sense of place	Medium (Negative impact)	Medium (Negative impact)
Impact on tourism	Low (Positive and Negative)	Low (Positive and Negative)

5.2.4 Assessment of cumulative impacts

The cumulative impacts associated with solar energy facilities, such as the proposed Kakamas II PVSEF, are largely linked to the impact on sense of place and visual impacts. In the case of the proposed Kakamas II PVSEF the significance of the

potential cumulative social impacts, specifically the impact on the landscape, was rated to be low.

However, it is recommended that the environmental authorities consider the overall cumulative impact on the rural character and the areas sense of place before a final decision is taken with regard to the optimal number of solar thermal plants in the area. In addition, the siting and number of individual components of the plant should be informed by findings of the relevant VIAs, specifically with respect to the visual impact on farmsteads and important roads in the area.

5.2.5 Transmission line options

The findings of the SIA indicate that the impacts associated with the proposed overhead power line will be low.

5.2.6 Assessment of no-development option

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost.

The no-development option also represents a lost opportunity in terms of the employment and business opportunities (construction and operational phase) associated with the proposed solar thermal plant. This also represents a negative social cost.

5.2.7 Decommissioning phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the solar thermal plants decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 25-30 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning.

When and if the proposed solar thermal plant is finally decommissioned, the impacts are likely to be limited due to the relatively small number of permanent employees (20-30) affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

INCA should also investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 25-30 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure.

5.3 CONCLUSIONS AND RECOMMENDATIONS

The findings of the SIA indicate that the development of the Kakamas II PVSEF will create employment and business opportunities for locals during both the construction and operational phase of the project. While these opportunities are likely to be limited, the mitigation measures listed in the report should be implemented in order to enhance them. INCA, in consultation with the Kai! Garib Municipality, should also investigate the opportunities for establishing a Community Trust. The revenue for the trust would be derived from the income generated from the sale of energy from the plant. The Community Trust should be linked to funding and supporting projects and initiatives identified in the Kai! Garib IDP. The mitigation measures listed in the report to address the potential negative impacts during the construction phase should also be implemented.

The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The establishment of the proposed Kakamas II PVSEF is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, solar energy facilities on an areas sense of place and landscape cannot be ignored. These impacts are an issue that will need to be addressed by the relevant environmental authorities, specifically given the large number of applications for solar facilities that have been submitted over the last 12 months.

5.4 IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Kakamas II PVSEF indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. However, the visual impacts associated with facility will impact on the areas rural sense of place and landscape character. This impact will be for the entire operational lifespan (approximately 25-30 years) of the facility. The potential for cumulative impacts also exists due to the large number of applications for solar energy facilities in the area. However, these impacts are not considered to represent a fatal flaw. It is therefore recommended that the facility as proposed be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the report.

ANNEXURE A

REFERENCES

Interviews[16]

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- Mr J. MacKay, Kai !Garib LM Municipal Manager, 07/09/2010;
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- The National Energy Act (2008);
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- The White Paper on Renewable Energy (November 2003);

Internet sources

- www.demarcation.org.za (Census 2001 data).
- Google Earth 2009.

[16] A number of the key authorities in the area were interviewed in 2010 as part of the SIA for a proposed CSP located near Upington. For the purpose of the Kakamas SIA it is assumed that the generic comments relating to renewable energy, and specifically solar energy, apply.

ANNEXURE B

METHODOLOGY FOR THE ASSESSMENT OF POTENTIAL IMPACTS

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

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

The **significance** is determined by combining the criteria in the following formula:

S=(E+D+M)P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

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

ANNEXURE C

ENVIRONMENTAL MANAGEMENT PLAN: SIA

CONSTRUCTION PHASE

Creation of employment and business opportunities

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase.

