SOCIAL IMPACT ASSESSMENT
POFADDER SOLAR THERMAL PLANT
NORTHERN CAPE PROVINCE

OCTOBER 2010

Prepared for

SAVANNAH ENVIRONMENTAL (Pty) Ltd

By

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EXECUTIVE SUMMARY

INTRODUCTION AND LOCATION

Savannah Environmental (Pty) Ltd were appointed by Ka Xu CSP South Africa (Pty) Ltd (hereafter referred to as !KaXu CSP) as the lead consultants to manage the Environmental Impact Assessment (EIA) process for the establishment of the proposed Pofadder Solar Thermal Plant and associated infrastructure on the farm Scuit-Klip 92, portion 4, near the town of Pofadder in the Northern Cape Province, South Africa.

Tony Barbour Consulting was appointed by Savannah Environmental (Pty) Ltd to undertake a specialist Social Impact Assessment (SIA) as part of the EIA 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 EIA. This report contains the findings of the Draft SIA undertaken as part of the EIA process.

DESCRIPTION OF THE PROPOSED SOLAR THERMAL PLANT

The proposed Pofadder Solar Thermal Plant is an Independent Power Producer (IPP) project, and is expected to produce approximately 310MW of power, which will be made up of a combination of the following technologies:

- Trough plants;
- Power tower plants;
- PV plants

Based on the information provided by the client, the construction phase is expected to extend over a period of 24 - 36 months and will create approximately 400-600 employment opportunities. The operational phase will employ between 60 and 80 people full time for a period of up to 30 years (extendable to 50 years). Based on the information provided by the client the proposed facility will consume approximately 12 000m^3 of water per day.

The REFIT rules (not finalised yet by NERSA), procurement process (by Treasury), and economics of the plant will be key in determining the final technology combination for the total facility. The associated infrastructural requirements will include:

- **Power island** which will include:
  - A **steam turbine** and **generator** typically housed within a 2-storey building
  - A generator **transformer** and a small **substation** located outside and adjacent to the 2-storey building
  - An **auxiliary steam boiler** and associated vessels (i.e. fossil fuel boiler/ generator), proposed to be fired by either diesel fuel or liquid petroleum gas (LPG)
- An **overhead power line** feeding into the Eskom electricity network at the Paulputs Substation, which is situated adjacent to the site
- An **abstraction point** on the Orange River and an associated water **supply pipeline** to the facility of approximately 30 km

- A **suspension reservoir** located approximately 6 km south of the raw water abstraction point (i.e. outside the boundaries of the identified site) to rid the raw water of particles in suspension (silt)
- A **storage reservoir** located within the boundaries of the identified site. The water stored within the reservoir will be used during the steam generation process (boiler makeup), for washing of the heliostats/mirrors, troughs and PV panels, potable water supply and fire protection supply.
- Lined **evaporation ponds** to allow for the evaporation of process waste water not to be re-used within the facility
- **External access road** leading to the site from the R358 which branches off the N14 towards Onseepkans
- **Internal access roads** for construction and maintenance purposes
- Workshop, office and storage areas

APPROACH TO THE STUDY

The approach to the Social Impact Assessment (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 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;
- Site specific information collected during the site visit to the area and interviews with key stakeholders;
- Review of information from similar projects;
- Identification of social issues associated with the proposed project.

No alternative sites were identified within the area. As such, the EIA does not assess any additional site alternatives for the project.

SUMMARY OF KEY FINDINGS

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

- Fit with policy and planning;
- Construction phase impacts;
- Operational phase impacts;

- Cumulative Impacts;
- Decommissioning phase impacts;
- No-development option.

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);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- The Khâi-Ma Local Municipality Integrated Development Plan (2009).

The findings of the review indicated that solar energy was strongly supported at a national, provincial, and local level. Based on this is it reasonable to assume that the establishment of the proposed Pofadder Solar Thermal Plant 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.

Based on the information provided by the client the construction phase is expected to extend over a period of 24 months and create approximately 400-600 employment opportunities. It is anticipated that approximately 60 % (240-360) 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% (160-240) 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 solar thermal plant 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.

Based on information from similar facilities the total wage bill for the construction phase could be in the region of R 150 – 200 million. The injection of income into the area in the form of rental for accommodation and wages will create opportunities for local businesses in Pofadder and other Northern Cape towns, such as Keimoes, Kakamas and Upington, 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 client has indicated that the majority of the construction

workers will be accommodated in the nearest local towns, with Pofadder likely to be the most convenient due to its proximity to the site. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. The benefits to the local economy will however be confined to the construction period (24 months). However, the potential capacity for Pofadder to accommodate 400-600 workers over a 24 month period needs to be assessed.

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 grass 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 large size of the labour force (400-600) the potential risk to local family structures and social networks in Pofadder is regarded as high. This risk is heightened by the small size of the Pofadder (approximately 3 000 people) relative to the number of construction workers. The presence and movement of construction workers during the construction phase will therefore need to be carefully managed.

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	Medium (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 grass 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;
- Impact on tourism and the creation of potential tourist opportunities (Impact on tourism may also be negative in some instances);
- The establishment of infrastructure to generate renewable energy.

Given the location of the proposed solar thermal plant the majority of permanent staff are likely to reside in Pofadder. In terms of accommodation options, a percentage of the permanent employees may purchase a house in one the town, while others may decide to rent. Both options would represent a positive economic benefit for the town. 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.

With the exception of the visual impact and impact on sense of place, all of the negatives impacts are can be effectively mitigated to a significance of Low.

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 thermal 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 plant 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)
Impact on tourism	Low (Positive and Negative)	Low (Positive and Negative)
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)

The findings of the SIA also indicate the proposed plant will consume relative large volumes of water (approximately 12 000m^3 of water per day) The allocation of such l volumes of water to a single user raises potential issues related to equity and efficiency in terms of allocating the water for other uses. The potential conflict between supporting renewable energy and conserving water is an issue that authorities will need to consider in South Africa.

Transmission lines, pipeline and access road options
The findings of the SIA support the preferred routes identified for the transmission lines, pipeline and access roads.

Cumulative impacts
The cumulative impacts associated with large, renewable energy facilities, such as the proposed Pofadder Solar Thermal Plant, are largely linked to the impact on sense of place and visual impacts. At the time of undertaking the SIA there was no indication that additional solar energy facilities were being planned in the area. The current cumulative impact is therefore regarded to be low. However, should additional facilities be considered the significance of this impact would increase in magnitude. In this regard the issue of potential cumulative impacts needs to be considered when assessing future facilities, specifically given that the N14 and R358 are recognised tourist access routes within the region, giving access to visitors to the Green Kalahari, Namaqualand and Namibia (via Onseepkans) (VIA, MetroGIS, October, 2010).

It is therefore 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.

Potential health impacts
The potential health risks associated with solar thermal plants are linked to the hazardous materials used in the process and stored on site. These include liquids such as oils that may be hazardous and present spill risks. In addition, various fluids are commonly used in most industrial facilities, such as hydraulic fluids, coolants, and lubricants. These fluids may in some cases be hazardous, and present a spill-related risk. Photovoltaic panels may also contain hazardous materials, and although they are sealed under normal operating conditions, there is the potential for environmental contamination if they were damaged or improperly disposed upon decommissioning.

However, the findings of a detailed health assessment undertaken as part of the assessment of the Genesis solar plant in California found that the proposed facility would not present a significant health risk to the public. In addition, proper planning and good maintenance and management practices can mitigate the potential risks and impacts.

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 Plant s 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 (60-80) 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).

!KaXu CSP should also establish 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 landowner who stands to be directly affected by the proposed Solar Thermal Plant supports the project. The findings of the SIA also indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project. In order to enhance the local employment and business opportunities the mitigation measures listed in the report should be implemented. !KaXu CSP, in consultation with the Khâi-Ma 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 establishment of a Community Trust does not only create potential benefits for local communities, but also addresses the issue of impact equity. In the case of the majority of renewable energy facilities, such as the Pofadder solar facility, the directly affected landowner is compensated for the loss of land, while the adjacent landowners and communities bear the external costs associated with the visual impacts on the sense of place and the landscape character of the area.

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 Pofadder Solar Thermal Plant is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, Solar Thermal Plant s 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 Thermal Plants that have been submitted over the last 12 months. The water demand associated with the operational phase of large, Solar Thermal Plants is also an issue that will need to be addressed by the relevant authorities.

IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Pofadder Solar Thermal Plant 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 affect the areas rural sense of place and landscape character. This impact will be for the entire operational lifespan (approximately 30 years) of the facility. 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 were appointed by Ka Xu CSP South Africa (Pty) Ltd (hereafter referred to as !KaXu CSP) as the lead consultants to manage the Environmental Impact Assessment (EIA) process for the establishment of the proposed Pofadder Solar Thermal Plant and associated infrastructure on the farm Scuit-Klip 92, portion 4, near the town of Pofadder in the Northern Cape Province, South Africa (Figure 1.1).

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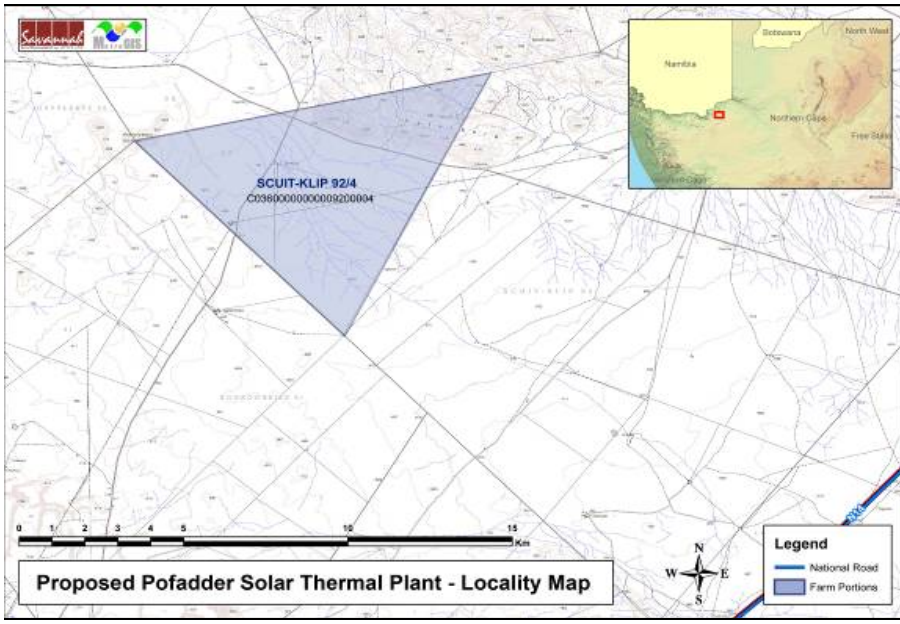

Figure 1.1: Location of proposed Pofadder Solar Thermal Plant (MetroGIS, 2010)

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 site is located on the Farm Scuit-Klip 92, portion 4. The southern part of the site is located approximately 37 km north-east of the town of Pofadder, while the northern section is located approximately 33 km southeast of the Gariep River the border settlement of Onseepkans.

The proposed site falls within the Khâi-Ma Local Municipality (NC067), which is one of seven local municipalities that fall within the greater Namakwa District Municipality (DC6) of the Northern Cape Province (Figure 1.1). The town of Pofadder is the administrative centre of the Khâi-Ma Local Municipality. Access to the proposed site is from the N14 to the south and the R385 to the west.

A detailed description of the project location is provided in Section 2.

1.4 PROJECT DESCRIPTION

The proposed Pofadder Solar Thermal Plant is an Independent Power Producer (IPP) project, and is expected to produce approximately 310MW of power, which will be made up of a combination of the following technologies:

- Trough plants;
- 50 MW power tower plants;
- PV plants.

