COUNTRY: FEDERAL REPUBLIC OF NIGERIA

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY

Date: February 2018

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<thead>
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<td>Team</td>
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<tr>
<th>Sector Manager</th>
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<tr>
<td>Sector Director</td>
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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT [ESIA]
SUMMARY

Project Title: PAN AFRICAN SOLAR POWER PROJECT
Project Number: P-NG-00-018 Country: NIGERIA
Department: PESR0 Division: PESR.2

1 INTRODUCTION

The Pan African Solar Power Project (Katsina PV project) is a solar PV power plant developed by JCM Capital along with local partner Pan Africa Solar Limited (PAS). The power plant is to be located in Kankia, which is about 60 km from the capital city of Katsina in Katsina State, Nigeria, the location of the project is shown in Error! Reference source not found.. The power plant will be constructed on a full-wrap turnkey, fixed price EPC contract the scope of which includes engineering, procurement, construction and commissioning of a solar PV plant capable of producing a minimum of 96.24 MWp and up to 80MW AC of power and interconnection to the 132kV TCN Grid. An initial 5 year O&M contract will be entered into to ensure optimal revenue streams throughout the life of the PV power plant. The plant is designed to have a life of at least 20 years.

This ESIA summary highlights the key assessment and management plans designed by Pan Africa Solar to ensure the proposed project complies with Nigerian legislation as well as international development partners’ E&S policy requirements.

2 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

The ESIA has been carried out in accordance with applicable environmental, social and power sector policies, standards, regulations and legislation in Nigeria as well as relevant international conventions and standards. These include EIA Act No 86 of 1992 (as amended by EIA Act Cap E12 LFN 2004), EIA Sectoral Guidelines for Power Sector, 2013; World Bank Safeguard Policies and Environmental Health & Safety (EHS) Guidelines and IFC Performance Standards on Environmental and Social Sustainability and Equator Principles.

According to the EIA Act No 86 of 1992 (as amended by EIA Act Cap E12 LFN 2004), a full EIA is required for all projects likely to have significant impacts on the environment because of the nature or extent of the activity. The Federal Republic of Nigeria’s constitution, the EIA Act, EIA Regulations and various sectoral legislation and regulations are broadly consistent with the Bank’s Integrated Safeguards System Policy (ISS).

Some of the key national legislation reviewed and considered in the ESIA studies and found to be consistent with the Bank’s ISS Policy include;

- National Environmental (Electrical/Electronic Sector) Regulations, 2011(S. I. No. 23);
- Land Use Act 1978 (Modified 1990), Labor Act, 1999;
• The Forest Act, Endangered Species (Control of International Trade and Traffic) Act No. 11 of 1985, Harmful Wastes (Special Criminal Provisions etc.) Act No. 42 of 1988;
• National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991 (S.I.No.9), National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 (S.I.No.15), National Environmental (Sanitation and Wastes Control) Regulations, 2009,(S.I. No.28);

**AfDB’s Operational Safeguard Review**

The project has been assigned a category 1 by the African Development bank in line with the guidelines within the bank’s ESAP for all power generating plants exceeding a generating capacity threshold of 30MW. Consequently Operational Safeguards (OS)1 on Environmental Assessment have been triggered because the component activities have the potential to generate significant environmental and social impacts to identified receptors within its area of influence which if not well managed can lead to disruption of ecosystem services for the community. Operational Safeguard (OS2) has also been triggered because it has economically displaced about 83 households. OS 4 on Pollution Prevention and Hazardous Substances is triggered since construction will involve use of fuels and possibly some hazardous materials. OS 5 on Labor, Working Conditions, Occupational Health and Safety is applicable since the construction will involve a significant number of construction workers.

Additional to this ESIA, the Project Proponent, Pan Africa Solar will develop and implement an Environmental and Social Management System (ESMS) that integrates environmental and social risk management into its business processes through the use of environmental and social due diligence procedures implemented concurrently with existing risk management arrangements.

### 3 PROJECT DESCRIPTION AND JUSTIFICATION

#### 3.1 The Project

The proposed project will generate and supply additional 80 MWAC of renewable electricity to boost national power supply and specifically provide the Katsina State and surrounding areas with a carbon free source of electricity to promote economic development in line with NEP\(^1\). The basic project component will involve:

- **A utility scale solar power plant involving the installation of ground-mounted PV solar modules capable of generating 80 MWAC using fixed tilt system configurations**;
- **The PV modules will convert sunlight to direct current (DC) power. The modules will be connected together to form arrays of panels, which in turn will be connected to inverters to convert the DC power to alternating current (AC) power**;
- **The voltage of the power will be stepped up by a transformer within an on-site substation to the required voltage of the nearby electricity grid**;

\(^1\) National Electric Power Policy
• Supervisory Control and Data Acquisition (SCADA) System;
• Associated infrastructure and utilities including:
  o Site security including fencing and CCTV
  o Buildings, including onsite substation, connection building, control building; guard cabin and spare parts storage;
  o Access road and internal road network;
  o Storm water infrastructure and drainage system; and
  o Water supply infrastructure (boreholes).

3.2 Technical Design Layout of the Project components
Figure 1 shows the technical design layout for the project components.

![Figure 1: Technical Design Layout plan for the project](image)

3.3 Project Development
The development of the Solar PV project is broken down into the following phases:

• **Pre-construction**: Including activities such as land acquisition, mobilization of personnel, equipment and materials to site, site preparation and installation of temporary structures for workers.
• **Construction**: Including civil works, electrical works, and equipment installation.
• **Operation**: Plant operation and routine maintenance
• **Decommissioning**: Removal of PV panels and equipment, demolition of structures and evacuation as well as site remediation.
3.4 Justification of the Project

The Project will help to reconcile existing shortfalls in Nigeria’s electricity generation infrastructure and bring the associated benefits of clean renewable energy generation, such as reducing carbon footprint of electricity generation without adding pollution, as well as benefits to the economy. PAS are proposing to use technology that will allow the solar panels to track the sun’s movements, thereby maximising energy capture and output.

Following the signing of the Power Purchasing Agreement (PPA) with the Nigerian Bulk Electricity Trading (NBET) (a Federal Government of Nigeria owned company dealing in the purchase and resale of electrical power and ancillary services from independent power producers) the tariff level set by the PPA necessitated the optimisation of project output to ensure economic sustainability of the Project; therefore PAS changed the design of the Project. Whilst remaining an 80MW Plant, the new design would use tracker technology that allows the solar panels to track the sun’s movement during the day. This new tracker system maximises capture and output by increasing the Project’s generation yield in terms of kilowatt hours (kWh) per day, due to the higher levels of irradiation received by the panels in comparison to the fixed angle mounting arrangement. The solar tracker system requires more space, therefore the Project required a further 89 ha of land, bringing the total amount of land required for the project to 209 ha. Figure 2 below shows the proposed new and original project land area requirement, as well as the proposed changes to the transmission route.