Project component/s	Construction and establishment activities associated with the establishment of the solar thermal plant, including infrastructure etc.
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activity/risk source	The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	INCA, in discussions with the Kai! Garib Municipality, should aim to employ a minimum of 80% of the low-skilled workers from the local area. This should also be made a requirement for all contractors. INCA should also develop a database of local BEE service providers

Mitigation: Action/control	Responsibility	Timeframe
• Attempt to employ a a minimum of 80% of the low-skilled workers are sourced from the local area; • Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that 80% target is met. • Skills audit to be undertaken to determine training and skills development requirements; • Develop a database of local BEE service providers and ensure that they are informed of tenders and job	• INCA& contractors • INCA • INCA • INCA	• Employment and business policy document that sets out local employment targets to be in place before construction phase commences. • Where required, training and skills development programmes to be initiated prior to the initiation of the construction phase. • Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase commences. • Database of potential local

opportunities; • Identify potential opportunities for local businesses	• INCA	BEE services providers to be completed before construction phase commences.
Performance Indicator	• Employment and business policy document that sets out local employment and targets completed before construction phase commences; • 80% of semi and unskilled labour locally sourced. • Database of potential local BEE services providers in place before construction phase commences. • Skills audit to determine need for training and skills development programme undertaken within 1 month of commencement of construction phase.	
Monitoring	• INCAand or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.	

Impact associated with presence of construction workers

OBJECTIVE: Avoid the potential impacts on family structures and social networks associated with presence of construction workers from outside the area

Project component/s	Construction and establishment activities associated with the establishment of the solar thermal plant, including infrastructure etc.	
Potential Impact	The presence of construction workers who live outside the area and who are housed in local towns can affect family structures and social networks.	
Activity/risk source	The presence of construction workers can impact negatively on family structures and social networks, especially in small, rural communities.	
Mitigation: Target/Objective	To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.	
Mitigation: Action/control	Responsibility	Timeframe
• Attempt to ensure that a minimum of 80% of the low-skilled workers are sourced from the local area. This should be included in the tender documents. Construction workers should be recruited from the local area in and around the towns of Upington, Keimoes, and Kakamas. • Local construction workers	• INCA and contractors • INCA	• Identify suitable local contractors prior to the tender process for the construction phase. • Tender documents for contractors include conditions set out in SIA, including transport of workers home over weekends, transportation of workers home on completion of

should be able to provide proof of having lived in the area for five years or longer.		construction phase, establishment of MF etc,
• Identify local contractors who are qualified to undertaken the required work.	• INCA	• MF established before construction phase commences.
• Consider establishing a Monitoring Forum (MF) consisting of representatives from the local community, local police, local farming community and the contractor prior to the commencement of the construction phase.	• INCA	• Code of Conduct drafted before construction phase commences. • Briefing session for construction workers held before they commence work on site.
• Develop a Code of Conduct to cover the activities of the construction workers housed on the site.	• INCAand contractors	
• Ensure that construction workers housed attend a brief session before they commence activities. The aim of the briefing session is to inform them of the rules and regulations governing activities on the site as set out in the Code of Conduct.	• INCAand contractors	
• Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct.	• Contactors	
• Ensure that construction workers who are found guilty of breaching the Code of Conduct are dismissed. All dismissals must be in accordance with South African labour legislation.	• Contractors	
• Provide opportunities for workers to go home over weekends. The cost of transporting workers home over weekends and back to the site should be borne by the contractors.	• Contractors	
• On completion of the construction phase all construction workers must be transported back to their	• Contractors	

place of origin within two days of their contract ending. The costs of transportation must be borne by the contractor.		

Performance Indicator	• Employment policy and tender documents that sets out local employment and targets completed before construction phase commences; • 80% of semi and unskilled labour locally sourced; • Local construction workers employed have proof that they have lived in the area for five years or longer; • Tender documents for contractors include recommendations for construction camp; • MF set up prior to implementation of construction phase; • Code of Conduct drafted before commencement of construction phase; • Briefing session with construction workers held at outset of construction phase;
Monitoring	• INCAand or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

Safety, poaching, stock theft and damage to farm infrastructure

OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure.