Based on the information provided by the client construction phase is expected to extend over a period of 24 months and create approximately 400-600 employment opportunities. The operational phase will employ between 60 and 80 people full time for a period of up to 30 years. Based on the information provided by the client the proposed facility will consume approximately 13 12 000 m^3 of water per day.

The REFIT rules (not finalised yet by NERSA), commercial process (by Treasury), and economics of the plant will be key in determining the final technology combination for the total facility. The associated infrastructural requirements will include:

- **Power islands** which will include:
  - A **steam turbine** and **generator** typically housed within a 2-storey building
  - A generator **transformer** and a small **substation** located outside and adjacent to the 2-storey building

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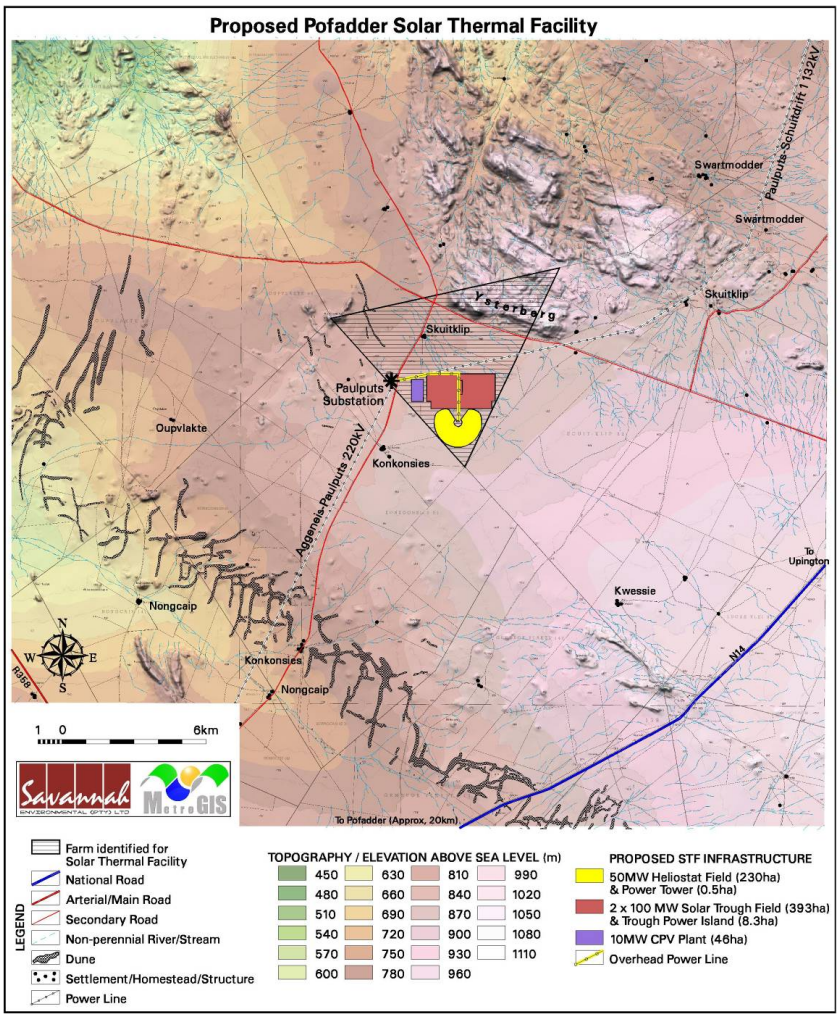

Figure 1.2: Proposed layout for the Pofadder Solar Thermal Plant (MetroGIS, 2010)

1.4.1 Components of Solar Thermal Plant

Parabolic Trough (Concentrating Solar Power)

A parabolic trough (Figure 1.3) is a large, curved mirror that sits on a motorised base, allowing it to follow the movement of the sun throughout the day. The mirror's unique parabolic shape is designed to gather a great deal of sunlight and then reflect that light onto a single point, concentrating the solar power (! KaXu CSP Solar S.A., 2008).

A receiver tube sits at the point where the mirror concentrates all the sunlight. The tube is filled with synthetic heat transfer oil, heated by the mirror's light to around 750 F (400 C). This superheated oil is then pumped from the solar field to a nearby power block, where the oil's heat is converted to high-pressure steam in a series of heat exchangers. This steam pushes a conventional steam turbine, creating electricity (!KaXu CSP Solar S.A., 2008).

Parabolic trough technology is the most developed CSP technology, and !KaXu CSP Solar is currently operating and deploying parabolic troughs at the Solúcar Platform outside of Seville, Spain and at numerous international locations. (!KaXu CSP Solar S.A., 2008).

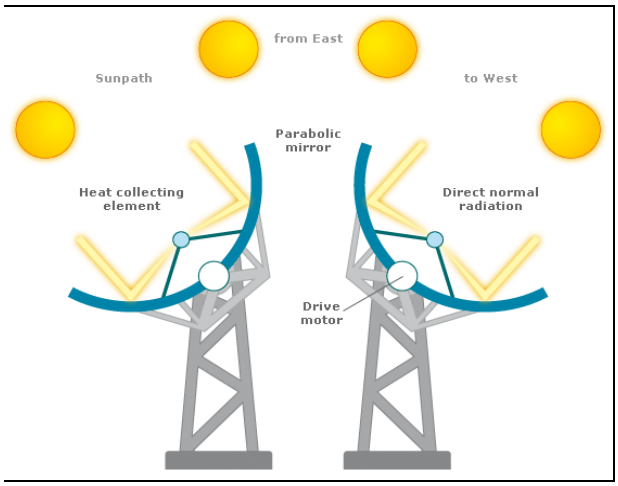

Figure 1.3: Parabolic trough and associated technology (source:KaXu CSP Solar S.A., 2008)

Power Tower & Heliostat Field (Concentrating Solar Power)
A power tower systems (Figure 1.4), consist of a heliostat field of movable mirrors oriented according to the solar position in order to reflect the solar radiation and concentrate it up to 600 times on a receptor located on the upper part of a power tower (i.e. up to 180 m high). This heat is transferred to a fluid with the purpose of generating steam that expands on a turbine that is coupled to a generator to produce electricity (!KaXu CSP Solar S.A., 2008).

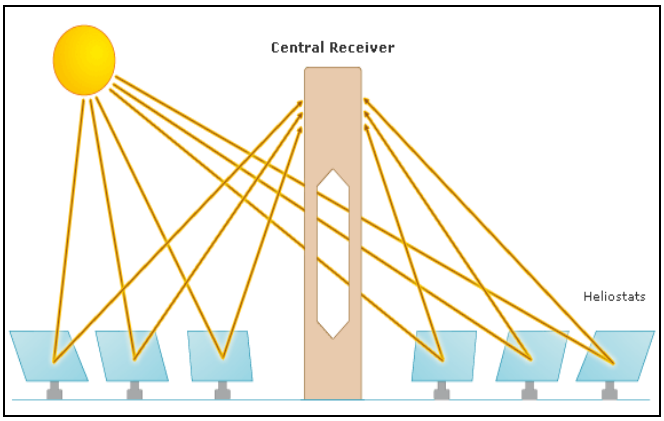

Figure 1.4: Solar power tower system and associated technology (source: !KaXu CSP Solar S.A., 2008)

Photovoltaic Panels

Photovoltaic (PV) use semiconductors, which absorb solar energy to produce electricity through the "Photovoltaic Effect." Since the photovoltaic effect produces direct current (DC), an inverter must be used to change it to alternating current (AC). Concentrating PV systems use lenses or mirrors to concentrate sunlight onto a PV cell (Figure 1.5). Since concentration greatly reduces the size of the solar cells needed, more expensive semiconductors are used to maximize performance. Tracking PV maximises the electricity generation whereby the panels are able to 'track' the sun during the day.

Figure 1.5: Concentrating and tracking PV (source: !KaXu CSP Solar S.A., 2008)

1.4.2 Associated infrastructure for the Pofadder Solar Thermal Plant

Based on information provided by !KaXu CSP, the basic infrastructure associated with the establishment of the proposed facility would include:

A steam turbine and generator
Concentrating solar power facilities require water as the heat transfer medium for the generation of high temperature steam which is used to drive a conventional turbine and generator. The turbine and generator will be housed within a 2-storey building on-site. It is envisioned that the water will be extracted from the Orange / Gariep River (the abstraction point and associated infrastructure are discussed below).

A generator transformer and a small substation outside the building
This infrastructure would form part of the power island.

Energy storage plant and vessels
An auxiliary steam boiler (i.e. fossil fuel boiler / generator) will be included on the power island and will be fired by diesel fuel or LPG. The boiler will be able to provide steam to the process, freeze protection heat exchangers, steam turbine seal system, and other critical plant components while the solar plant is offline or during night time or cloud covered days, or when the grid connection is not available.

Power line
Four alternative corridors/routes are proposed for the overhead power line. The preferred route (green line) follows the existing Eskom line (linear infrastructure) (Figure 1.6).

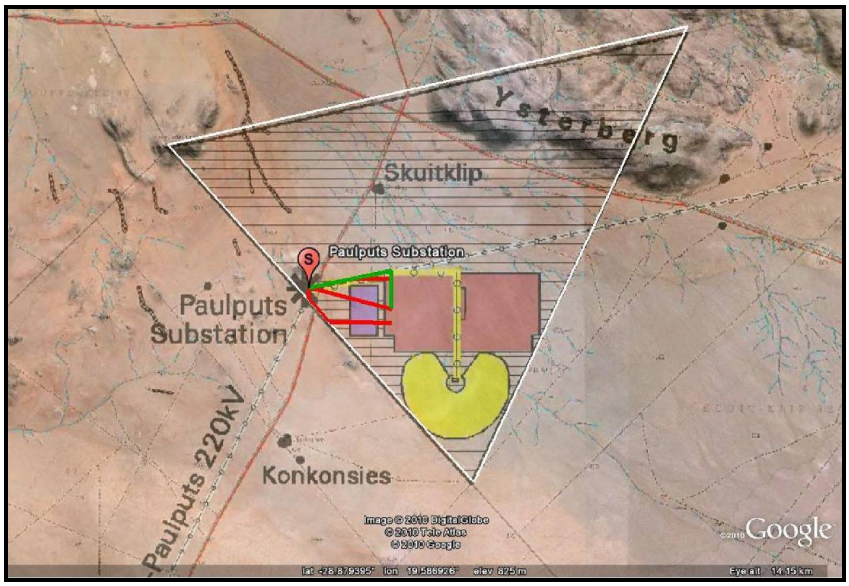

Figure 1.6: Power line alternatives preferred (-) and non-preferred (-)

Abstraction point and associated infrastructure
An abstraction point will be established on the Orange / Gariep River and a pipeline will be constructed to the facility. Based on an extensive feasibility assessment, one route has been provided for the proposed pipeline (Figure 1.7). Storage and treatment reservoirs will also be established.

Figure 1.7: Preferred pipeline alternative (-) and associated infrastructure

Evaporation pond
An evaporation pond will be established to receive wastewater from the generation process.

Workshop, office, and storage areas
These areas would be located within the boundaries of the overall site.

Access roads
The site is traversed by the R358 (a secondary road to Onseepkans), which links up with the N14. Within the site itself, access to the individual components of the facility will be required from the R358. Four alternative access routes have been identified. The preferred route follows the existing Eskom line (Figure 1.8).