PAS met with the State Government including the State Ministry of Land to inform them of the project's new requirements and request assistance in identifying an additional 89 ha, adjacent to the original site but avoiding as much cultivated land as possible. An initial desktop study was completed to determine where the areas that met these criteria were located. The desk study highlighted areas to the north and west of the 120 Ha site; the southern areas would have included a main track to the dam and significant areas of cultivated land, while areas to the east of the main site (over the main road) are the property of another proposed future solar project. The northern areas contain scrubland with some cultivated land and the west was predominantly scrubland not under cultivation. PAS then walked the provisional boundaries, accompanied by local government officials, avoiding as much cultivated land as possible.

4 DESCRIPTION OF THE PROJECT ENVIRONMENT

The Project will be situated on 209 Ha of land approximately 2.5 km from Kankia Town in Katsina State (see Figure 2). The substation required for the Project will be located within the acquired land, but the Project will connect, via a transmission line, to a switchyard to be located on a different project site (see Figure 2 above that shows the transmission route and substation), which lies around 4 km to the east of the PAS site, on the other side of the Katsina-Kano expressway, approximately 100m to the East. The area to the east of the main road has been allocated by the KSG to another solar developer (NOVA Power). Figure 2 below shows the location of both projects.
4.1 Project Area of Influence
The Project Area of Influence (AOI) for EISA study was a radius of 5km from the Project site boundary (see Figure 3). The settlements of Kafin Dangi (Fanga and Gandi) and Kauyen Dawa are the communities that are directly affected by the Project, specifically with regards to the land acquisition and restricted access to land and are considered as the AOI for the LRP. The ESIA covers all the communities in the AOI.
4.2 Environmental Baseline
This section provides a description of the exiting environmental conditions of the Project study area. Baseline information was collected using the following methods:

- Desktop review of existing reports related to the Project site and the surrounding environment;
- One season (wet season) of field sampling, measurements and laboratory analysis; and
- Additional information gathered from consultation with surrounding communities.

Climate and Meteorology
The Project area is described as semi-arid, categorised by two predominant climatic conditions: very hot and long dry season (November-March) and a humid and short wet season (April-October). The climate of the study area is tropical and it is under the influence of the Inter-Tropical Convergence Zone (ITCZ) or Inter-Tropical Discontinuity Zone (ITDZ).

Rainfall
Rainfall in the Project area is generally between April and October. The average annual rainfall in the area is about 600 mm.
Temperature

The mean monthly temperature recorded in the Project area between 1989 and 2013 was approximately 35ºC in the wet season months and 33ºC in the dry season.

Humidity

The average humidity for the Project area was recorded at 45% to 75% between April and October. Lower values were recorded during the dry season months.

Wind

The lowest mean monthly wind speed in the Project area was recorded at 4.92 m/s during October with the highest annual mean value of 8.78 m/s recorded in June. The prevailing wind directions in the Project area are East and South-West Trade Winds. The East wind predominates during the dry season while in the wet season the dominant wind direction is usually the South-West.

Sunshine

The mean monthly sunshine hours in the Project area ranges between 7.09 hours in August (peak of the rainy season) and 8.75 hours in October. Katsina State generally experiences high sunshine hours throughout the year and is regarded as one of the states in Nigeria with high intensity of sunlight.

Ambient Air and Noise Quality

A total of 20 locations were sampled in the study area for ambient air and noise quality. The concentrations of air quality parameters recorded in the study area were compared with the Nigerian Ambient Air Quality Standards (NAAQS) and the WHO Air Quality Guidelines. Also, the ambient noise levels recorded in the area were compared with the FMEnv standards and the World Bank Noise Level Guidelines.

Results from the ambient air tests indicate that project area could be said to be good in terms of Total Suspended Particles (TSP) concentration during the wet season, and the low SO₂ concentrations recorded across the project site was indicative of an unpolluted environment. The TSP values reported in the study area during the dry season survey ranged from 0.05 mg/m³ to 0.52 mg/m³. This maximum TSP value was found to be above the FMEnv prescribed limit for TSP in ambient air (0.25 mg/m³). This could be attributed to the intense dusty-dry harmattan winds that predominate in the study area during the dry season.

The ambient noise level reported in the study area during the dry season ranged from ranged from 55.3 to 69.7 dBA, below the FMEnv limit of 90 dBA.

Terrestrial Ecology and Habitats

The study area lies within the Sudan Savannah vegetation belt of Nigeria in West Africa. The primary ecosystem within the Project site was found to be characterised by open savannah vegetation with shrubs, grasses and herbs which appear green in the wet season and pale brown and withered in the dry season. The vegetation is mostly regarded as shrub-grazing land. Some of the land is cultivated by members of the Fanga, Gandi and Kauyen Dawa communities. The Project site is also used for grazing.
Geology

The site geotechnical survey revealed that the near-surface ground of the area was formed of compacted fine-grained sediments, such as clays and silts and a conglomerate with lateritic matrix. The results of a sieve analysis of the fine-grained sediments identified hard sandy clay and sandy clay. Quartzite pebbles of 10 mm were identified as the largest single component in the conglomerate.

Hydrogeology

The site and its surrounding area as generally lacking in natural surface water bodies or seasonal river beds, with runoff expected to readily penetrate the surface soil locally or drain south westward along the surface terrain through the central depression in the site, and a very limited tendency for flooding in the Project area. The River Gada runs approximately 450 m to the east of the site in a southeasterly direction to the Kankia Dam.

Water Use in the Project Area

The major sources of water in the Project area are hand dug wells, boreholes, excavated pits (for water retention) and the Kankia Dam. The hand dugs wells are mostly recharged during the rainfall period. No existing borehole is present within the Project site. The Kankia Dam is situated approximately 200 m southwest of the Project site. The dam was constructed about 12 years ago by the Katsina State Government (Ministry of Water Resources) to serve as a source of water for irrigation and domestic use in Kankia. The dam is currently full of silt and therefore not used to capacity.

Soil and Groundwater Quality Sampling and Analysis

Field sampling for the wet season surveys were undertaken between 17-21st 2014 and the dry season data for the Project area was obtained in 2013. Prior to the field sampling, a reconnaissance survey of the study area was conducted from 15-16th July 2014. Soil and groundwater samples obtained from the field were transported to the laboratory and analysed for the required ESIA parameters. The results of the field measurements and laboratory analyses were compared with the relevant Nigerian regulatory standards, international standard, World Bank Environmental, Health and Safety (EHS) Guidelines and World Health Organisation (WHO) guidelines and limits.

Soil Quality

Soil chemistry determines its physical properties and stability, nutrient availability and the health of microbial populations. The soil’s ability to retain, absorb or filter pollutants is also dependent on its physicochemical properties. The soils within the study area are reddish brown and brown soils, which are characteristic of a semi-arid and arid region.

