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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROJECT FOR THE CONSTRUCTION OF A 33 KV ELECTRIC TRANSMISSION LINE FROM THE ZINA PHOTOVOLTAIC POWER PLANT TO THE WONA TRANSFORMER STATION IN THE RURAL COMMUNES OF KONA AND BANA, MOUHOUN AND BALE PROVINCES, BOUCLE DU MOUHOUN REGION

FINAL VERSION

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ACRONYMS AND ABBREVIATIONS

AGR	Income-generating activities
ANEVE	National Environmental Assessment Agency
YEAR	National Agency for Renewable Energy and Energy Efficiency
RFPA	Certificate of Rural Land Ownership
BDOT	Land Use Database
CAMELIA	Metric Calculation of Air Lines
NCC	Numerical Control
UNFCCC	United Nations Convention on Climate Change
CIMAC	Inter-ministerial Action Committee on the Convention
OCOL	Community Liaison Officer
COTEVE	Technical Committee on Environmental Assessment
COVID 19	Coronavirus disease 19
CSPS	Health and Social Promotion Centre
DRE	Regional Environment Directorate
DRFPTPS	Regional Directorate of Public Service, Labour and Social Protection
EAS/HS	Exploitation Sexual abuse/ Sexual harassment
EHS	Environment Health Safety
EIES	Environmental and Social Impact Assessment
PPE	Personal Protective Equipment
GHG	Greenhouse gases
IWRM	Integrated Water Management
GDT	Sustainable Land Management
GPS	Global Positioning System
IEC	Information Education and Communication
IPEAD	Environmental Preservation Engineering in Planning and Sustainable Development
STI	Sexually Transmitted Infection
KV	Kilo Volts
KVA	Kilo Volts Amps
MCPD	Sustainable Consumption and Production Patterns
MGP	Complaints Mechanism
MTEE	Ministry of Ecological Transition and Environment
MW	Mega Watt

NIE	Environmental Impact Statement
OCADES	Catholic Organisation for the Development of Solidarity
NGO	Non-Governmental Organisation
PANA	National Action Programme on Adaptation to Climate Variability and Change
PANE	National Environmental Action Plan
PANED	National Environmental Education Action Plan for Sustainable Development
PAN/LCD	National Action Plan to Combat Desertification
PAP	Person Affected by the Project
IDP/OCADES	Integrated Development Programme/ Organisation
FRP	Rehabilitation and Closure Plan
ESMP	Environmental and Social Management Plan
PPCB	Contagious bovine pleuropneumonia
PRME	Livelihoods restoration plan
PV	Photovoltaic panels
PLHIV	Person Living with Human Immunodeficiency Virus
SFI	International Finance Corporation
AIDS	Acquired Immunodeficiency Syndrome
SEMAFO	Société d'Exploitation Minière de l'Afrique de l'Ouest
SONABEL	Société Nationale de l'Electricité du Burkina
TDR	Terms of reference
VBG	Gender-Based Violence
VCE	Violence Against Children

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NON-TECHNICAL SUMMARY

Background and rationale for the study

The present study is an update of the data on the environmental, biophysical and human components of the 33kV transmission line construction project that was initiated in the framework of the Zina solar power plant project located in the commune of Kona/Mouhoun Province (West of Burkina). This 7.8 km long line will link the village of Zina to that of Wona and will allow the transport and connection to the national grid of the energy produced by the 22.4 MWac photovoltaic power plant. The update of the Environmental and Social Impact Notice of the project is justified by the fact that the project had obtained an environmental feasibility opinion dating from November 2015 which expired in accordance with Article 33 of Decree No. 2015-1187/PRES-TRANS/PM/MERH/MATD/MME/MS/MARHASA/MRA/MICA/MHU/MIDT/MCT of 22 October 2015 on the conditions and procedures for carrying out and validating the strategic environmental assessment, the study and the environmental and social impact notice after three (03) years of non-implementation.

Indeed, Article 33 of the said decree stipulates that: ***"In case of a favourable opinion, the promoter has three (03) years to implement his project under penalty of nullity".*** Given the failure to comply with the deadline for the implementation of the project, this provision obliges the promoter ZINA SOLAIRE SA to update the study for which it had obtained a favourable opinion and to respect the sustainability criteria of the International Finance Corporation.

Description of the project

The promoter of this project is ZINA SOLAIRE SA, a company incorporated under Burkinabe law and owned by AMEA POWER based in Dubai. AMEA POWER has solar projects all over Africa. The Deputy Managing Director of the company is Mr Assane YAMEOGO. Postal address: 14 BP 318 Ouaga ZAD Burkina Faso; sector 13, Avenue Babanguida, door 333.