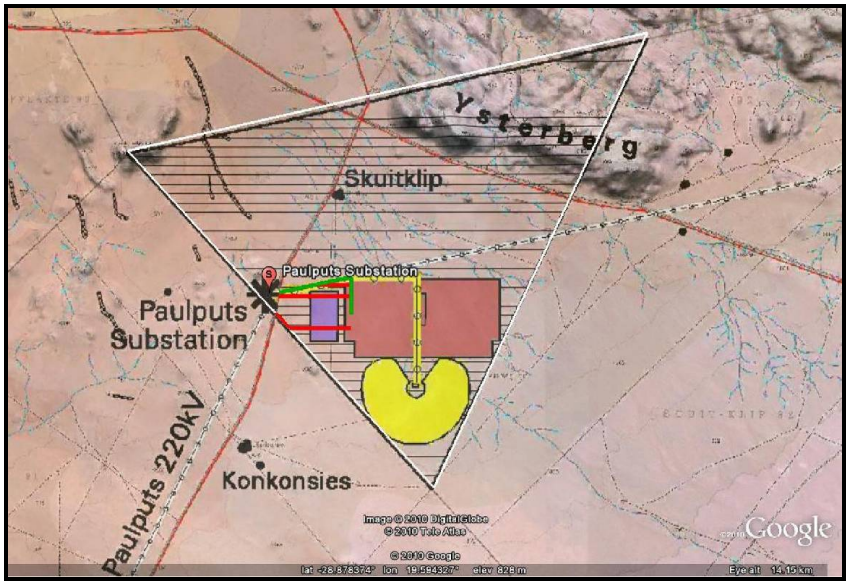

Figure 1.8: Access road alternatives preferred (-) and non-preferred (-)

1.5 APPROACH TO STUDY

The approach to the Social Impact Assessment (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 Environment and Water Affairs (DEWA). 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;
- 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 Solar Thermal Plant 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 contains a copy of the background information document made available to interested and affected parties. Annex C 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 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 !KaXu CSP represents a technically suitable site for the establishment of a solar thermal plant.

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 wind energy facilities.

1.6.2 Limitations

Demographic data
The demographic data used in the study is largely based on the 2001 Census. 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.

1.7 SPECIALIST DETAILS

The lead author of this report is an independent specialist with 20 years 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 80 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. These guidelines have also been endorsed by DWEA.

Daniel Rogatschnig has an MSc in Environmental Science and has five years 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 SIA Report, are independent and do not have vested or financial interests in the proposed Solar Thermal Plant 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 wind 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 and 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 plant 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, Karoo, Namakwa, Siyanda, and Kgalagadi DM, twenty-six Category B municipalities and five district management areas. Khâi-Ma Local Municipality (NC067), which is one of seven local municipalities that fall within the greater Namakwa District Municipality (DC6)

Population
The 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 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 to out migration, 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.

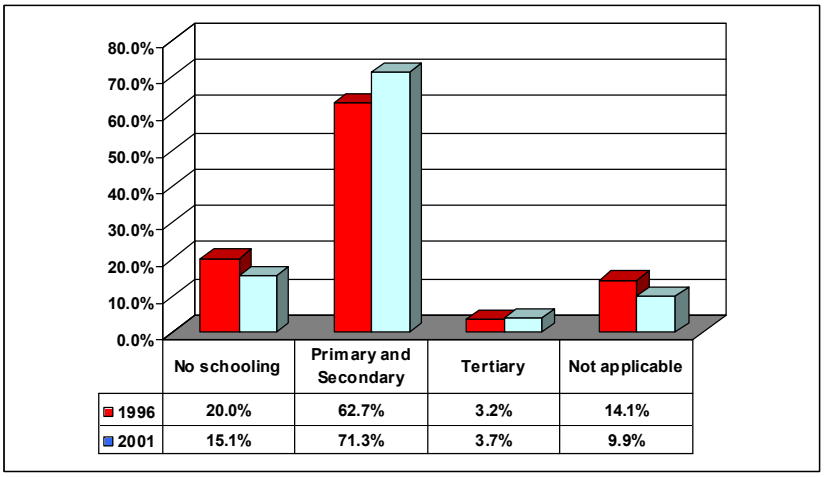

Figure 2.1: Percentage of people by level of education for 1996 and 2001 (Source: Northern Cape Province PGDS

Economic development

The Human Development Index[1] (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 is 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 respectively, primarily due to the broader economic opportunities and access to

[1] 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.

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 near 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[2]. 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%.

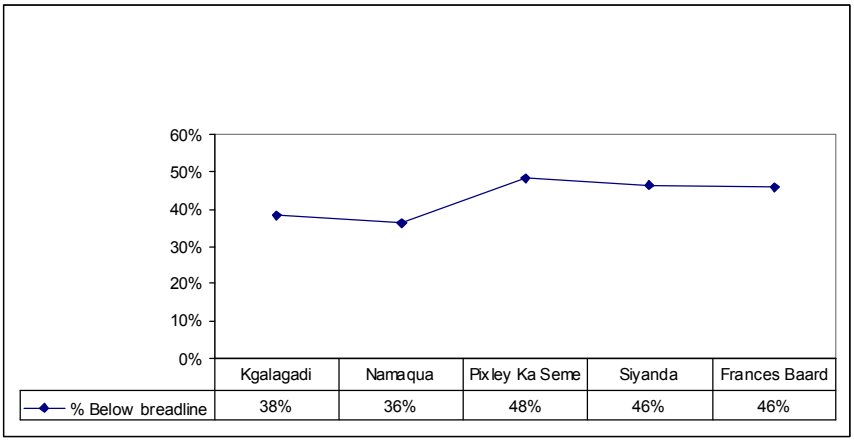

Figure 2.2: Percentage of household income below the poverty breadline by district (Source: Northern Cape PGDS)

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%.

[2] 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%), (Table 2.1).

Table 2.1: Formal employment by sector (Source: Northern Cape PGDS)

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**	

2.3 SOCIO-ECONOMIC OVERVIEW OF THE PROPOSED PROJECT AREA

2.3.1 Khâi-Ma Municipality

The proposed solar thermal plant is located in the Khâi-Ma Municipality (Figure 2.3), a category-B municipality[3], which forms part of the greater Namakwa District Municipality (DC6, category-C municipality). The site is located approximately 614 km west of the provincial capital of Kimberly.

The Khâi-Ma Local Municipality is largely rural and agricultural with two urban/semi-urban nodes at Pofadder, the designated administrative centre of the municipality, and Aggeneys. The municipality is approximately 8 332 km² in size (~7.7% of the Namakwa District Municipality) and is bordered to the north by the Orange River (the border with the Republic of Namibia), by a District Management Area (NCDMA08, part of the Siyanda District Municipality) to the east, and District Management Area (NCDMA06) to the south and the Nama Khoi Local Municipality to the west.

[3] 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

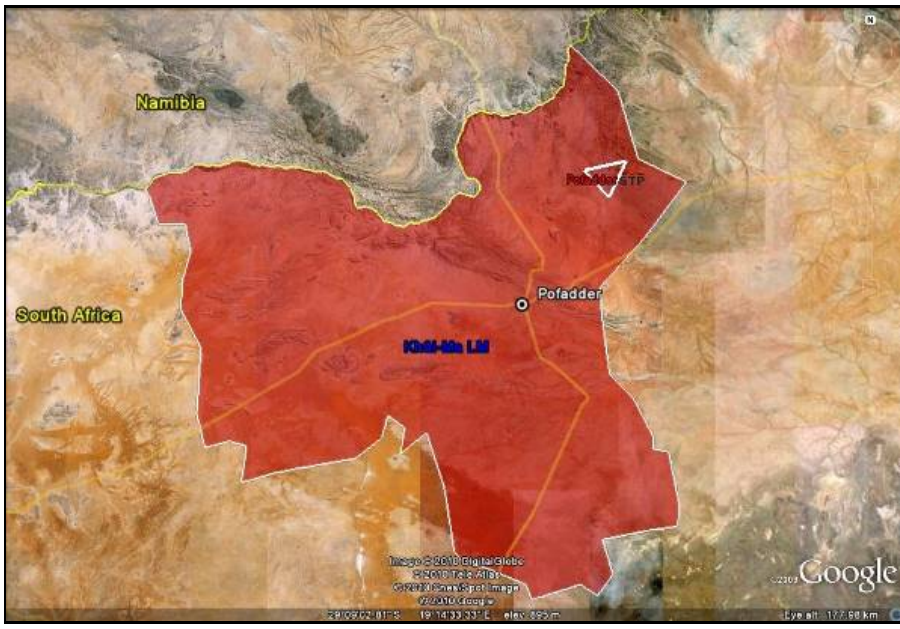

Figure 2.3: Khâi-Ma Local Municipality (Source: Municipal Demarcation Board, Garmin, Google Earth)

The population the Khâi-Ma Municipality is estimated at 12 571 (2007) and makes up approximately 10% of the total population of the greater Namakwa District Municipality (126 494 [2007]). The main towns of Pofadder and Aggenys account for approximately 64% of the total population (Khâi-Ma IDP, 2004). The remainder of the population in the Khâi-Ma Local Municipality is made up of small farming communities. The average population density within the Municipality is very low and is estimated at ~1-3 people/km² (Khâi-Ma IDP, 2004). The average population growth for the Khâi-Ma local municipality (2001-2010) is estimated at ~1% (Namakwa DM Economic Profile Report, 2009).

The majority of the population is Coloured (66%), followed by Black Africans (10.5%) and Whites (8.4%). The dominant language within the Municipality is Afrikaans (87.7%) with the remainder made up of Setswana (9.8%), isiXhosa (1.4%), English (0.8%) and other African languages (0.1%).

In terms of education levels, based on the Census 2001 data approximately 6.4% of the population has no formal education, while approximately 24% have less than a Grade 7 (standard 5). When these totals are added to the no formal education figures they indicate that a third of people in the Khâi-Ma Local Municipality (70%) have less than a Grade 7 (standard 5) qualification. This is regarded as the minimum education level required for functional literacy and numeracy. Only 14.6% of the population had a matric qualification, while less than 4% had a tertiary qualification.

Employment data for Khâi-Ma Local Municipality indicates that 53% of the population between the economically active age group of 15 to 65 was employed in the formal sector and the unemployment rate was approximately 10%. The Agricultural sector provided approximately 18% of the formal employment, followed by the Community Services, Mining, and Quarrying sectors, which employed between 5% and 4% of the employed population in the area respectively. According to the 2001 Census data, the majority of employment was characterised as 'undetermined' (~66%).

In 2007, the Khâi-Ma Local Municipality contributed 10.3% of the total GDP of the greater Namakwa District Municipality, which in turn contributes 16.7% to the Northern Cape GDP (DTI Namakwa District Municipality Profile, 2008).

Based on the data from the 2001 Census, 51% of the population have no formal income and a majority 89.6% 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 DTI Namakwa District Municipality Profile (2008), 65% of households in the Khâi-Ma Local Municipality were registered as indigent (impoverished) households in 2005.

2.3.2 Khâi-Ma Local Municipality – Ward 1

The proposed project is located within Ward 1 of the Khâi-Ma Local Municipality. The ward constitutes ~22.5% (1879 km^2) of the total area of the Municipality (8332 km^2). The largest town within the ward is Pofadder (population – 2 935[1996]). Ward 1 is one of 4 administrative wards that make up the Khâi-Ma local Municipality.

Population

According to Census 2001 data, the total population of Ward 1 was 5 147. It is assumed that the population would have increased marginally given the low population positive growth rate (1%) within the Khâi-Ma Local Municipality over the last 10 years.

Table 2.2: Ward 1 - Population figures

Population Group	Khâi-Ma LM Ward 1 (%)
Black African	18.4
Coloured	79
Indian or Asian	0.2
White	2.4
Total	100

Source: Census 2001

Table 2.2 indicates that the coloured population group was overwhelmingly dominant within the ward, accounting for 79% of the total population. The Black African population group represents ~18% of the total population and is made up of primarily Setswana-speaking individuals.