The dominant soil type within the project site is sandy clay based on the grain size analysis. The top and sub soil samples collected at twelve (12) sampling stations in the study area generally recorded low nutrient values. Heavy metals and hydrocarbon concentrations in the soil samples were either recorded in trace amount or below the detection limit of 0.001 mg/kg indicating the absence of heavy metal or hydrocarbon pollution.
Groundwater Quality

Groundwater samples were collected from four (4) existing boreholes and hand dug well in the study area. The results of physico-chemical and microbial properties of the water samples were compared with the FMEnv limits for drinking water and the WHO standards limits for potable water. The concentrations of parameters analysed in the groundwater samples were generally within the FMEnv and WHO prescribed limits. Heavy metals in the groundwater samples were recorded in trace concentrations.

4.3 Socio-Economic Characteristics

Land Use: Land within the Project area is predominantly used for agricultural purposes, small scale farming. The geo-mapping of the project area indicates that 31.07 ha of land is used for agricultural purposes at the time of the surveys. Vacant land within the project area, not utilised by farmers, is used by herders as grazing land for their livestock. The Federal and State Governments during the mapping exercises highlighted that some of the land within the Project area is owned by households within Fanga and Gande but not currently cultivated for agricultural purposes.

Table 1 below, indicates the land use by the affect communities within the Project footprint.

Table 1: Project Area Land Use

<table>
<thead>
<tr>
<th>Community</th>
<th>No. PAHs losing agricultural land</th>
<th>Land loss type</th>
<th>Total land loss (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cultivated</td>
<td>Uncultivated</td>
</tr>
<tr>
<td>Fanga</td>
<td>48</td>
<td>29</td>
<td>19</td>
</tr>
<tr>
<td>Gande</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Kauyen Dawa</td>
<td>33</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>83</td>
<td>63</td>
<td>20</td>
</tr>
</tbody>
</table>

Alternative Land: During the stakeholder engagement activities and social data collection, it was discovered that alternative vacant land around the Project area potentially available for the livelihood restoration programme is scarce. Land surrounding the Project footprint that is of similar farming quality is either being cultivated by other community members, or has been demarcated for the NOVA PV Project.

Livelihoods and Economy: Livelihoods did not differ between affected communities and those not directly affected around the Project area. However, the main source of income is through remittances. PAPs supplement this income with other activities such as farming, food processing and trading.

Farming: Farming is the main income generating activity within the Project area and predominately undertaken by men. Women may sometimes assist the farmers with threshing and winnowing, particularly around harvest time. Major crops grown in the Project area
include staple foods – millet, maize and guinea corn, sorghum, groundnut, beans, sesame seeds, rice and vegetables. These are grown for both subsistence and commercial purposes.

**Livestock:** Livestock rearing is generally an activity used to supplement other income generating activities such as farming and trading. Both men and women own and rear livestock. Typically, small animals such as chicken or guinea fowl are kept close to the homesteads, and tended to by women. The larger livestock, cattle and goats are the responsibility of the men; although Fulani woman may also inherit cattle from their fathers or husbands and rear them.

**Grazing:** Project site is currently used by herders, whose livestock graze on the land not occupied by farmers. The Project area was a Community Forested Area (CFA) designated by the LGA, which means that communities do not require permission to use this land for grazing. During the FGDs, PAPs indicated that the nomadic herders usually migrate to the CFA around September, where their animals graze for 1-3 months. Usually special arrangements are made, for instance a farmer may allow a herder to graze their cattle on his land in exchange for manure.

**Food Processing:** Women are mainly involved in food processing. Groundnut is the most common crop processed, either into ground nut cake (Kuli-Kuli) or groundnut oil. Processed foods are sold within the communities and in the Kankia market. Other crops such as millet and maize are processed into flour and used at home and sold within the markets.

**Trading:** It is predominately women who trade, mainly food (groundnut oil and groundnut cake, vegetables). Men do engage in some trading to support other forms of livelihoods, especially during the dry season. They tend to sell provisions such as drinks, clothing and sometimes livestock. Most of the trading occurs in Kankia Town, although some people in the communities travel to other parts of Katsina.

**Infrastructure:** The Project affected communities have access to five healthcare facilities: 3 private hospitals in Kankia, 1 general hospital in Kankia and 1 dispensary in Kauyen Dawa. Respondents reported the most prevalent diseases in the Project area malaria, typhoid, hypertension, ulcer, gastrointestinal diseases and diabetes. There are various sources of water within communities around the Project. These sources include wells, boreholes, water vendors, earthen dams and wells; the main source of water are wells and boreholes. Communities have access to one earthen dam located in Kauyen Dawa used mainly to irrigate farmland close to the dam.

It was noted that some of the communities have access to energy via the national grid, used mainly for lighting in homes. Some communities also use generators and kerosene lamps. Over half of the respondents from the surveys use torches as a source of lighting.

**Cultural and Social Networks:** Members of the communities generally have a cordial relationship with each other, whether Hausa or Fulani. However, there are clear divisions between the roles of men and women within the communities. Women are responsible for housekeeping and caring for the children, while men are the household heads and are responsible for the provision of family needs and decision making. Opportunities with respect to education at the basic level, health issues, and religious practice are the same for both men and women. But issues such as decision making, political right to vote and be voted for and freedom of speech are restricted for women. Decisions regarding communities are made at a
community level by the Elders (all men). The male youths are sometimes invited to participate in the decision-making process.

**Vulnerable Groups:** Vulnerability can be described as those who may experience adverse impacts more severely than others based on their vulnerable or disadvantaged status. This vulnerability may be due to ethnicity, gender, language, religion, political views, dependence on natural resources, sickness or disability or other factors that can lead to further social exclusion, such as low levels of education and unemployment or underemployment. There are some PAPs more vulnerable in the directly affected communities of Fanga and Kauyen Dawa, namely 4 female headed households, 4 with physical disabilities and 3 with mental illnesses.

5 PROJECT ALTERNATIVES

5.1 Site Location

There are several factors which make the selected Project site advantageous:

- Proximity to existing infrastructure (overhead transmission line): The site is located 500m from the existing overhead transmission line, to which power generated by the project will be directly evacuated.
- Government-owned land: The project site was owned by the Katsina Government before rights were granted to PAS.
- Environmental condition: The portion of the site to be developed has no significant ecological constraints

Alternatives to the current Project site will include siting the proposed Project within the urbanized area in Katsina town, requiring significant physical resettlement, or areas that are extensively known for agricultural use.

5.2 Solar Technology Alternatives

The solar technologies options considered for the proposed Project were:

- Concentrated Solar Power (CSP) Systems
- Photovoltaic (PV) Solar Panels

CSP is a solar power generation system that relies on use of mirrors or lenses to concentrate a large area of sunlight or solar thermal energy onto a small surface. PV technology (consisting of PV modules comprising PV cells) is the preferred option for the proposed Project since it does not require liquid substance to operate which could lead to significant process wastewater generation. In addition, the PV technology is highly flexible and requires low installation and maintenance cost in comparison to CSP technology.