The power line that will be built to transport the energy produced by the solar power plant in Zina runs alongside the village of Dagouna to the Wona transformer station. It is 7.8 km long with a corridor of 14 metres, covering an area of 10.92 ha. The main activities of this project will include

- the opening of a corridor of 7m on either side of the voltage line, i.e. a width of 14 metres;
- the installation of a 228 mm AAAC phase conductor line[2] with a fibre optic guard cable type OPGW;
- the installation of 88 steel posts with concrete foundations, i.e. 4xHEB 220 single, 3xHEB 220 double, 68xHEB 180 single, 5xHEB 180 double.

Policy, legal and institutional framework

The project must be implemented in accordance with the political and legal context of the environmental and social sector in Burkina Faso and the requirements defined by the International Finance Corporation.

The national policy framework to be taken into account is mainly the National Economic and Social Development Plan II; the National Environmental Action Plan (1991-2005) and its Environment and Sustainable Development Plan (2005-2020); the Framework Programme for the Management of Forest and Wildlife Resources; the National Action Plan to Combat Desertification (NAP/LCD) and the sectoral energy policy 2014-2025.

At the legislative and regulatory level, we can mention mainly the Constitution of Burkina Faso; the law N° 006-2013/AN of 02 April 2013, on the Environment Code in Burkina Faso, the law N° 034-2012/AN of 02 July 2012, on Agrarian and Land Reorganisation (RAF) in Burkina Faso; Law n°003/2011/AN of 05 April 2011 on the Forestry Code, Decree N°2015-1187/PRESTRANS/PM/MERH/MATD/MAE/MARHASA/MRH/MICA/MHU/MIDT/MCT of 22 October 2015 on the conditions and procedures for carrying out and validating the strategic environmental assessment, the study and the environmental and social impact notice. And the international conventions ratified or signed by the Burkinabe State which are automatically part of the country's legal arsenal.

At the institutional level, the implementation of the project is under the control of the company AMEA POWER, represented by the company ZINA SOLAIRE. Several ministries and organisations are involved in the implementation of this project, including (i) the Ministry of Energy Transition, Mines and Quarries (MTMCE); (ii) the National Agency for Environmental Assessments (ANEVE) placed under the supervision of the Ministry of Ecological Transition and Environment; (iii) the Ministry of Territorial Administration, Decentralisation and Security through the municipalities and prefectures of Kona and Bana as well as the Deconcentrated Technical Services (STD) concerned by the implementation of the project. This NIES is also subject to the requirements of the International Finance Corporation.

Description of the current state of the environment

Within the framework of the updating of biophysical and human data. Three (03) zones of influence were defined, this definition taking into account the administrative division and the inventory radii suggested in the literature. These zones are defined as follows:

- the zone of direct influence, which covers the 7 m on either side of the power line route;
- the local influence zone concerns the communes of Kona and Bana;
- the regional influence zone, which concerns the Boucle du Mouhoun region.

Characteristics of the biophysical environment

The project area (communes of Bana and Kona) in which the project right-of-way falls is very similar. It is characterised by a vast plateau dissected by rivers. The summits are armoured hillocks, located in the south-eastern part of the commune of Kona.

The project area is crossed by three main types of soil (BUNASOL) in the commune of Kona, which are: undeveloped soils, mull soils and sesquioxidic soils. On the other hand, there are four types of soil in the town of Bana: brown soils, gravelly soils, hydro morphic soils and sandy soils.

The rural communes of Kona and Bana, like all the communes of the Mouhoun loop region, are located in the Sudanian climatic zone with isohyets ranging from 700 to 1000 mm. They are characterised by two (2) main seasons (rainy and dry).

The study area is located entirely in the upper part of the Mouhoun watershed. Locally, it is possible to distinguish two sub-watersheds separated by the chain of hills to the south-east of the village of Wona, namely those of the Karouko river in the northern part and the Grand Balé river in the southern part.

The hydrogeology of the area consists mainly of two sets:

- a group of rocks composed of granitoids, greenstone and volcano-sedimentary shales;
- a collection of sedimentary rocks.

The project area (communes of Bana and Kona) belongs to the Sudanian phytogeographic domain, which is characterised by a shrubby to woody savannah with gallery forests along the rivers. Thus, the very varied vegetation is dense and is favourable to the creation of protected areas and the development of forestry potential. The corridor has 325 plant species that have been inventoried.

As the wildlife habitat is severely degraded, no wild mammals have been observed in the project area. Surveys of local people indicate that mammals have migrated to other habitats, away from the pressure of the agricultural front and poachers.