Age distribution

Table 2.3indicates that the <15 years age bracket in Ward 1 is relatively high at ~29%. The post retirement cohort (>64) is moderate at ~5%. The dependency ratio[4] is 0.5, which means that 2 working individuals support 1 non-working/unemployed individual.

Table 2.3 Ward 1 - Age distribution

Age Group	Khâi-Ma LM Ward 1 (number)
0-4	467
5-9	458
10-14	541
[Youthful dependents]	[1466]
15-19	494
20-24	629
25-29	569
30-34	457
35-39	388
40-44	276
45-49	227
50-54	147
55-59	144
60-64	105
65-69	95
70-74	63
75-79	44
80 and over	43

Source: Census 2001

Education levels

Table 2.4 indicates that, based on 2001 Census data, approximately 36.7% (corresponding to an absolute total of 1 169 people) of the population of in Ward 1 aged 15 and older were estimated to be functionally illiterate/ innumerate in 2001.

Approximately 50% of the population have less than a Standard 5/Grade 7 education and 37% of the school going age population have a matric qualification, while just over 3% has 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.

[4] 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.

Table 2.4: Ward 1 - Education levels

Description	Khâi-Ma LM Ward 1 (number)
No schooling	254
Some primary	915
[% functional illiteracy/ innumeracy][5]	36.7% [1169]
Complete primary	442
Some secondary	1191
Std 10/Grade 12	282
Higher	103

Source: Census 2001

Employment levels

The employment statistics presented in Table 2.5 indicate that in 2001 55.4% of Ward 1's population was employed. The unemployment rate was relatively low, estimated at ~11%.

Table 2.5: Ward 1 - Employment levels (15 – 64 age groups)

Description	Khâi-Ma LM Ward 1 (%)
Employed[6]	55.4
Unemployed	11.1
Not Economically Active[7]	33.5

Source: Census 2001

Sectoral employment

Table 2.6 provides an overview of proportional employment per economic sector by head of household for Ward 1 within the Khâi-Ma Local Municipality. The largest employer in Ward 1 is the Agricultural sector which provides ~62% of the formal employment in the area. This sector is followed by the Wholesale and Retail trade sector that employs ~9% of the employed population and the Community and Social Services sector, providing 9% of the employment in the Ward. The other significant formal employment sectors are the Construction sector (6.5%) and the Private Households sector (5.2%).

[5] 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).

[6] 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).

[7] 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.

Table 2.6: Sectoral contribution to employment

Description	Khâi-Ma LM Ward 1 (%)
Agriculture, hunting, forestry and fishing	62.0
Mining and quarrying	1.4
Manufacturing	0.7
Electricity, gas and water supply	2.1
Construction	6.5
Wholesale and retail trade	9.3
Transport. Storage and communication	0.0
Fin., real estate and bus. Services	1.1
Community, social and personal services	8.9
Other and not adequately defined	2.7
Private households[8]	5.2

Source: Census 2001

Household income

Census data on household income for 2001 (Table 2.7) indicates that the vast majority of households (~96%) in Ward 1 were living on less than the R1 600/ month minimum subsistence level. Significantly, the 'no formal income' category was the most pronounced at ~50%. Only ~4% of household heads were earning an income clustered in the R800-R3200/ month range.

Table 2.7: Ward 1 - Household income (by head of household)

Income per month	Khâi-Ma LM Ward 1 (%)
No formal income	50.3
R 1 – R 400	14.6
R 401 – R 800	27.9
R 801 - R 1 600	3.2
[% households below minimum subsistence level]	[96.1]
R1 601 - R 3 200	1.3
R 3 201 – R 6 400	0.3
R 6 401 – R 12 800	0.1
R 12 801 – R 25 600	0.0
R 25 601 and higher	1.3

Source: Census 2001

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

2.4 SURROUNDING LAND USES

The proposed site is relatively isolated and is located along a minor road that connects the R64 (which connects Pofadder and Keimoes) and the R358 (which connects Pofadder and Karasburg in Namibia).

The triangular shaped site is located north of the N14 and east of the R358 and straddles a four-way intersection of secondary/gravel roads on the farm Skuit-Klip. The southern portion of the proposed facility is located approximately 37 km northeast of the settlement of Pofadder, while northern portion is located approximately 33 km southeast of the border settlement of Onseepkans. The topography on the site consists of open plains punctuated by occasional hills and rocky outcrops (Photograph 2.1).

Photograph 2.1: View over the proposed Pofadder site

Farm Scuit-Klip 92, portion 4, on which the proposed site is located, has been farmed by the current landowner for 6 years. However, the family has been farming in the area for 5 generations (Personal communication, Sept. 2010). The farmhouse on Scuit-Klip 92 is illustrated in photograph 2.2. A few isolated farmsteads are located within and around the site. Figure 2.4 illustrates their location relative to the proposed site.

Photograph 2.2: Farmhouse on Scuit-Klip 92

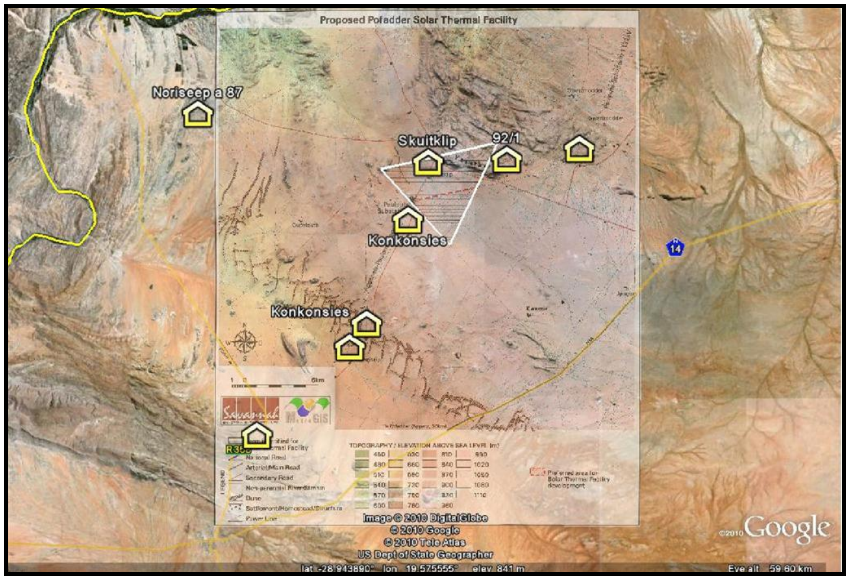

Figure 2.4: Relative location of farmsteads/labourers cottages relative to the site

In addition to the farmhouses in the area, Eskom's Paulputs Transmission Substation is located adjacent to Road No. 73, which lies immediately to the west of the site (Photograph 2.2). This substation is connected to the National Power grid via an

existing 220kV transmission line to the Aggeneys substation. A 132kV distribution line cuts across the site from west to east feeding Kakamas.

Photograph 2.2: Paulputs substation located to the west of the site

Road access to the proposed site is mainly from the N14, which is located to the southeast of the site, via Pofadder along the R358 (to the South Africa/Namibia border at Onseepkans) and Road No. 73, and the unnamed tarred Road to Onseepkans 46km northeast Pofadder (in the direction of Kakamas), that runs in a northwest direction from the N14 intersection with Road No. 73 (~ 21km from the N14) and the R358 (~48 km from the N14). This unnamed tarred road lies to the north/northeast of the proposed site. The relative distance to the site access gate from the N14 is ~25.3 km from the unnamed tarred road and ~34.1 km from the N14 (Pofadder) via the R358 and the N14.

Photograph 2.3: Intersection between R358 and Road No. 73 (turn to the right)

Photograph 2.4: Intersection between N14 and unnamed tar road (46km northeast of Pofadder)

Apart from the area along the banks of the Orange River where irrigation is possible, the Khâi-Ma Local Municipal area has a low agricultural potential and is characterised by livestock (cattle and sheep) and game farming (Khâi-Ma IDP, 2004) (Photograph 2.5 and 2.6). The proposed site is currently used for sheep farming.

Photograph 2.5: Viticulture along the Orange (Gariep River) outside Kakamas

Photograph 2.6: Sheep on the farm Scuit-Klip

SECTION 3: POLICY AND PLANNING CONTEXT

3.1 INTRODUCTION

Section 3 provides and 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);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- Khâi-Ma Municipality Integrated Development Plan (IDP) (2004);

The section also provides a summary some of the key social issues associated with Solar Thermal Plant s based on international experience.

3.2 NATIONAL LEVEL ENERGY POLICY

3.2.1 NATIONAL ENERGY ACT (ACT 34 OF 2008)

The National Energy Act was promulgated in 2008 (Act 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including wind:

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

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; and
- 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 indicates 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).

3.3 PROVINCIAL AND LOCAL LEVEL POLICY AND PLANNING

3.3.1 Northern Cape Province Provincial Growth and Development Strategy

The 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; and
- Tourism.

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

- Creating opportunities for life long learning;
- Improving the skills of the labour force to increase productivity; and
- 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; and
- Enhancing infrastructure for economic growth and social development.

Of specific relevance to the SIA the NCPGDS refers to the need to ensure the availability of inexpensive energy. The document 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 affect the provincial government's commitment to land reform through the allocation of water rights to emerging black farmers. However, improvement of energy security may also improve food security.

3.3.2 Khâi-Ma 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 eradication of poverty. The Integrated Development Plan (IDP) enables Local Municipalities like the Khâi-Ma Municipality to manage and measure their progress in fulfilling its developmental responsibilities.

The Khâi-Ma Local Municipality Integrated Development Plan (IDP) (2004) identifies 5 Key Priorities to address the municipality's development objectives:

- Priority 1: Institutional (Local Governance and Administration);
- Priority 2: Spatial Development and Land Reform;
- Priority 3: Socio-economic Needs;
- Priority 4: Infrastructure Development; and
- Priority 5: Economic Development.

These priorities address the outcome of an analysis of the status quo across numerous sectors within the Municipality and, in turn, inform the 5 key priorities and their associated objectives and strategies. In terms of these priorities, the IDP sets out a number of critical targets. The ones that are regarded as relevant to the proposed facility include:

- Socio-economic needs, specifically, improve the income levels for the population within the municipality, reduce unemployment from 39% to below 20%, introduce capacity and skills building programs, introduce awareness campaigns around issues relating to healthcare (HIV/AIDS), water and the environment, improve safety and security to vulnerable and marginalized communities.
- Infrastructure Development;
- Economic development (including electricity and roads), specifically, provide support for capacity and skills development;

According to the Khâi-Ma Municipal Manager, the development of renewable energy (Wind and Solar) has been integrated into the Municipality's revised Spatial Development Framework (currently in Phase 3), but it has not yet been formally documented (Mr. Baker, personal communication, Sept. 2010).

3.4 INTERNATIONAL EXPERIENCE WITH SOLAR THERMAL PLANTS

3.4.1 Introduction

All renewable energy technologies are not appropriate to all applications or locations. As with conventional energy production, there are environmental issues to be considered. Solar power plants reduce the environmental impacts of combustion used in fossil fuel power generation such as green house gas and other air pollution emissions. However, concerns have been raised over land disturbance, visual impacts, and the use of potentially hazardous materials in some systems. The section below provides a summary of potential issues, including social issues typically associated with solar energy plants. The key issues listed below are largely sourced from the Solar Energy Development Programmatic Environmental Impact Statement (PEIS) being prepared by the U.S. Department of Energy, Energy Efficiency and Renewable Energy Program and the U.S. Department of the Interior, Bureau of Land Management (the Agencies) in order to assess environmental impacts associated with the development and implementation of agency-specific programs that would facilitate environmentally responsible utility-scale solar energy development in six western states (Arizona, California, Colorado, New Mexico, Nevada, and Utah) (http://solareis.anl.gov/guide/environment/index.cfm). The findings of the literature review also indicated that there do not appear to be any national or international guidelines for the siting and establishment of solar energy plants.