5.3 PV cell alternatives

PV cells are commonly constructed from mono or poly crystalline (using Silicon) or thin film technology. The PV cells that are being considered for the Project are thin film solar cells technology or poly crystalline (due to environmental performance and cost benefits) with emphasis on thin film. Thin-film solar cells technology consists of depositing one or several thin layers of photovoltaic semi-conductor material (such as cadmium telluride, amorphous
silicon, and copper indium gallium selenide) onto a low cost substrate such as glass, stainless steel or plastics. This technology results in lower production costs compared to the more material intensive crystalline technology.

5.4 Development Options

No Project Option

Choosing the no Project option will mean a loss of preliminary investments made by the proponent on the Project. It will also mean that potential benefits to the Federal Government, Katsina State Government and the associated potential employment opportunities will be lost. In addition, such a decision will not be in accordance with the Federal Government’s initiatives to boost energy supply in Nigeria. These and other related issues make it impossible to adopt the no project option.

Project Option (Go ahead option)

The proposed Project will generate additional 80 MW\textsubscript{AC} to the national grid from a renewable energy source with minimal environmental footprint especially during operations. There will also be some job opportunities created with such a development, predominately during the construction phase. The go-ahead option is therefore considered optimal.

6 POTENTIAL IMPACTS

6.1 Environmental and Social Impacts

The following potential positive and negative environmental and social impacts are anticipated throughout the different project development phases as summarized in Table 2 below.

<table>
<thead>
<tr>
<th>PROJECT PHASES</th>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
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<tbody>
<tr>
<td>Pre-construction</td>
<td>—</td>
<td>• Employment of local labor.</td>
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</tbody>
</table>
| Construction | — | • Opening up of access roads to adjoining settlements and remote areas to enhance easy movement of people & their farm produce.  
• Job creation via direct engagement by Pan Africa Solar and indirect employment through economic vendor activities e.g. food selling.  
• Stimulation of local socioeconomic activities.  
• Improved livelihood and poverty reduction.  
• Acquisition of new skills and development of human capacity. |
### Table 2: Potential Environmental and Social impacts

<table>
<thead>
<tr>
<th>PROJECT PHASES</th>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
</tr>
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</table>
| Operation      | • Reduction of overall emissions of GHGs as a result of cost effective and renewable source of energy generation.  
• Avoidance of fossil fuel utilization and reduced GHGs and other pollutant gas emissions.  
• Promotion of clean energy as an alternative energy source and the establishment of Cleaner Development Mechanism (CDM).  
• Creation of employment and business opportunities.  
• Creation of tourist attraction and recreational resources.  
• Technology transfer and training of project staff on solar power plant management, operation and maintenance.  
• Generation of renewable electricity to boost national power supply.  
• Increased revenue generation to government through permits and taxes.  
• Savings on cost of diesel for pumping & distributing water to citizens by the Katsina State ministry of water resources.  
• Increase power transmission to homes and industries.  
• Reduction in power outages. |
| Decommissioning | • Soil stabilization and regeneration  
• Restoration of flora and fauna habitat | • Increase in land availability for agriculture and other purposes. |

#### NEGATIVE IMPACTS

<table>
<thead>
<tr>
<th>PHASE</th>
<th>ENVIRONMENTAL</th>
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</table>
| Pre-construction | • Deterioration of local air quality due to the release of fugitive dusts & gaseous pollutant emissions  
• Noise disturbances from equipment & truck traffic.  
• Loss of vegetation/habitat fragmentation.  
• Predisposition of soil to erosion  
• Generation of various waste streams associated with packaging of the equipment |
| Construction | • Deterioration of local air quality.  
• Noise disturbances.  
• Soil erosion  
• Pollutant release and potential soil and groundwater contamination.  
• Generation of hazardous wastes.  
• Generation of packaging wastes  
• Change in land use pattern (land conversion/transformation) from agro-forestry to industrial use.  
• Increased traffic and attendant risk of RTA and Injuries.  
• Risk of communicable & vector-borne diseases such as STDs including HIV/AIDS, malaria.  
• Threat to community safety and security.  
• Increase demand on existing health & sanitation infrastructure  
• Increased social vices/crimes and dilution of indigenous culture, norms and traditions in nearby communities  
• Risk of worker exposure to OHS hazards, accidents and injuries. |
| Operation | • Generation of industrial/ hazardous wastes  
• Soil contamination form leachates of hazardous wastes.  
• Potential for fire outbreak due to failure of electrical installations  
• Pollution and hazardous substances management.  
• Risk of electrocution.  
• Visual intrusion and disruption to aesthetics.  
• Risk of worker exposure to OHS hazards, accidents and injuries. |
Table 2: Potential Environmental and Social impacts

<table>
<thead>
<tr>
<th>PROJECT PHASES</th>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
</tr>
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<tbody>
<tr>
<td>Decommissioning</td>
<td>• Air quality deterioration</td>
<td>• Traffic Congestion and increased risk of RTA and Injuries.</td>
</tr>
<tr>
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<td>• Generation of industrial and hazardous waste.</td>
<td>• Risks of occupational accidents and injuries to workers.</td>
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<td></td>
<td>• Soil contamination from indiscriminate dumping of wastes.</td>
<td>• Loss of employment</td>
</tr>
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6.2 Climate Change

The project will boost electricity generation in Nigeria and reduce dependency on hydrocarbon and other non-renewable sources which will result in significant reduction of emission of GHGs in two major ways:

- Generation of the 80 MWAC electricity from the sun will not lead to emission of GHGs and thus offsetting emission which would have otherwise been emitted from the generation of equivalent amount of electricity from other sources such as hydrocarbon, coal amongst others.
- The electricity generated will be utilized by households and businesses who would have otherwise continued their reliance on off-grid petroleum powered generators contributing significantly to the release of GHGs and climate change.
- The project will result in overall less water intake compared to its fossil fuel equivalent.
- The project will also reduce the need for finite resources dependence for Nigeria.

7 ENVIRONMENTAL MANAGEMENT PLAN (ESMP)

The ESIA has developed an ESMP to manage the residual environmental and social impacts associated with the project development works following identification and analysis of all the identified potential environmental and social impacts. The ESMP contains mitigation measures developed in line with the hierarchy of mitigation as summarized in Table 3.