<u>Human characteristics of the environment</u>

The project area has an estimated population of about 28321 inhabitants (according to the RGPH of 2019, Kona), in 2024 (at the horizon of the plan), the population of the commune will be 30 311 inhabitants. As for the commune of Bana, the general population of the commune is estimated at 17,375 inhabitants in 2018 (based on the natural growth rate of 2.45% per year), i.e. 8,883 men and 8,492 women. This population is divided into 3301 households and represents 0.91% of the regional population and 6.08% of the regional population. Women represent 48.88% of the municipal population.

In the commune of Kona, two villages are affected by the construction of the 33 kV line, namely Zina with 6 people affected and Dagouna with 29 people affected. In the commune of Bana, two villages are impacted, including 2 people affected in Somona and 22 people affected in Wona. Thus, a total of 59 PAPs have been identified within the power line right-of-way. All these PAPs have been compensated within the framework of property compensation activities.

The economic activities of the population of Kona and Bana are essentially agro-sylvo-pastoral production, handicrafts and small-scale trade.

The communes of Bana and Kona have Basic Education Districts (CEB). The CEB of Kona has a total of 24 schools, all of which are functional and spread over the various villages. One of them is in the village of Zina. The commune of Kona has a total of 4 post-primary schools (Kona, Dangouna, Pié, Lah), 2 secondary schools including the departmental high school and a public school. As for the CEB of Bana, it has 13 primary schools including a Franco-Arabic school built by the population. All the schools in the district have a total of 53 classes.

The commune of Kona has five health facilities. These are the CSPSs of Kona, Kouana, Dangouna, Lah and Pié, and the one in Bana, which has three (03) CSPSs located in Bana, the main town of the commune, in Wona and in Yona. All these health facilities are functional.

The commune of Kona has 125 water points divided into 76 boreholes (12 of which are non-functional), 5 AEPS (1 of which is non-functional) and 4 standpipes. The drinking water coverage rate is relatively satisfactory. Of which one (01) borehole is functional and one (01) is non-functional in Zina. In terms of water infrastructure, the commune of Bana is well served and has a total of 54 boreholes, 46 of which are functional, and 13 large-diameter boreholes, 10 of which are functional. All the boreholes are managed by the Health Management Committee (COGES). The ratio shows that there is one borehole for every 285 people, which respects the national norm of one borehole for every 300 inhabitants.

Environmental and social issues

The analysis of the biophysical and socio-economic environment revealed a number of environmental and social issues that will require attention during the execution of the works:

- supply of electrical energy to the population;
- preservation of vegetation ;
- preservation of health (STI/HIV and COVID 19) and the living environment;
- preservation of the peace and quiet of the local population;
- safety of workers and neighbouring populations;
- respect for customs and traditions.

Potential impacts of the project

The realisation of the line project will certainly generate potentially positive social, economic and environmental impacts, but also negative ones. The positive environmental and social impacts are :

- creation of temporary jobs in the locality for men, women and vulnerable groups in the site.
- building energy capacity in the area.
- improvement of the living conditions of the beneficiaries.
- Public lighting of the main roads will contribute to the safety of people and property and will facilitate cultural events;

- Improved study conditions for pupils and students who will now be able to study at home or on the main roads in neighbourhoods with public lighting;
- Improving the working conditions of health centres for better patient care.

The implementation of the project will have both positive and negative impacts such as

- creation of permanent and temporary posts ;
- solid and liquid waste generation ;
- impacts on the microclimatic condition ;
- minor alterations and/or damage to the landscape ;
- loss of wildlife habitat,
- change in terrain ;
- soil pollution ;
- disruption of human-nature interaction; probable displacement of fields.
- modification of the physico-chemical properties of soils;
- loss of local plant species ;
- various nuisances (noise, vibrations, dust) for the local population during the construction and installation of the solar panels.

Potential risks

The various potential risks during the implementation of the project activities are

- risk of injury and illness ;
- risk of noise pollution ;
- risk of air pollution ;
- risk of accidents to workers and the community ;
- fire risks ;
- risks of soil pollution ;
- risks of spills of hazardous materials ;
- risk of electric shock ;
- risk of social conflict with communities.

Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) describes the arrangements for implementing the activities of the remedial action and enhancement, environmental monitoring and surveillance, and capacity building programmes and indicates the overall cost of implementing these programmes.

It aims to ensure that the project activities comply with environmental and social requirements. The overall cost of the ESMP is **fifty-eight million one hundred and fifty thousand** (**58 150 000** FCFA).

Closure/rehabilitation plan ;

The 33kv line will have a lifetime similar to that of the solar power plant. At the end of its life, it must be dismantled and the right-of-way corridor restored. The restoration of the site will consist of restoring the land to a state as close as possible to the initial state before the project was implemented.

The closure and rehabilitation plan aims to restore the project right-of-way to a similar state as before the project intervention.