3.4.2 Health and safety issues

Materials used in some solar systems can create health and safety hazards for workers and anyone else being exposed to them. In particular, the manufacturing of photovoltaic cells often requires hazardous materials such as arsenic and cadmium. Even relatively inert silicon, a major material used in solar cells, can be hazardous to workers if it is breathed in as dust. Workers involved in manufacturing photovoltaic modules and components must consequently be protected from exposure to these

materials. However, none of these potential hazards is much different in quality or magnitude from the innumerable hazards people face routinely in an industrial society. Through effective regulation, the dangers can very likely be kept at a very low level. In addition, it should be noted that these health impacts refer to the manufacturing process which takes place in a factory environment, and not the health issues associated with establishment of the facilities on site.

3.4.3 Land disturbance and land use impacts

Large, utility-scale solar power plants require approximately one square kilometer of land for every 20-60 megawatts (MW) generated-poses. The large arrays of solar collectors may interfere with natural sunlight, rainfall, and drainage, which could have a variety of effects on plants and animals. Solar facilities may also interfere with existing land uses, such as grazing. In some instances homesteads may be affected which in turn may require the affected parties to be relocated. Proper siting decisions can help to avoid land disturbance and land use impacts. In addition, new solar installation sites are often levelled sprayed with weed control chemicals. Each one of these steps will change the dynamics of the original function of the land with respect to plant and animal inhabitants.

However, it is important to bear in mind that these impacts are not unique to solar power plants. Generating electricity from coal and uranium usually requires as much or more land per unit of energy delivered if the land lost to mining is taken into account. Solar-thermal plants (like most conventional power plants) also require cooling water, which may be costly or scarce in arid areas.

3.4.4 Visual impacts

Due to their size, and the presence of numerous highly geometric and sometimes highly reflective surfaces, solar energy facilities may create visual impacts. However, being visible does not necessarily imply that they are visually intrusive. Aesthetic issues are by their nature highly subjective. Proper siting decisions can help to mitigate aesthetic impacts to the landscape.

3.4.5 Hazardous materials

Photovoltaic panels may contain hazardous materials, and although they are sealed under normal operating conditions, there is the potential for environmental contamination if they were damaged or improperly disposed upon decommissioning. Concentrating solar power systems may also employ liquids such as oils that may be hazardous and present spill risks. In addition, various fluids are commonly used in most industrial facilities, such as hydraulic fluids, coolants, and lubricants. These fluids may in some cases be hazardous, and present a spill-related risk. The potential risks and impacts can, however, be mitigated by proper planning and good maintenance and management practices.

3.4.6 Impact on water resources

Parabolic troughs and power tower systems use conventional steam turbines and generators to generate electricity, which commonly consume water for cooling. In arid settings, the increased water demand could strain available water resources and other water users.

3.4.7 Carbon Footprint

The primary environmental, health, and safety issues associated with solar energy involve how they are manufactured, installed, and ultimately disposed of. Energy is required to manufacture and install solar components, and any fossil fuels used for this purpose will generate emissions. It is therefore important to compare how much fossil energy input is required for solar systems compared to the fossil energy consumed by comparable conventional energy systems. Although this varies depending upon the technology and climate, studies have found that the energy balance for solar energy facilities is generally favourable and is improving with each successive generation of technology.

3.4.8 Other issues identified in the literature

Concentrating Solar Power (CSP) systems can potentially cause interference with aircraft operations if reflected light beams become misdirected into aircraft pathways. Operation of solar energy facilities, especially CSP facilities, involves high temperatures that may also pose an environmental or safety risk to workers. Like all electrical generating facilities, solar facilities produce electric and magnetic fields that can interfere with communication equipment, TVs, and radios. Construction and decommissioning of utility-scale solar energy facilities would involve a variety of possible impacts normally encountered in construction/decommissioning of large-scale industrial facilities. If new electric transmission lines or related facilities were needed to service a new solar energy development, construction, operation, and decommissioning of the transmission facilities could also cause a variety of environmental impacts.

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:

- The Social Scoping Report prepared for the Scoping Report (Tony Barbour, March, 2010);
- Review of project related information, including other specialist studies;
- Interviews with key interested and affected parties;
- Experience of the authors of the area and the local conditions; and
- Experience with similar projects, including other 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)

- The White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- The White Paper on Renewable Energy (November 2003)
- Northern Cape Provincial Growth and Development Strategy (2004-2014)
- Khâi-Ma 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 affect 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 a local level the Khâi-Ma Municipal Manager has indicated that the development of renewable energy (wind and solar) has been integrated into the Municipality's revised Spatial Development Framework.

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,
- 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 grass 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; and
- Potential loss of grazing land associated with construction-related activities.

Annexure D contains the management plan for addressing social impacts.

4.4.1 Creation of employment and business opportunities

Based on the information provided by the client, the construction phase is expected to extend over a period of 24 months and create approximately 400 - 600 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 solar thermal plant and the associated components, including, access roads, services, power line, abstraction point at and pipeline from the Orange (Gariep) River.

It is anticipated that approximately 60% (240 - 360) of the employment opportunities will be available to low (construction labourers, security staff etc) and semi-skilled (drivers, equipment operators etc) and 40% (160 - 240) 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 solar thermal plant 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.

Due to issues relating to commercial sensitivity the client was not in a position to provide information on the capital expenditure associated with the construction phase. However, based on information from similar energy facilities it is safe to assume that the capital expenditure could be in excess of R 1 billion. 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 Khâi-Ma economy and the town of Pofadder 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 solar thermal plant 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 facility therefore does have 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. Based on the information provided by the client the majority of the construction workers will be accommodated in the nearest local town, which is Pofadder. 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 construction phase is also likely to be spent in the regional and local economy. The injection of income into the area in the form of rental for accommodation and wages will create opportunities for local businesses in local larger towns in the Northern Cape, specifically Pofadder and Upington. The benefits to the local economy will however be confined to the construction period.

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 REFIT procurement rules will dictate specifics in this regard.

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 Enhancement	**With Enhancement**
Extent	Local – Regional (2) (Rated as 2 due to potential opportunities for local communities and businesses)	Local – Regional (4) (Rated as 4 due to potential opportunities for local communities and businesses)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (32)	Medium (48)
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 solar thermal plant 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, !KaXu CSP 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, however it should be noted that the REFIT process will dictate the specifics in this regard;
- Before the construction phase commences !KaXu CSP should meet with representatives from the Khâi-Ma 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 !KaXu CSP 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
- !KaXu CSP 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, !KaXu CSP should assist local BEE companies to complete and submit the required tender forms and associated information;
- The Khâi-Ma 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. However, there are a number of potentially vulnerable farming activities, specifically sheep 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.

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can affect 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)

The most vulnerable communities include the residents of Pofadder and local farm workers in and around the site. This risk is exacerbated by the large number of construction workers (400-600) relative to the small size of the town of Pofadder,

population of 2 935, in 1996. Due to the low growth rate in the region the population of Pofadder is unlikely to have increased significantly since 1996. This risk is heightened by the relatively low-income and education levels in the town and surrounding area.

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. However, due to the potential mismatch of skills and low education levels, the potential employment opportunities for the members from these local communities are likely to be low.

The client has indicated that the majority of construction workers are likely to be housed in the closest town, which is Pofadder. However, due to its relatively small size, the town may not be in a position to accommodate 400-600 workers over 24 month period. The establishment of a construction camp would reduce the potential risk to the residents of Pofadder and should therefore be investigated.

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 (4) (Rated as 4 due to potential severity of impact on local communities)	Local (3) (Rated as 3 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc (5)	Short term for community as a whole (2) Long term-permanent for individuals who may be affected by STD's etc (5)
Magnitude	Moderate for the community as a whole (6) 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	Moderate for the community as a whole (36) Moderate-High for specific individuals who may be affected by STD's etc (57)	Low for the community as a whole (27) 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	Yes, to some degree. However, the	

mitigated?	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. 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:

- !KaXu CSP, in consultation with representatives from the Khâi-Ma Municipality, should assess if the town of Pofadder has the capacity to accommodate 400-600 construction workers for a period of 24 months;
- Where possible !KaXu CSP 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;
- !KaXu CSP 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;
- !KaXu CSP 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;
-
- !KaXu CSP 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 24 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 critical or security personnel, should be permitted to stay overnight on the site. This will make it possible to manage the potential impacts effectively.

In the event of a decision being taken to establish a construction camp on the site, or elsewhere the following mitigation measures should be considered.

- The following facilities should be considered for the workers:
  - Pool tables, table tennis tables, dart boards and other board games, such as chess, etc.;
  - DSTV and DVD library;
  - Library, that includes a subscription to local daily newspapers;
  - Lounge (smoking and non-smoking) area for relaxing;
  - Barbeque area and facilities;
  - Gymnasium / exercising equipment;
  - Facilities for making tea and coffee;
  - A kitchen area(s) for preparing their own food if they so wish, including stoves, microwaves, fridges, etc.; and
  - A canteen where meals are served.

- !KaXu CSP should investigate the provision of subsidised transport to enable workers to return to their homes as often as possible. The possibility of returning home over weekends would be possible for most construction workers if the employment criteria listed above are implemented. The findings of the Berg River Dam Project study (Dr Shakti Malan, 2007) indicate that being able to return home as often as possible was a critical issue in terms of the workers' well-being;
- !KaXu CSP should assess the religious needs of the construction workers and provide free transport to those workers who want to attend churches located in Pofadder and other towns in the area. The option of providing services on the site should also be investigated. The findings of a review of the construction phase of the Berg River Dam Project in South Africa indicated that the majority of construction workers attend church on Sundays (Dr Shakti Malan, 2007);
- The cultural food preferences of different race groups should be recognised and accommodated;
- Access to the construction camp should be strictly controlled. No non-construction workers should be allowed into the construction camp;
- Access by construction workers onto adjacent farms should be strictly controlled. Construction workers should not be permitted to visit adjacent farms without the prior knowledge and permission of the affected farmer.
- !KaXu CSP should liase with the local authorities to assess the potential impact on existing services and amenities and look at ways of addressing these issues in a co-operative and constructive manner.

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	Short term (2)	Short term (2)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (24)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	Yes
Mitigation: See below		
Cumulative impacts: No		
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:

- !KaXu CSP should investigate need to establish a MF (see above) that includes local farmers and develop a code of conduct for construction workers.
- !KaXu CSP should hold contractors liable for compensating farmers and communities in part/full for farm infrastructure that can be linked to construction workers.
- The EMP should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by !KaXu CSP 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 trespassing on adjacent farms;
- In the event that workers are housed in Pofadder, the presence of workers overnight on the site should be limited to security and critical personnel.

4.4.4 Increased risk of grass fires

The presence of construction workers and construction-related activities on the site poses an increased risk of grass 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 grass fires is heightened by windy conditions in the area, specifically during the dry, winter months.
- The majority of farms in the area farm sheep. 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 Pofadder.

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

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass 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	Short term (2)	Short term (2)
Magnitude	Moderate-High due to reliance on livestock for maintaining livelihoods (8)	Low-Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	Medium (42)	Low (30)
Status	Negative	Negative
Reversibility	Yes, partial	Yes, partial
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
The potential increased risk of grass 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 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/s should also ensure that they join the local fire protection agency.

4.4.5 Impact of construction vehicles

The site is traversed by the R358 (a secondary road to Onseepkans), which links up with the N14. Within the site itself, access to the individual components of the facility will be required from the R358. Four alternative access routes have been identified. The preferred route follows the existing Eskom 132kV distribution line (see Figure 1.8).