8 POTENTIAL IMPACTS AND MITIGATION MEASURES

The most significant potential impacts of the Project and proposed mitigation measures as proposed in the ESIA are summarized in Table 3 below. Note that the table is a summary of the impact section from the ESIA and does not include all minor/ negligible impacts.
### Table 3: Summary of Significant Potential Impacts and Mitigation Measures

<table>
<thead>
<tr>
<th>Project Activities</th>
<th>Receptors</th>
<th>Summary of Potential Impacts</th>
<th>Impact Rating</th>
<th>Mitigation Measures</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-construction and construction phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minor</td>
</tr>
<tr>
<td>Site clearing and preparation</td>
<td>Socio-economic</td>
<td>Loss of farmland for 83 identified farmers.</td>
<td>Major</td>
<td>• Development and implementation of Livelihood Restoration Plan (LRP).</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Socio-economic</td>
<td>Communities will lose access to tracks used to access farms and grazing sites and routes between communities.</td>
<td>Minor</td>
<td>• Loss of farmland will mean that farmers and herders will not need to use the tracks to access the farms and grazing sites • PAS to widen and improve existing tracks that are used outside the Project site.</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Socio-economic</td>
<td>Loss of grazing land for animals (for cattle, sheep, goats, etc.)</td>
<td>Moderate</td>
<td>• Develop and implement LRP • Grievance mechanism will be in place for local communities</td>
<td>Minor</td>
</tr>
<tr>
<td>Site clearing, preparation and construction, including establishment of laydown areas, and site infrastructure</td>
<td>Soil</td>
<td>Removal of top soil and soil compaction associated with vegetation clearance, excavation, passage of traffic and site preparation and construction activities.</td>
<td>Moderate</td>
<td>• The removal of vegetation and soil cover shall be restricted to only those areas necessary for the development, and all cleared / disturbed areas not required for use during the operational phase will be re-vegetated to prevent erosion. • Soil conservation measures shall be implemented such as stockpiling topsoil or gravel for the remediation of disturbed areas. • Work areas will be clearly defined and where necessary demarcated to avoid unnecessary disturbance of areas outside the development footprint. • Excavation works shall not be executed under aggressive weather conditions. • Construction vehicles will remain on designated compacted gravel roads. The additional creation of access roads will be kept to a minimum. • Fuel, oil and used oil will be stored appropriately, with spill containment and clean up kits available onsite.</td>
<td>Minor</td>
</tr>
</tbody>
</table>
### Table 3: Summary of Significant Potential Impacts and Mitigation Measures

<table>
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<tr>
<th>Project Activities</th>
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<th>Impact Rating</th>
<th>Mitigation Measures</th>
<th>Residual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site clearing, preparation and construction, including establishment of laydown areas and site infrastructure.</td>
<td>Flora</td>
<td>• Vegetation loss&lt;br&gt;• Habitat fragmentation&lt;br&gt;• Disturbance of avifauna associated with noise from site clearing equipment&lt;br&gt;• Direct impacts on vegetation and soil-dwelling organisms, indirect impacts on other animals&lt;br&gt;• Introduction of alien plants which may prevent the natural recovery of the natural vegetation on the site.</td>
<td>Moderate</td>
<td>• No herbicides shall be used on site.&lt;br&gt;• Cleared areas not being used will be re-vegetated using plants of locally occurring species, as soon as practical, encouraging growth of native plant species. Also opportunities to create habitats that help support and enhance the local biodiversity will be identified.&lt;br&gt;• Workers shall be educated with respect to protection of tree species which could be of high importance to the local people.&lt;br&gt;• Mature trees in the vicinity of the project site (off site) shall be clearly marked to prevent unnecessary damage during construction activities.&lt;br&gt;• All construction equipment is to be cleaned (mud and soil removed) at source before being brought to site to minimise the introduction of alien species.&lt;br&gt;• Any stored sand or other natural building materials brought to site will be monitored for alien species and removed where identified.&lt;br&gt;• Regular monitoring will be undertaken (at least every 6 months) to ensure that alien plants are not increasing as a result of the disturbance.&lt;br&gt;• A post construction rehabilitation plan will be compiled.</td>
<td>Minor</td>
</tr>
</tbody>
</table>
### Table 3: Summary of Significant Potential Impacts and Mitigation Measures

<table>
<thead>
<tr>
<th>Project Activities</th>
<th>Receptors</th>
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<th>Residual Impact</th>
</tr>
</thead>
</table>
| Site clearing, preparation and construction, movement of construction vehicles | Atmosphere (Air quality) | Air quality impacts from vehicular emissions and fugitive dust (SPM, NOx, CO, SO₂) in particular in relation to nearby Gandi Primary School. | Moderate | - Spraying water on soil before excavation and periodic road wetting to reduce nuisance dust levels  
- Visual inspection of dust pollution from roads and the construction site and appropriate intervention if dust levels are too high  
- 10km/h speed limit on unpaved roads, to minimise dust generation  
- Potentially dust generating materials to be stored and covered, away from sensitive receptors, and fine materials covered during haulage  
- Ensure that removal of vegetation cover is done in discrete sections to guard against exposure of large areas of loose soil.  
- Potentially dust generating activities to be kept to a minimum and avoided where possible during windy and dry weather  
- Regular maintenance and servicing of machines and engines;  
- Use of clean fuels e.g., unleaded and desulphurised fuels, if available  
- Enclose and insulate noise emitting processes / equipment as much as practicable.  
- Vehicles and machinery turned off when not in use | Negligible |
| Civil work activities, movement of construction vehicles | Noise emission to sensitive receptors | Noise emission with associated effects on sensitive receptors | Moderate | - Noisy, stationary equipment such as generators and compressors shall be located to minimise noise impacts on the nearby Gandi Primary School.  
- Noisy construction activities shall be, as much as practicable, synchronised and restricted to the least noise-sensitive period of the day in relation to the school.  
- As much as practicable, PAS, through a Community Liaison Officer (CLO) appointed by PAS, shall inform the school and the communities around the project site ahead if there will be blasting or any major noisy activities that may cause panic or disturbance.  
- In areas away from the school, ensure that equipment and general construction activities are limited to normal working hours (8.00hr to 17.00hr during weekdays; and Saturdays between 9.00hr-16.00hr). | Negligible |
### Table 3: Summary of Significant Potential Impacts and Mitigation Measures

<table>
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<tr>
<th>Project Activities</th>
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</tr>
</thead>
</table>
| Construction activities | Health, safety, and welfare of construction workers | Risk of injury and health related issues, rights denial etc.   | Moderate      | • A robust H&S Management Plan will be developed and implemented of by the EPC Contractor, following all relevant national and international standards.  
• Appropriate Health and Safety communication and training programmes to be provided, including H&S induction training and regular drills involving the neighbours.  
• Provision of adequate personal protective equipment (PPE) for workers.  
• Provision of accessible and regularly maintained fire-fighting equipment  
• The developer and the EPC Contractor will put in place a worker grievance mechanism that will be accessible to all workers.                                                                 | Minor           |
| Construction activities | Socio-economic                                  | Job creation                                                  | Moderate (positive) | It is envisaged that during each of the two construction phases, about 200 people will be employed for approximately 8 months. This would include around 20 experienced engineers, 10 experts and 150 - 180 local skilled, semi-skilled and unskilled workers. | Moderate (positive) |