Project component/s	Construction and establishment activities associated with the establishment of the solar thermal plant, including infrastructure etc.
Potential Impact	Impact on safety of farmers and communities (increased crime etc) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
Activity/risk source	The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may also result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation: Target/Objective	To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
• The housing of construction workers on the site should be limited to security personnel. • Consider establishing a MF with the adjacent farmers	• INCAand contractors • INCA	• Establish MF before construction phase commences. • Develop Code of Conduct prior to commencement of construction phase. The Code

and develop a Code of Conduct for construction workers. • Inform all workers of the conditions contained in the Code of Conduct. • Dismiss all workers that do not adhere to the code of conduct for workers. All dismissals must be in accordance with South African labour legislation. • Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	• INCAand contractor • Contractors • Contractors	of Conduct should be signed by INCA and the contractors before the contractors move onto site; • Inform all construction workers of Code of Conduct requirements before construction phase commences. • Compensate farmers / community members within 1 month of claim being verified by INCA and or Contractor/s.

Performance Indicator	• Community MF in place before construction phase commences. • Code of Conduct developed and approved prior to commencement of construction phase. • All construction workers made aware of Code of Conduct within first week of being employed. • Compensation claims settled within 1 month of claim being verified by Community MF.
Monitoring	• INCA and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

Increase risk of veld fires

OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase.

Project component/s	Construction and establishment activities associated with the establishment of solar thermal plant, including infrastructure etc.
Potential Impact	Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activity/risk source	The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/control	Responsibility	Timeframe
• Ensure that open fires on the site for cooking or heating are not allowed except in	• INCAand contractors	• Ensure that these conditions are included in the Construction Phase EMP.

designated areas. • Provide adequate fire fighting equipment onsite. • Provide fire-fighting training to selected construction staff. • Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc. • fpa	• INCAand contractors • Contractors • Contractors	• Ensure that designated areas for fires are identified on site at the outset of the construction phase. • Ensure that fire fighting equipment and training is provided before the construction phase commences. • Compensate Farmers within 1 month of claim being verified by MF.

Performance Indicator	• Conditions contained in the Construction EMP. • Designated areas for fires identified on site at the outset of the construction phase. • Fire fighting equipment and training provided before the construction phase commences. • Compensation claims settled within 1 month of claim being verified by Community MF.
Monitoring	• INCAand or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

Impact of dust and noise due to heavy vehicles and damage to roads

OBJECTIVE: To avoid and or minimise the potential impacts of safety, noise and dust and damage to roads caused by construction vehicles during the construction phase.

Project component/s	Construction and establishment activities associated with the establishment of the solar thermal plant, including infrastructure etc.
Potential Impact	Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activity/risk source	The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads.

Mitigation: Action/control	Responsibility	Timeframe
• Implement dust suppression measures for heavy vehicles such as wetting roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	• Contractors	• Ensure that these conditions are included in the Construction Phase EMP. • Ensure that dust suppression measures are implemented for all heavy vehicles that require such measures during the construction phase

• Ensure that all vehicles are road-worthy, drivers are qualified and are made aware of the potential noise, dust and safety issues. • Ensure that drivers adhere to speed limits. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit. • Ensure that damage to roads is repaired before completion of construction phase.	• Contractors • Contractors • Contractors	commences. • Ensure that drivers are made aware of the potential safety issues and enforcement of strict speed limits when they are employed. • Fit all heavy vehicles with speed monitors before they are used in the construction phase. • Assess road worthy status of heavy vehicles at the outset of the construction phase and on a monthly basis thereafter; • Ensure that damage to roads is repaired before completion of construction phase.

Performance Indicator	• Conditions included in the Construction Phase EMP. • Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences. • Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. • All heavy vehicles equipped with speed monitors before they are used in the construction phase. • Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	• INCAand or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

Impact on farming activities

OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase.

Project component/s	Construction phase activities associated with the establishment of the solar thermal plant and associated infrastructure.
Potential Impact	The footprint of the solar energy plant and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activity/risk source	The footprint taken up by the solar energy plant and associated infrastructure.
Mitigation: Target/Objective	To minimise the loss of land taken up by the solar thermal plant and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe

• Minimise the footprint of the solar thermal plant and the associated infrastructure. • Rehabilitate disturbed areas on completion of the construction phase. Details of the rehabilitation programme should be contained in the EMP. • Investigate the possibility of allowing farmers in the area to continue to use the site for grazing, or the option of leasing the land for grazing to other local farmers and possibly emerging farmers.	• Savannah Environmental and INCA • ECO and Contractors • INCA	• Footprint for solar thermal plant should be defined in the Construction EMP before construction phase commences. • Rehabilitation should be on-going and completed within 3 months of the completion of the construction phase. • Meeting/s with local farmers to discuss lease options should take place during the construction phase.
Performance Indicator	• Footprint of solar thermal plant included in the Construction Phase EMP. • Meeting/s held with farmers during construction phase.	
Monitoring	• ECO must monitor indicators listed above to ensure that they have been met for the construction phase.	