The movement of heavy construction vehicles during the construction phase will damage roads and create noise, dust, and safety impacts for other road users. The potential damage to the heavy equipment can result in a number of potential negative impacts, including increased wear on vehicles owned by local farmers, impact on ease of access (e.g. time delays, detours) to stock posts, between neighbors and members of the farming community, as well as access to local towns (services, retail, socialising). However, the findings of the SIA indicate that the current road use frequency is low. The significance of the impact is therefore rated to be low.

In terms of the internal access road alternatives, the preferred alternative is supported given that it follows an existing Eskom power line route.

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 (3) (Rated as 2 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)

Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (18)
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

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 mitigated by the fact that the farming activities in the area are confined to sheep farming as opposed to crops. In addition, only one landowner is affected and !KaXu CSP has purchased the section of the farm that is affected by the development. The loss of production farmland has therefore been offset by the purchase price of the property in question. 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.

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 solar plant, water pipeline 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 (6)	Minor (2)
Probability	Definite (5)	Highly Probable (4)
Significance	High (70)	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
In addition to the purchase of the land from the affected farmer by !KaXu CSP, the potential long term 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 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;
- Impact on tourism and the creation of potential tourist opportunities (This can also be regarded as a negative impact);
- The establishment of renewable energy infrastructure

Potential negative impacts
- The visual impacts and associated impact on sense of place;
- Impact on scarce water resources

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

4.5.1 Creation of employment and business opportunities

Based on information provided by the client the proposed Solar Thermal Plant will employ approximately 60 - 80 full time employees over a 30 year period. 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 Khâi-Ma 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 Khâi-Ma IDP.

Given the location of the proposed facility the majority of permanent staff is likely to reside in the town of Pofadder. 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 Pofadder 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 Boet Bakker) indicated that solar energy will form part of the municipality's strategic development framework (currently in phase 3 of the draft) and will act as a driver for local economic development within

the municipality. The MM of the Namakwa District Municipality (DM), Mr J Loubser, also indicated that the development would be beneficial to the area in terms of job creation and skills development. Mr Loubser also noted that renewable energy (wind and solar) formed part of the DM's development strategy and was therefore in line with the Namakwa DM IDP.

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)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Medium (39)
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 4.2.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase.

In addition:

- !KaXu CSP 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;

4.5.2 Abengoa 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. The significance of this potential benefit is rated as low positive.

Table 4.8: 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	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) Negative (Potential to distract from the tourist experience of the area)
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impact be enhanced?	Yes	
Enhancement: See below		
Cumulative impacts: Potential benefit for tourism in the Khâi-Ma 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:

- !KaXu CSP should liaise with representatives from the Khâi-Ma Municipality and local tourism representatives to raise awareness of the proposed facility;
- !KaXu CSP should investigate the option of establishing a renewable energy interpretative signage entrance to 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.

4.5.3 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 300 MW produced will 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 significant.

Table 4.9: Development of clean, renewable energy infrastructure

Nature: Promotion of clean, renewable energy		
	Without Mitigation	**With Mitigation**
Extent	Local, Regional and National (4)	Local, Regional and National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (56)	High (64)
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 !KaXu CSP 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/support a training and skills development programme for locals. 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.

4.5.4 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 eco-tourism 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, October, 2010) indicate that the proposed facility would be easily and comfortably visible, especially within a 16km radius of the site and the power tower in particular, would constitute a high visual prominence, potentially resulting in a high visual impact. It should be noted, however that the nature of the impact is subjective. The specific findings of the VIA include:

Potential visual impact on users of secondary roads in proximity of the solar facility
Potential visual impact on the secondary roads in close proximity (i.e. within 8km) to the proposed solar facility is expected to be **high**.

Potential visual impact on residents of settlements and homesteads in close proximity of the proposed solar facility
The visual impact of the proposed solar facility on homesteads and settlements is found to be **high** for those within 8km of the facility.

Potential visual impact on users of major roads and residents of settlements and homesteads within the region
The visual impact of the proposed solar facility on users of the national, arterial, and secondary roads, as well as residents of settlements and homesteads which lie beyond 8km of the site is found to be **moderate**. Of significance is that the N14 and R358 are recognised tourist access routes within the region, giving access to visitors to the Green Kalahari, Namaqualand, and Namibia (via Onseepkans).

Potential visual impact of on-site ancillary infrastructure on visual receptors in close proximity of the solar facility
The potential visual impact of this on-site ancillary infrastructure is expected to be **medium** in close proximity (i.e. within 4km) of the proposed facility.

In conclusion the VIA notes that the construction and operation of the Pofadder Solar Thermal Plant (primarily the power tower) will have a visual impact on the natural scenic resources of this region. However, the VIA also indicates that the facility has a novel and futuristic design that invokes a curiosity factor not generally present with other conventional power generating plants. The advantage of this is that the solar facility can become an attraction or a landmark within the region that people would actually want to come and see. As it is impossible to hide the facility, the only option would be to promote it.

The VIA does however stress that this opinion should however not detract from the fact that the power tower would be visible for a large area that incorporates potentially sensitive visual receptors that should ideally not be exposed to industrial-type structures. Of additional significance is that the N14 and R358 are recognised tourist access routes within the region. However, the VIA states that the anticipated visual impact is not, however, considered to be a fatal flaw from a visual perspective, considering the low incidence of visual receptors in the region and the contained area of potential visual exposure.

Table 4.11: 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 (3)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
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 resources?	No	
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.

4.5.5 Impact on scarce water resources

The NCPGDS 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 facility will consume relatively large volumes of water, which is a scarce resource in the area. Based on the information provided by the client the proposed facility will consume approximately 12 000 m^3 of water per day. These represent large volumes of water being allocated to a single user and raise potential issues related to equity and efficiency in terms of allocating the water for other uses. However, it is assumed that the provincial and national Department of Water Affairs has been informed of the proposed development and that !KaXu CSP has followed the required procedures for obtaining a water use licence for the operation.

The issue of impact on water resources is raised in an assessment of a Solar Thermal Plant in California (Genesis Solar Energy Facility). The findings of the assessment undertaken by the US Bureau of Land Management and he California Energy Commission (March, 2010) indicate that while the state of California has a strong interest in developing its solar energy resources, the construction and operation of solar energy facilities requires the use of water, which state policy also protects. In this regard the report states that the Energy Commission must balance the state's interest in promoting solar energy development with its interest in conserving and protecting the state's water resources. In this regard the report notes that several solar projects currently proposed in the Mojave and Colorado deserts of California would use water for power plant cooling, which staff believes is contrary to the state's long term interest in maximising solar power generation and minimising adverse environmental impacts. The potential for the same conflict to arise in South Africa exists and needs to be borne in mind by the authorities.

As a potential mitigation measure the authorities in California recommended consideration of air-cooled condenser (ACC) or dry cooling systems rather than the cooling towers proposed for the Genesis project. Based on the information provided by the client no such alternative is being considered currently due to the economic impact of such and REFITs that are based on wet cooling systems. While DWAF is aware of this situation, is appears to be an oversight given that water is one of South Africa's scarcest resources.

4.6 ASSESSMENT OF POWER LINE OPTIONS

The proposed facility includes the establishment of an overhead power line of 132 kV which will connect to Eskom's Paulputs transmission substation adjacent to the property. The distribution line will be approximately 2 km long. This substation is connected to the National Power grid via an existing transmission line to the Eskom Aggeneys transmission substation.

Four alternative corridors/routes are proposed for the overhead power line. The preferred route follows the existing Eskom line (see Figure 1.6). The findings of the SIA indicate that the social impacts associated with all four alternatives are low. However, the preferred alternative is supported given that is follows the existing Eskom line. The findings of the VIA also support the preferred alternative.

Table 4.12: 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 preferred alternative should be developed and 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 ACCESS ROAD OPTIONS

The site is traversed by the R358 (a secondary road to Onseepkans), which links up with the N14. Within the site itself, access to the individual components of the facility will be required from the R358. Four alternative access routes have been identified. The preferred route follows the existing Eskom line (see Figure 1.8). The findings of the SIA indicate that the social impacts associated with all four alternatives are low. However, the preferred alternative is supported given that is follows the existing Eskom line.

Table 4.12: Assessment of access roads

Nature: Potential noise, dust and safety impacts associated with traffic		
	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 increase in safety, noise, and dust risks to local communities.		
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 preferred alternative should be developed. The measures listed above to address the potential impacts associated with the construction phase also apply to the construction of the access road.

4.8 ASSESSMENT OF PIPELINE ROUTE OPTIONS

The proposed facility requires the establishment of a water supply pipeline linking the facility to an abstraction point on the Orange (Gariep) River. A retention reservoir/dam located approximately 6.3km from the abstraction point on the Gariep (Orange) River will also be established. Based on an extensive feasibility assessment, only one route has been provided for the proposed pipeline. This route is preferred by virtue of the following:

- Suitability of abstraction pool depth;
- Existing infrastructure at the abstraction point;
- Following an existing road reserve;
- Minimum impact on the environment;
- Access to the pipeline for maintenance purposes.

The findings of the SIA indicate that the social impacts associated with the proposed route are negligible and the significance of the impact is rated as low negative. The route identified is therefore supported.

Table 4.13: Assessment of pipeline options

Nature: Potential visual impact and impact on sense of place associated with pipelines if they are established above ground. Disturbance to the land during the construction phase		
	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 water pipelines.

4.9 POTENTIAL HEALTH IMPACTS

The potential health risks associated with Solar Thermal Plant s are linked to the hazardous materials used in the process and stored on site. These include liquids such as oils that may be hazardous and present spill risks. In addition, various fluids are commonly used in most industrial facilities, such as hydraulic fluids, coolants, and lubricants. These fluids may in some cases be hazardous, and present a spill-related risk. Photovoltaic panels may also contain hazardous materials, and although they are sealed under normal operating conditions, there is the potential for environmental contamination if they were damaged or improperly disposed upon decommissioning.

However, the findings of a detailed health assessment undertaken as part of the assessment of the Genesis solar plant in California found that the proposed facility would not present a significant health risk to the public. In addition, proper planning and good maintenance and management practices can mitigate the potential risks and impacts.

4.10 ASSESSMENT OF NO-DEVELOPMENT OPTION

As indicated above, South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions (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 4.14: 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.

4.11 ASSESSMENT OF CUMULATIVE IMPACTS

The impact of solar facilities on the landscape is 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. At the time of undertaking the SIA there was no indication that additional solar energy facilities were being planned in the area. The current cumulative impact is therefore regarded to be low. However, should additional facilities be considered the significance of this impact would increase. The issue of potential cumulative impacts needs to be considered when assessing future facilities given that the N14 and R358 are recognised tourist access routes within the region, giving access to visitors to the Green Kalahari, Namaqualand and Namibia (via Onseepkans) (VIA, MetroGIS, October, 2010).

Table 4.15: 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 Thermal 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 more than one large solar facility in an area is likely 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.

4.12 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 (60 - 80) 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:

- !KaXu CSP should investigate the option of relocating employees to other solar facilities when the Pofadder plant is decommissioned;
- !KaXu CSP 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;

SECTION 5: KEY FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

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

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

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 Thermal Plant s.

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);
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- The Khâi-Ma Local Municipality Integrated Development Plan (2009).

The findings of the review indicated that solar energy was strongly supported at a national, provincial, and local level. Based on this is it reasonable to assume that the establishment of the proposed Pofadder Solar Thermal Plant 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.

Based on the information provided by the client the construction phase is expected to extend over a period of 24 months and create approximately 400-600 employment opportunities. It is anticipated that approximately 60 % (240-360) 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% (160-240) 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 Solar Thermal Plant 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.