**Operation Phase**
<table>
<thead>
<tr>
<th>Project Activities</th>
<th>Receptors</th>
<th>Summary of Potential Impacts</th>
<th>Impact Rating</th>
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</tr>
</thead>
</table>
| Facility operation including routine      | Visual Prominence             | Visual impacts: site is visible from receptors travelling along   | Moderate      | • Site offices and structures limited to single storey and sited to reduce visual intrusion. Colours will reflect surrounding vegetation and/or the ground.  
• Vegetation outside and around the perimeter fencing will be allowed to grow, to provide some screening of the site; particularly along the eastern boundary of the site to screen the project from the road.  
• Substations will be set into the ground as much as possible and the structures will be painted a grey green colour.  
• The area will be kept free of waste, except in designated waste storage areas. Any wastes distributed by winds will be regularly cleaned up.  
• All lighting will be kept to a minimum within the requirements of safety, with only low-level LED lighting, shielded to reduce light spillage, installed.  
• No naked light sources will be directly visible from a distance.  
• All structures (including panels and buildings) will be restricted to a height of less than 6m, excluding transmission towers.  
• Observations should be made to confirm that visual and glint / glare impacts are acceptable. Should these prove to be a significant nuisance then appropriate additional screening shall be provided.                                                                 | Minor           |
| maintenance                               |                               | Kastina-Kano Express road (IBB way), which is not known as a     |               |                                                                                                                                                                                                                 |                 |
|                                           |                               | tourist route and receives relatively low levels of traffic.     |               |                                                                                                                                                                                                                 |                 |
|                                           |                               |                                                                  |               |                                                                                                                                                                                                                 |                 |
| Facility operation including routine      | Health, Safety of staff       | Exposure to injuries, electrical shock, rights denial etc.        | Moderate      | • Develop and implement human resources (HR) policy, to include clear and understandable information regarding rights under national labour and employment law and appropriate provision relating to IFC/AfDB PS4, such as:  
  - working conditions, including working hours, terms of employment  
  - equal opportunity and non-discrimination / sexual harassment policy  
  - freedoms of association, collective bargaining and to join or form unions.  
  - worker grievance mechanism that will be made known to all workers.  
• Develop and implement occupational health and safety policy and procedures including emergency plan. Staff shall be trained on emergency preparedness and responses.                                                                 | Minor           |
| maintenance                               | including worker’s right      |                                                                  |               |                                                                                                                                                                                                                 |                 |
9 MONITORING PROGRAM

PAS will appoint qualified auditors and inspectors, as well as contractual obligations made with the EPC, will ensure a thorough and comprehensive monitoring system is implemented throughout the lifespan of the Project. The objectives of the project’s monitoring plan are as follows:

- Ensure compliance with the applicable local and AfDB/IFC environment and social standards and guidelines
- Ensure that regulatory standards / limits for parameters of concerns are not exceeded
- Monitor changes in existing physical, chemical and biological characteristics of the environment of the Project area
- Determine whether any detected changes in environmental components are caused by the Project or by other factors
- Determine the effectiveness of the mitigation measures as well as check mitigation measures are correctly implemented
- Highlight areas of concern undetected during the ESIA study and provide a basis for recommending additional mitigation measures
- Ensure all Lender Environmental and Social Action Plan (ESAP) actions are appropriately addressed.

9.1 Construction Phase

During project construction the following tiered approach will be implemented:

**Site Walkover Tours** – to be conducted daily by HSE Manager. These checks will focus on compliance with all environmental, social and H&S aspects of the project Social and Environmental Management Plan (SEMP) and associated EHS documentation. Records, including photographs will be kept in a site diary. Weekly meetings will be held between the Environmental Control Officer (ECO), the Community Liaison Officer (CLO), the Project manager and the HSE Manager to review any issues highlighted during site walkover checks.

**Weekly Site Inspections** – to be conducted by the HSE Manager using site inspection checklists provided for each of the EHS plans and procedures produced by the EPC. The inspections will be used to ensure the contractor is fully implementing the mitigation and management procedures outlined within the Social and Environmental Management Plan (SEMP) and associated EHS plans.

**Auditing** - an audit protocol will be developed by the project ECO and internal auditing will be undertaken following this protocol by the ECO on a monthly basis, and will include elements such as checking contractor compliance with the SEMP and supplementary management plans, review of compliance with the Environmental and Social Action plan (ESAP) and a review of incidents of non-compliance to determine if additional controls are required.

**Reporting** - the developer will produce a monthly Construction Report for the project Lenders. This report will incorporate all environmental, social, H&S and security aspects of the project. To this end, the ECO and CLO will provide information relating to the environmental and social performance of the project.
9.2 Operational Phase

Due to the passive nature of an operational solar facility and the low level of potential E&S and HSE impacts compared to the construction phase, daily and weekly site monitoring is not required during the operational phase. However, periodic E&S, HSE and security checking and reporting will be maintained for the duration of the project.

**Monitoring** - periodic checks will be undertaken on the provision of appropriate HSE training for staff that are required to undertake maintenance and repair activities on site. Ongoing observations will be made by the O&M site manager, and records kept of any non-compliance with E&S and HSE measures included in the SEMP and relevant management plans. The project Grievance Mechanism will remain active throughout the operational phase, including a log of any grievances registered and actions taken. The contractor will also carry out constant equipment and facilities checks to detect any deteriorating or malfunctioning equipment and facilities associated with the project to ensure that all faulty equipment and facilities are restored to full working order and that any environmental, social or HSE impacts resulting from equipment performance issues are avoided.

**Reporting** - during the operational phase reporting is likely to be required annually by the lenders, and will consist of all Environmental, Social, HSE and security aspects of the Project.

9.3 Incident Report

Any observed breaches of the management procedures in any of E&S management plans will be reported to the HSE Officer using an incident report form. A copy of each completed incident report form will be held on file by HSE Officer and included in the monthly auditing.

9.4 Documentation

The EPC contractor (for the construction phase) and the O&M contractor (for the operational phase) will put in place a formal procedure for the control of E&S and HSE documentation. All records will be kept on site and will be backed up at several offsite locations. Records will be kept in both hard copy and soft copy formats and will be archived for future purpose.

An Action Tracker Log will be maintained by the EPC Contractor, which will provide a record of all incidences of non-compliance identified through E&S and HSE monitoring, auditing and reporting, and include actions identified to address each incidence.

10 PUBLIC CONSULTATIONS AND DISCLOSURE

10.1 Stakeholder Engagement Plan (SEP) and Livelihood Restoration Plan (LRP)

A Project Stakeholder Engagement Plan (SEP) has been developed for the Project. At a number of different stages throughout the ESIA (and LRP), the local communities and relevant authorities have been engaged. This section gives a brief overview of engagement undertaken and with whom. Meetings were held with:
In addition to the regulatory meetings, engagement and consultation was held with local communities:

- Gandi
- Fanga
- Galadima
- Kauyan Dawa
- Gachi
- Kankia.