OPERATIONAL PHASE

Creation of employment and business opportunities

OBJECTIVE: Maximise local employment and business opportunities associated with the operational phase.

Project component/s	Day to day operational activities associated with the solar thermal plant, including maintenance etc.
Potential Impact	The opportunities and benefits associated with the creation of local employment and business should be maximised
Activity/risk source	The operational phase of the solar thermal plant will create approximately 30 full time employment opportunities.
Mitigation: Target/Objective	In the medium to long term employ as many locals as possible to fill the 30 full time employment opportunities.

Mitigation: Action/control	Responsibility	Timeframe
• The entire workforce of 60 - 80 permanent staff will be based in local towns of Upington, Keimoes and Kakamas. INCA should commit to implementing a 5-year training and skills development and training programme. The initial local content target is 30%, however, after 5 years the objective is to have all the employment opportunities taken up by locals. • Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	• INCA • INCA	• Develop 5 year training and skills development programme during the construction phase • Identify local members of the community who are suitably qualified or who have the potential to be employed full time during the construction phase.

Performance Indicator	• 5 year training and skills development programme developed and designed before construction phase completed. • Potential locals identified before construction phase completed.
Monitoring	• INCA must monitor indicators listed above to ensure that they have been met for the operational phase.

Impact on tourism and highlight benefits of renewable energy projects

OBJECTIVE: Maximise the potential tourism opportunities during the operational phase. In addition, highlight the benefits of renewable energy projects.

Project component/s	Operational phase of the project.
Potential Impact	The proposed solar thermal plant has the potential to provide Kai! Garib Municipality with an attraction that would improve its attraction to tourists. The development also has the potential to promote the benefits of renewable energy projects.
Activity/risk source	The establishment of a solar thermal plant has the potential to create and attraction for visitors to the area. The development also has the potential to promote the benefits of renewable energy projects.
Mitigation: Target/Objective	To enhance the potential tourism and renewable energy opportunities associated with the proposed solar thermal plant.

Mitigation: Action/control	Responsibility	Timeframe
• Liaise with representatives from the Kai! Garib Municipality and tourism organizations to raise awareness of the proposed solar thermal plant;	• INCA	• Set up meeting with Kai! Garib Municipality and local tourism organisations during the construction phase. • Establish interpretation centre at the outset of the construction phase. This will create an opportunity to provide tourists with information on both the construction and operational phases of the project.
• Establish a renewable energy interpretation centre at the site. The centre should be equipped with information boards that provide visitors with information on the project and other relevant information. Information should also be provided on renewable energy and its benefits.	• INCA	
• Information should presented in the main languages in the Northern Cape Province, namely Afrikaans, Setswana and English	• INCA	

Performance Indicator	• Meeting with Kai! Garib Municipality and local tourism organisations during the construction phase. • Establishment of interpretation centre at the outset of the construction phase.
Monitoring	• INCA must monitor indicators listed above to ensure that they have been met for the operational phase.

DECOMMISSIONING PHASE

Impact of decommissioning

OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase.

Project component/s	Decommissioning phase of the solar thermal plant		
Potential Impact	Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life, stress, depression etc. However, the number of people affected (60-80) is relatively small. Decommissioning is also similar to the construction phase in that it will also create temporary employment opportunities.		
Activity/risk source	Decommissioning of the solar thermal plant		
Mitigation: Target/Objective	To avoid and or minimise the potential social impacts associated with decommissioning phase of the solar thermal plant.		
Mitigation: Action/control		Responsibility	Timeframe
• Retrenchments should comply with South African Labour legislation of the day		• INCA	• When solar thermal plant is decommissioned
Performance Indicator	• South African Labour legislation relevant at the time		
Monitoring	• INCA and Department of Labour		