Based on information from other energy facilities the total wage bill for the construction phase could be in the region of R 150 – 200 million. The injection of income into the area in the form of rental for accommodation and wages will create opportunities for local businesses in Pofadder and other Northern Cape towns, such as Keimoes, Kakamas and Upington, 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 client has indicated that the majority of the construction workers will be accommodated in the nearest local towns, with Pofadder likely to be the most convenient due to its proximity to the site. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. The benefits to the local economy will however be confined to the construction period (24 months). However, the potential capacity for Pofadder to accommodate 400-600 workers over a 24 month period needs to be assessed.

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 theft, and damage to farm infrastructure associated with construction workers;
- Increased risk of grass 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 large size of the labour force (400-600) the potential risk to local family structures and social networks in Pofadder is regarded as high. This risk is heightened by the small size of the Pofadder (approximately 3 000 people) relative to the number of construction workers. The presence and movement of construction workers on and off the site during the construction phase will therefore need to be carefully managed.

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	Medium (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 theft and damage to farm infrastructure **Risk of grass fires**	Medium (Negative impact) Medium (Negative impact)	Low (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;
- Impact on tourism and the creation of potential tourist opportunities (Impact on tourism may also be negative in some instances);
- The establishment of infrastructure to generate renewable energy.

Given the location of the proposed Solar Thermal Plant the majority of permanent staff is likely to reside in Pofadder. In terms of accommodation options, a percentage of the permanent employees may purchase a house in Pofadder, while others may decide to rent. Both options would represent a positive economic benefit for the town. 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.

With the exception of the visual impact and impact on sense of place, all of the negatives impacts are can be effectively mitigated to a significance of Low.

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, s 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.

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)
Impact on tourism	Low (Positive and Negative)	Low (Positive and Negative)
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)

The findings of the SIA also indicate the proposed plant will consume relative large volumes of water (approximately 12 000 m^3 of water per day during the summer and winter months respectively). The allocation of such large volumes of water to a single user raises potential issues related to equity and efficiency in terms of allocating the water for other uses. The potential conflict between supporting renewable energy and conserving water is an issue that authorities will need to consider in South Africa.

5.2.4 Assessment of cumulative impacts

The cumulative impacts associated with large, renewable energy facilities, such as the proposed Pofadder Solar Thermal Plant, are largely linked to the impact on sense of place and visual impacts. At the time of undertaking the SIA there was no

indication that additional solar energy facilities were being planned in the area. The current cumulative impact is therefore regarded to be low. However, should additional facilities be considered the significance of this impact would increase in magnitude. In this regard the issue of potential cumulative impacts needs to be considered when assessing future facilities, specifically given that the N14 and R358 are recognised tourist access routes within the region, giving access to visitors to the Green Kalahari, Namaqualand and Namibia (via Onseepkans) (VIA, MetroGIS, October, 2010).

It is therefore 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 support the preferred route, which follows an existing Eskom power line route.

5.2.6 Access road options

The findings of the SIA support the preferred route, which follows an existing Eskom power line route.

5.2.7 Pipeline options

The findings of the SIA indicate that the social impacts associated with the proposed route are negligible and the significance of the impact is rated as low negative. The route identified is therefore supported.

5.2.8 Potential health impacts

The potential health risks associated with Solar Thermal Plant s are linked to the hazardous materials used in the process and stored on site. These include liquids such as oils that may be hazardous and present spill risks. In addition, various fluids are commonly used in most industrial facilities, such as hydraulic fluids, coolants, and lubricants. These fluids may in some cases be hazardous, and present a spill-related risk. Photovoltaic panels may also contain hazardous materials, and although they are sealed under normal operating conditions, there is the potential for environmental contamination if they were damaged or improperly disposed upon decommissioning.

However, the findings of a detailed health assessment undertaken as part of the assessment of the Genesis solar plant in California found that the proposed facility would not present a significant health risk to the public. In addition, proper planning and good maintenance and management practices can mitigate the potential risks and impacts.

5.2.9 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.

5.2.10 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 Plant s 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 (60-80) 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).

!KaXu CSP should also establish 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 will create employment and business opportunities for locals during both the construction and operational phase of the project. In order to enhance the local employment and business opportunities the mitigation measures listed in the report should be implemented. !KaXu CSP, in consultation with the Khâi-Ma Municipality, should also investigate the opportunities for establishing a Community Trust. The establishment of a Community Trust does not only create potential benefits for local communities, but also addresses the issue of impact equity. In the case of the majority of renewable energy facilities, such as the Pofadder solar facility, the directly affected landowner is compensated for the loss of land, while the adjacent landowners and communities bear the external costs associated with the visual impacts on the sense of place and the landscape character of the area.

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 Pofadder Solar Thermal Plant is therefore supported by the findings of the SIA.

However, the potential impacts associated with large, solar 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. The water demand associated with the operation phase of large, Solar Thermal Plant s is also an issue that will need to be addressed by the relevant authorities.

5.4 IMPACT STATEMENT

The findings of the SIA undertaken for the proposed Pofadder Solar Thermal Plant 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 affect the areas rural sense of place and landscape character. This impact will be for the entire operational lifespan (approximately 30 years) of the facility. 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

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Interviews

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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 are 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 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

BACKGROUND INFORMATION DOCUMENT

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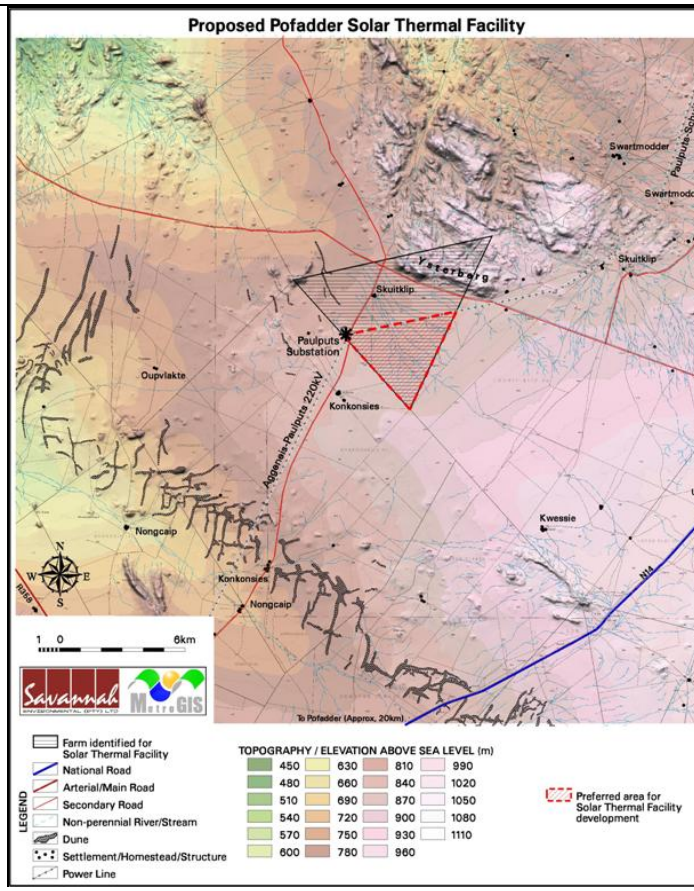
BACKGROUND INFORMATION DOCUMENT FOP SOCIAL IMPPACT ASSESSMENT

Project Name	Pofadder Solar Thermal Plant (STP)
Project Developer	!Kaxu CSP South Africa
Location/nearest Town(s)	Pofadder, Northern Cape Province, South Africa
Local Authority	Kai Ma Local Municipality (Pofadder) & Namakwa District Municipality (Springbok)
Locality Map	

	
Brief project description	! KaXu CSP South Africa South Africa has identified the potential to establish Solar Thermal Plant using Concentrated Solar Power (CSP) an Concentrating or Tracking Photovoltaic Power (PV) technology on the farm *Scuit-Klip 92, portion 4* near the town of Pofadder in the Northern Cape.
Typical Infrastructure Associated with a Solar Thermal Plant using CSP technology	The identified site which is being considered for the construction of the Sola Thermal Plant covers a total extent of 33km²; However, the facility itself will b confined to a smaller area at the southern end of the site. The facility w consist of an unspecified number of parabolic troughs, heliostats an associated power tower, photovoltaic (PV) panels as well as the associate infrastructure. The facility is proposed to accommodate up to 310MW which will be comprise of a combination of the following technologies (in any combination): » trough plant (CSP) » power tower plant (CSP)

» PV plant

Parabolic Trough

A parabolic trough (Figure 1.1) is a large, curved mirror that sits on motorized base, allowing it to follow the movement of the sun throughout th day. The mirror's unique parabolic shape is designed to gather a great deal sunlight and then reflect that light onto a single point, concentrating the sol power (! KaXu CSP Solar S.A., 2008).

A receiver tube sits at the point where the mirror concentrates all the sunligh The tube is filled with synthetic heat transfer oil, heated by the mirror's light around 750 F (400 C). This superheated oil is then pumped from the sol field to a nearby power block, where the oil's heat is converted to hig pressure steam in a series of heat exchangers. This steam pushes conventional steam turbine, creating electricity (!KaXu CSP Solar S.A., 2008).

Parabolic trough technology is the most developed CSP technology, an !KaXu CSP Solar is currently operating and deploying parabolic troughs at th Solúcar Platform outside of Seville, Spain and at numerous internation locations. (!KaXu CSP Solar S.A., 2008).

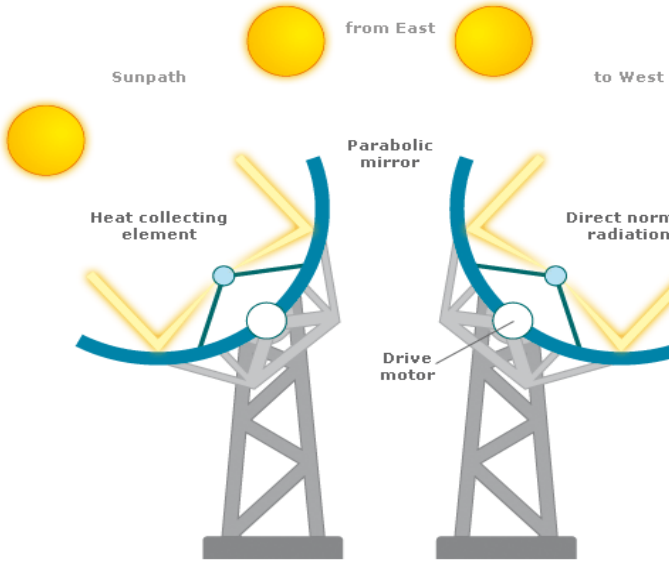


Figure 1.1: Parabolic trough and associated technology (source: !KaX CSP Solar S.A., 2008)

The Parabolic Trough components specified by !KaXu CSP include:

- **Parabolic trough reflectors** are cylindrical in shape and reflect incide

sunlight from its surface onto the receiver at the focal point. Typically, th reflector is made of thick glass silver mirrors formed into the shape of parabola. Alternatively, mirrors can be made from thin glass, plastic film or polished metals.

- **Receiver tube or heat collection elements** consist of a metal absorbe surrounded by a glass envelope. The absorber is coated with a selectiv coating to maximise energy collection and to minimise heat loss. Th glass envelope is used to insulate the absorber from heat loss, and typically coated with an anti-reflective surface to increase th transmittance of light through the glass to the absorber. For hig temperature Solar Thermal Plant applications, the space between th absorber and glass tube is evacuated to form a vacuum.
- A **sun-tracking system** is an electronic control system and associate mechanical drive system is used to focus the reflector onto the sun as moves during daylight hours.
- The **Support structure** is typically made of metal and holds the mirrors accurate alignment while resisting the effects of the wind.

Solar Power Tower

Solar Power tower systems (Figure 1.2), are comprised of a heliostat field movable mirrors oriented according to the solar position in order to reflect th solar radiation and concentrating it up to 600 times on a receptor located o the upper part of a power tower. This heat is transferred to a fluid with th purpose of generating steam that expands on a turbine that is coupled to generator to produce electricity (! KaXu CSP Solar S.A., 2008).