The objectives of engaging stakeholders during the ESIA and LRP process included:

- **Ensuring understanding.** An open, inclusive and transparent process of culturally appropriate engagement and communication to ensure that stakeholders are well informed about the proposed development. Information will be disclosed as early and as comprehensively as possible to ensure stakeholders understand the potentially significant E&S impacts of the Project.
- **Involving stakeholders.** Stakeholders have been included in the E&S assessments to date. Stakeholders can assist in developing effective mitigation measures, especially when it comes to resettlement planning and restoring livelihoods. Stakeholders may have ideas on how to optimise local benefits that can be delivered through the Project.
- **Building relationships.** Through supporting open dialogue, engagement can help to establish and maintain a social licence to operate. This has enabled an effective ESIA and LRP, as well as strengthened the positive relationship between PAS and affected communities.
- **Managing expectations.** It is important to ensure that the proposed Project does not create or allow unrealistic expectations of Project benefits amongst local communities. The engagement process serves as a mechanism for understanding and managing stakeholder and community expectations, by disseminating accurate information in an accessible way.
- **Collect data.** Whilst not the primary objective, stakeholder engagement and public meetings can be an additional way to gather more information to strengthen the baseline as well as help to identify mitigation measures.

### 10.2 Grievance Mechanism

A Project specific grievance mechanism has been developed to capture all concerns and issues raised by external stakeholders. Grievances may take the form of specific complains for actual damages or injury, general concerns about project activities, incident and impacts, or perceived
impacts. Grievances are monitored to provide signals of any escalating conflicts or disputes. The Grievance Mechanism will remain in place throughout the construction and operation of the project.

The SEP details the methods of engagement, timings, the grievance procedure and the concerns and issues raised during meetings thus far. The main concerns raised to date are over access to farmland and grazing land, the scarcity of replacement land, and the desire for jobs and training.

PAS will continue to engage with the affected communities as the Project lifecycle evolves. In particular with those identified in the LRP.

11 DECOMMISSIONING PLAN

At least a year before the scheduled end of the Project life (or abandonment), the owner will develop a decommissioning plan. The plan must be submitted to FMEnv for approval, and any other relevant regulatory bodies. The plan will include activities and procedures for the following:

- Dismantling and removal of PV panels and any other equipment
- Demolition of any buildings and/ or Project structures
- The re-establishment of site vegetation in order to restore and where possible improve the site environment to its pre-Project state as reasonably as possible
- Assessment of residual impacts, if any
- Stakeholder engagement.

12 COMPLEMENTARY INITIATIVES - LIVELIHOOD RESTORATION PLAN

12.1 Introduction

The most significant impact identified in the ESIA was as a result of Project land acquisition and the impacts this would have on local farmers and their livelihoods. The recommended mitigation measure was to develop and implement a Livelihood Restoration Plan.

The LRP is required to meet both national and international best practice (IFC PS 5 and AfDB OS2). After a review of the Nigerian and Katsina State legislation around resettlement and livelihood restoration, findings show that the Nigerian requirements are significantly weaker than the international standards. In instances where there are differing approaches and polices regarding resettlement, international guidance requires that the most stringent apply; in this instance, the IFC/AfDB safeguards will apply.

12.2 Objectives of the LRP

The objectives of the livelihood restoration are to:

- Avoid displacement where possible. Where feasible the Project boundary will be re-design to reduce impacts of displacement from farmland acquisition
- Compensation for land owners and land users, calculated at current market rates in line with international standards
• Identify feasible livelihood restoration options and alternative economic activities as part of the livelihood restoration programme
• Ensure Project affected people are financially compensated for the loss of land or access to land but also have access to alternative income generating activities to ensure economic sustainability
• Ensure herders/ grazers have access to alternative grazing land where possible.

12.3 Resettlement Minimisation

The LRP identified 83 Project Affected Households (PAHs) and 749 Project Affected Persons (PAPs). International best practice urges developers to avoid and minimise displacement where possible through exploring alternative project designs and sites. It may not be financially feasible or within the design or technology to make changes to avoid displacement. Development Banks (AfDB and IFC) provide guidance on how to manage these displacement impacts – the LRP was developed in line with this guidance.

As previously described, the project was initially designed to be a 20 MWp. The site initially selected was in the middle of the current project footprint. This area was selected and as it is grazing land, with no farms or houses. The initial project impacts were a lot less significant. As the project evolved, more land was required to accommodate the changes to design and technology, causing unavoidable economic displacement.

The project is limited in the direction it can expand, as it is surrounded by two main roads on two sides. The project design ensures that the dam near Kauyen Dawa is not impacted by its activities and operation. The acquisition of farm land to the north (Fanga) and the West/ South-West (Gande and Kauyen Dawa) was unavoidable.

Following the field work and analysis of the entitlements, PAS has revised the project boundary in order to minimise displacement. It is not possible to avoid displacement completely whilst still having a viable project. PAS has made considerable efforts to minimise displacement impacts by enabling as many land owners and users as possible to retain access to their land. Below, Figure 4 shows how the boundary has been changed, particularly in the north-east corner, where land owners from Fanga have agricultural land. The blue line shows the original Project boundary, and the pink the revised boundary. Individual farm plots have been highlighted to show how the extent of the displacement has been minimised. By revising the Project boundary, PAS has avoided the economic displacement of 32 plots and 30 PAHs.
It should be noted that this adjustment to the boundary to minimise displacement impacts was undertaken as a result of the LRP. This LRP was drafted prior to the boundary re-design and therefore the baseline and impacts assessment has not considered the reduced number of PAHs. It should also be noted that based on the recommendations for compensation and LRP programmes, some of the land required for their implementation will be allocated from the land made available from the revised Project boundary. However, this will be finalised upon discussions and negotiations with the individual PAHS during the disclosure engagement.

12.4 Stakeholder Engagement

A specific LRP SEP was developed as part of the Project. As with the ESIA SEP, the aims of the LRP SEP are the similar, to disseminate information, gather feedback and questions surrounding the LRP process (rather than the ESIA process and activities), but with a focus on displacement and economic resettlement.

The LRP affected communities were engaged on the status of the Project and importantly the process and need for the LRP studies. The communities participated in consultation and engagement around the processes for the census, asset inventory and mapping exercises. The communities helped to identify those land owners and land users directly impacted by the Project; members of the communities walked the Project perimeter with the field team to identify those who had or worked on plots within the boundary. The communities were fully compliant with the field work activities and no grievances were raised during this time (with regard to Project or the LRP and its process).

The key concerns were surrounding:
• Compensation and replacement land
• Scarcity of grazing land
• Employment opportunities.

12.5 Socio-Economic Baselines and Displacement Impacts

Fundamental to resettlement planning is an understanding of the socioeconomic context of the communities’ subject to displacement as a result of the Project. A series of focus group discussions, interviews, census questionnaires and so on were used to paint of picture of the current socio-economic environment. The field work also entailed enumeration and inventory of assets for 100% of PAPs, and was undertaken in line with international best practice. The GIS surveys, asset inventory and valuation assessment and socioeconomic surveys were carried out between 8th and 28th March 2017. The main findings were that land where the Project is to be located is traditional land, owned and used by local residents. The main land use is farming and grazing for livestock. Due to the natural climatic conditions and the arid nature of the landscape, farming is seasonal, and not the only source of income for the Project Affected Households (PAHs) and wider communities. Typically the local residents and PAHs engage in several income generating activities to supplement farming and herding, such as trading, food processing, formal employment in Katsina Town, etc.

The field work identified that no physical displacement will occur as a result of the Project, but there will be some economic displacement. There are three communities (shown in Table 5) who will have some Project Affected Persons (PAP) economically displaced by the land acquisition for the Project - Fanga, Gande and Kauyen Dawa. The table below shows the key displacement impacts.

Table 4: Key Displacement Impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Fanga</th>
<th>Gande</th>
<th>Kauyen Dawa</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of farmland (approximately 30 ha)</td>
<td>48 PAPs</td>
<td>2 PAPs</td>
<td>33 PAPs</td>
<td>Upgrade of additional farm land owned by PAPs, and provision of alternative land for those who do not already have alternative land. Secure access to alternative resources for those who do not own additional land.</td>
</tr>
<tr>
<td>Loss of access to grazing land (178 ha)</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>Acquire grazing land outside of the Project footprint for herders, and upgrade grazing land</td>
</tr>
<tr>
<td>Food processing livelihoods</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>To ensure income from food processing at a minimum remains the same, the alternative land needs to be upgraded to ensure productivity and levels of income pre-Project can be achieved.</td>
</tr>
</tbody>
</table>
12.6 Eligibility and Compensation

The Project will comply with both local and international requirements in terms of compensation. For instance, the Project will take the following approach, but not limited to:

- Land owners and land owners & users will be compensated for loss of land and any improvements (crops and/or assets) made to that land.
- Land users will not be compensated for loss of land, but will compensated for any crops or assets on the land.
- Land users who are renting the land from the government will be compensated for rent for a period of 3 years.
- Compensation for land and other assets will be calculated at full replacement cost without any depreciation.
- Loss of agricultural land will be compensated with both in-kind compensation (where possible) and cash compensation.
- Surveys identified that there are 47 Project affected farmers who own additional land/alternative land outside the Project footprint. Due to the lack of available farm land outside the Project footprint, it is not possible for in-kind compensation to be paid, these PAHs will be paid compensation in cash.
- Replacement land will be provided for the 2 farmers without alternative land outside of the Project footprint. The replacement land will be sought along the Project boundary, land that was being used or owned by a PAH with alternative land, and will therefore be of the same productive value and location. This option will be discussed in detail with PAH to ensure that it is a feasible option not arising in any conflict. If agreement can be reached, security of tenure will be guaranteed on the replacement land.
- Physical relocation assistance or allowance will be provided, if required.
- Disturbance allowance will also be paid to all impacted PAHs. This is to compensate them for the inconvenience associated with resettlement activities such as loss of active man days.

All compensation will be paid at market rate. The market value is directly related to comparable competitive prices of properties on the date of valuation.

12.7 Livelihood Restoration Programme

The main purpose of the Livelihood Restoration Programme is to support PAHs restore their livelihoods to at least pre-Project levels, if not better. The Programme’s primary focus is to complement the compensation that has been paid by the Project for lost assets, and enable PAHs to continue, or replace, lost forms of livelihoods, or adopt new complimentary or alternative livelihoods.

This Livelihood Restoration Programme considers potential livelihood strategies that complement the existing livelihoods practices, skills and access to assets and resources within the 3 Project affected communities. The Programme will be discussed, amended, and agreed upon with the communities. Whilst developing the livelihood restoration options, we have taken into consideration the following:
• Options that are focused on existing skills and knowledge of the PAPs, as introducing completely new skills may take time for people to understand which can lead to disinterest and ultimate failure. Therefore, the focus should be on agriculture and value processing.
• Where possible, the LRP should link farmers to markets and provide support for value adding, or access to the value chain.
• Local culture and traditions must be taken into consideration into any planning. The consultations and Focus Group Discussions highlighted the importance of the communities’ clearly defined gender roles. Providing options that may not conform to the existing structures and cultures may cause disruptions in the existing social networks.
• Due to the limited availability of alternative land, the LRP must consider livelihood enhancement activities that are not land intensive such as small livestock keeping, value chain and processing opportunities.

The livelihoods restoration programme options below are designed specifically to address the identified level of impact by each project affected households. The categories include:

• Replacement land
• Continuous cropping/ rotation farming
• Small livestock
• Improved livestock (large animals – cattle, camel).

The livelihood restoration programmes will be discussed in detail with the PAPs during the LRP disclosure engagement.

12.8 Budget

This section describes the estimated budget to implement the LRP, including all cash compensation for crops and assets. This cost is an estimate based on the 83 PAHs directly impacted by the Project. If the boundaries are re-defined to further reduce economic displacement, this cost estimate may change.

The value of the compensation and the cost to implement the livelihood restoration programmes are around USD 438,000 or 0.3% of the total value of the Project.

13 CONCLUSION

The ESIA study for the proposed 80 MWAC solar PV plant near the town Kankia, Katsina State has been carried out in line with the power sector regulations of Nigeria as well as other relevant national and international standards including the AfDB ISS, the IFC Performance Standards and the Equator Principles. The overall goal of the ESIA is to identify and assess the potential environmental and social impacts of the proposed project, evaluate alternatives and propose appropriate measures to mitigate the significant adverse effects and enhance potential benefits in order to ensure that the proposed project is environmentally and socially sustainable.

This ESIA has identified a series of measures to enhance potential positive impacts of the proposed project as well as technically and financially feasible measures to address negative impacts largely through the application of appropriate mitigation measures, sound engineering design, good construction practices, effective maintenance and adequate supervision and
enforcement during the project life cycle. In addition, a comprehensive ESMP has also been developed using the hierarchy of mitigation to manage any residual environmental and social impacts throughout the development phases of the project.

In consideration of the above therefore, there is no major environmental or social issue to impede the implementation of the proposed development of the solar PV project, which is expected to generate and supply additional 80 MWAC of renewable electricity to boost national power supply and specifically provide the Katsina State and surrounding areas with carbon free source of electricity to promote economic development. The immense benefits that will be derived from the proposed project are significantly greater than the short-term environmental effects.

**Contact from the AfDB**

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