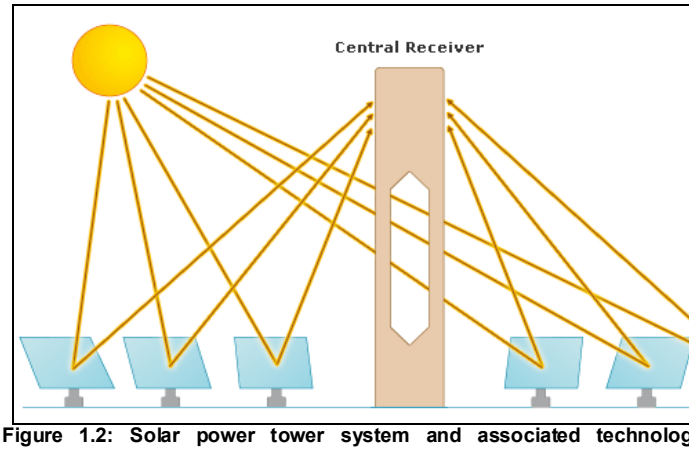


Figure 1.2: Solar power tower system and associated technolog (source: !KaXu CSP Solar S.A., 2008)

The solar power tower components specified by !KaXu CSP include:

- **Heliostats** have the function to capture solar radiation and direct it to th receiver. They are composed of a reflective surface, a supportin structure, and mechanisms used to orientate them, following the sun movement (which involves the necessary systems for the heliosta

movement as well as control systems). The most used reflective surface today are glass mirrors.

The receiver, which transfers received heat to an operating fluid (whic could be water etc.). This fluid is responsible for transmitting hear to othe parts of the C.S.P. plant, generally to a water deposit, obtaining hig temperature steam to produce electricity through the action of a turbine Latest advances and research are centred to obtain high temperatur towers, with heat transporting fluids, such as air, salts, etc.

- **The tower** acts as support for the receiver which should be located at certain height above the heliostats level to avoid, or at least reduc shades and blockings.

Concentrated Photovoltaics

Concentrated Photovoltaic (CPV) systems use lenses or mirrors to concentrat sunlight on a PV cell. Since concentration greatly reduces the size of the sola cells needed, more expensive semiconductors are used to maximiz performance.

CPV plants can be described as either low concentration or high concentratio (Figure 1.4). While Low concentration PV plants often use mirrors concentrate solar radiation onto a PV cell, high concentration PV plants us optical technology and lenses to concentrate solar radiation up to 500 times.

Figure 1.3: Low (left) and high (right) concentration PV plant tracker

(source: !KaXu CSP Solar S.A., 2008)

The typical CPV components specified by !KaXu CSP include:

- **2-axis tracking heliostats**: Heliostats that track the sun on 2 axes are th structure upon which mirrors and PV cells are supported. 2-axis trackin PV yields 35% to 48% more energy production than fixed PV systems.
- **Concentrators:** Concentrators are used to direct solar radiation onto a P cell. Often, these concentrators are mirrors manufactured with a silicon covered metal. The orientations of mirrors on a concentrating PV modu differ depending on their dimension, inclination angle, and module design
- **Photovoltaic cells:** PV cells are what convert solar radiation in electricity. Low concentration PV cells are often made from single crystalline silicon semiconductors. This technology has an efficiency roughly 12%.
- **Inverter:** Since the photovoltaic effect produces direct current (DC), a

	inverter must be used to change it to alternating current (AC). The proposed Pofadder Solar Thermal Plant is expected to produc approximately 110MW of power with parabolic troughs contributing ~50MW each, Power Tower ~50MW and Concentrated Photovoltaics ~10MW. Th exact proportion of the total output ascribed to each of these technologies subject to change. The exact number and placement of the facility components will b investigated in more detail during the EIA phase of the study. The power lin for the facility will connect to existing Eskom transmission line that runs to th south of the proposed site. The proposed Solar Thermal Plant is therefore a Independent Power Producer (IPP) project. In addition, a water pipeline will b required to abstract from the Orange River. Alternative routes for these will b assessed as part of the EIA. Based on information provided by !KaXu CSP South Africa, the bas infrastructure associated with the establishment of the proposed facility woul include: • An access road to the site from the main road/s within the area. In th case of the proposed Pofadder site, access is likely to be from the N1 (which runs to the south and south east of the Solar Thermal Plant site and/ or existing gravel and access roads. • An internal access road that links the facility components and associate infrastructure on the site; • A generator transformer and a small substation outside the building; • An overhead power line feeding into the Eskom electricity network via "turn in and turn out" configuration to an existing distribution line running 4 km south of the site;; • A steam turbine and generator housed within a 2-storey building; • Water supply pipeline/s to the facility and extraction point on the Orang River; • Water treatment plant and water storage facilities; • Blow down pond (for wastewater from the generation process); • Access roads to the site from the main road, as well as access roac within the site; • Workshop, office, and storage areas.
Typical construction phase activities	The construction phase of the Solar Thermal Plant will take approximately 2 months. In order to construct the proposed solar energy facility an associated infrastructure, a series of activities will need to be undertake They are as follows: • Conduct surveys e.g. geotechnical survey, site survey etc; • Establishment of access roads to the site; • Undertake site preparation e.g. clearance of vegetation, the establishme of internal access roads and terracing; • Construct solar field foundation and steelworks; • Transport of components and equipment to site; • Establishment of laydown Areas on Site for the storage of Pla components etc.; • Plant infrastructure • Construct substation on site ; • Establishment of ancillary infrastructure i.e. office, solar field assemb

	facility, contractor's equipment camp etc.; • Connection of Plant to the substation; • Connect substation to power Grid via transmission lines; and • Undertake site remediation i.e. all construction equipment is removed fro the site, the site rehabilitated where practical and reasonable. The number of construction personnel involved in the construction phase w be between 400 and 600 depending on the design of the Plant. It is estimate that 60% of the workforce will be low-skilled/unskilled while the remaining 40 will be skilled. The exact number of jobs (and the nature of the skills require will be determined during the Impact Assessment Phase of the Environment Impact Assessment Process undertaken by Savannah Environmental (Pty) L (http://www.savannahsa.com/) on behalf of the project developer.
Typical operation phase activities	During the operational phase the operations workforce will includ management, supervisors, plant operators, engineering and maintenance sta skilled labor, and unskilled labour. Operational procedures will guide the maj part of maintenance operations ensuring the correct functioning of all section of the power plant from the basic components of the solar field to the ma equipment of the power block (i.e. conventional steam turbine and generato including access roads and internal road tracks. All these features will b under close supervision of a well trained management team which will not on control the daily operation and maintenance of the power plant but will also b searching for continuous improvements and will be responsible for procurin all spares, equipment components and consumables as required. There w also be a specialized team involved in the performance monitoring of the pla with the aim of optimizing plant production. A financial team, responsible f the daily accounting and cost control measures, will receive feedback from a management sections and report as required. Approximately 60-10 people will be employed during the operational phas The approximate breakdown (%) of employment categories is as follows: • Managers 3 - 6% • Engineers 12 - 18% • Technicians 35 - 40% • Craftsmen 40 - 50%
Decommissioning	The Solar Thermal Plant infrastructure is expected to have a lifespan approximately 30 years (with maintenance). Equipment associated with th facility would only be decommissioned once it has reached the end of i economic life. It is most likely that decommissioning activities of th infrastructure of the Plant would comprise the disassembly and replacement operating Plant components with more appropriate technology/infrastructu available at that time.
Questions to Consider	The typical social issues associated with solar energy facilities include: **Construction phase** • Impacts associate with construction related activities, such as noise, dust traffic and presence of construction workers; • Disruption of farming activities and potential increased risk of veld fires; • Creation of employment opportunities

Operational phase

- Visual impact on the landscape;
- Impact on tourism in the area, positive and negative.

In your view, would these impacts apply to the proposed facility in your area?; and

Do you think there are any other key social impacts that might occur?

NOTES

ANNEXURE D

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	!KaXu CSP, the EPC contractor in discussions with the Khâi-Ma Municipality, should aim to maximise employment of the low-skilled workers from the local area.

Mitigation: Action/control	Responsibility	Timeframe
• Attempt to employ low-skilled workers which are sourced from the local area; • Where required, implement appropriate training and skills development programmes • 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 opportunities; • Identify potential opportunities for local businesses	• !KaXu CSP & contractors	• 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 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	• !KaXu CSP and 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 affect 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
• Ensure that the low-skilled workers are sourced from the local area. Construction workers should, where practical, be recruited from the local area in and around the towns of Pofadder, Upington, Keimoes, and Kakamas. • Identify local contractors who are qualified to undertaken the required work. • Consider establishing a Monitoring Forum (MF) consisting of representatives from the local community, local police, local farming community, and the contractor prior to the	• EPC contractors • EPC contractor & !KaXu CSP	• 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 construction phase, establishment of MF etc, • MF established before construction phase commences. • Code of Conduct drafted

commencement of the construction phase. • Develop a Code of Conduct to cover the activities of the construction workers on the site. • 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. • Ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct. • 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. • On completion of the construction phase all construction workers must leave the site.		before construction phase commences. • Briefing session for construction workers held before they commence work on site.

Performance Indicator	• Employment policy and tender documents that sets out local employment and targets completed before construction phase commences; • Semi and unskilled labour locally sourced; • 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	• 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 and critical personnel. • Consider establishing a MF with the adjacent farmers and develop a Code of Conduct for construction workers. • Inform all workers of the conditions contained in the Code of Conduct.	!KaXu CSP and EPC contractors	• Establish MF before construction phase commences. • Develop Code of Conduct prior to commencement of construction phase. The Code of Conduct should be signed by !KaXu CSP and the contractors before the contractors move onto site; • Inform all construction workers of Code of Conduct requirements before construction phase commences.

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.
Monitoring	• ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

Increase risk of grass fires

OBJECTIVE: To avoid and or minimise the potential risk of increased grass 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	Grass 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	The presence of construction workers and their activities on the

source	site can increase the risk of grass fires.		
Mitigation: Target/Objective	To avoid and or minimise the potential risk of grass 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 designated areas. • Provide adequate fire fighting equipment onsite. • Provide fire-fighting training to selected construction staff.		EPC contractors	Construction phase
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.		
Monitoring	• 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. • Ensure that all vehicles are road-worthy; drivers are		EPC Contractor	Construction phase.

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.		

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	• 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 affect 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. Investigate the possibility of allowing farmers in the area	• !KaXu CSP & EPC Contractor	• Construction phase.

	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.		
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 is likely to be based in the local town of Pofadder. • Implement/support a training and skills development programme for locals. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project; • Identify local members of the community who are suitably qualified or who have the potential to be employed full time.	• !KaXu CSP • !KaXu CSP	Operational phase

Performance Indicator	• Potential locals identified before construction phase completed.
Monitoring	• !KaXu CSP 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 Khâi-Ma 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 Khâi-Ma Municipality and tourism organizations to raise awareness of the proposed Solar Thermal Plant ;	• !KaXu CSP	Operational phase
• 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.	• !KaXu CSP	
• Information should presented in the main languages in the Northern Cape Province, namely Afrikaans, Setswana and English	• !KaXu CSP	

Performance Indicator	• Meeting with Khâi-Ma Municipality and local tourism organisations during the construction phase. • Establishment of interpretation centre at the outset of the construction phase.
Monitoring	• !KaXu CSP 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		• !KaXu CSP	• When Solar Thermal Plant is decommissioned
Performance Indicator	• South African Labour legislation relevant at the time		
Monitoring	• !KaXu CSP and Department of Labour		