The specific objectives of the closure and rehabilitation plan are

- rehabilitate degraded soils at the end of the works;
- dismantle all installations (poles, inverters, cables, supports, support foundations, premises, etc.);
- draw up a protocol for the clean-up of the site and the management of the various components of the dismantled line (photovoltaic modules, inverters, cables, supports, etc.).

How the public is consulted

The line project has incorporated the issue of stakeholder participation and consultation. In the process of integrating the project with the population, a monitoring committee for the livelihoods restoration plan has been set up. This committee includes the representative of the promoter, the community relations officer, the administrative and decentralised authorities (prefects and mayors) of Kona and Bana, the deconcentrated technical services of the Environment and Livestock, the customary authorities, the CVDs, the women's associations, the PAPs and the representative of the vulnerable people of the communes concerned. As a reminder, the 2015 Notice had identified 59 PAPs and as part of the update for the current NIES, the number of PAPs has not changed and remains at 59 whose property has been identified and compensated. The project continues to communicate with stakeholders and the population through the social specialist and the CLOs.

As part of the NIES update, a stakeholder consultation was carried out with all stakeholders to ensure a good understanding of the issues, the positive and negative impacts and the environmental and social risks, as well as the various mitigation and compensation measures of the project.

At this meeting the following recommendations were made to the promoter:

- to respect the commitments made to the population and to ensure that they are respected by the service providers;
- ensure that the procedure for recruiting local labour is respected;
- Involve PAPs' representatives in the process of recruiting local labour;
- consider the initial inventory of trees on the line.

INTRODUCTION

Burkina Faso, a landlocked country, has made the development of the energy sector a priority in its sustainable development strategy. The government has therefore made enormous efforts to promote this sector. Despite these efforts by the state, the sector remains marginalised, slowing down the country's socio-economic development. The demand for electrical energy is increasing in view of the growing demography and the need for investors.

Energy is fundamental to a country's development as a factor in improving people's living conditions, but also because it reduces a country's dependence on hydrocarbons and stimulates economic growth.

It is in this context that the construction project of the 33kV transmission line is initiated within the framework of the Zina solar power plant project located in the commune of Kona/Mouhoun Province (in the West of Burkina Faso). This line, 7.8 km long, will link the village of Zina to that of Wona and will allow the transport and connection to the national grid of the energy produced by the 22.4 MWac photovoltaic plant.

In order to comply with the environmental legislation and regulations in force, the line project was subject to an Environmental and Social Impact Notice in 2016. This project had obtained a decree n°2015-199 /MERH/CAB issuing an environmental feasibility opinion for the project of realization of the 33kv electric transmission line from the Zina photovoltaic power plant to the Wona transformer station for the benefit of the WINDIGA Energie company on 24 November 2015.

Due to a number of technical and financial difficulties, the promoter has not been able to undertake the construction activities of the line. Having resolved these difficulties, the promoter wishes to undertake the construction activities of the electric transmission line in accordance with the provisions of Article 33 of Decree No. 2015-1187/PRES-TRANS/PM/MERH/MATD/MME/MS/ MARHASA/MRA/MICA/MHU/MIDT/MCT of 22 October 2015 on the conditions and procedures for the completion and validation of the strategic environmental assessment, the study and the environmental and social impact notice, which stipulates that: "In case of a favourable opinion, the promoter has three (03) years". This provision obliges the promoter ZINA SOLAIRE SA to update the study, and it is in this context that the present Environmental and Social Impact Notice. The report is structured around the following points in accordance with Annex 2 of Decree No. 2015-1187/PRESTRANS/PM/MERH/MATD/MAE/MARHASA/MRH/MICA/MHU/MIDT/MCT of 22 October 2015 on the conditions and procedures for conducting and validating the strategic environmental assessment, the study and the environmental and social impact notice:

- non-technical summary ;
- policy, legal and institutional framework ;

- project description ;
- generalities and methodology ;
- description of the initial state of the environment ;
- analysis of project variants ;
- identification and assessment of the environmental impacts of the project ;
- environmental risk assessment of the project ;
- environmental and social management plan ;
- conclusion;
- closure/rehabilitation plan ;
- modalities of public consultation and participation.

1 POLITICAL, LEGAL AND INSTITUTIONAL FRAMEWORK

1.1 Legal framework

Constitution of 02 June 1991

The preamble of the constitution of Burkina Faso adopted on 2 June 1991 and revised by law n°023-2012/AN of 18 May 2012 mentions the absolute need to protect the environment. The following articles are particularly noteworthy:

- Article 14: enshrines natural resources as national heritage and their rational use for the improvement of living conditions in the following terms: "the sovereign people of Burkina Faso are aware of the absolute necessity to protect the environment" and that "natural wealth and resources belong to the people. They are used for the improvement of their living conditions";
- Article 29: recognises the citizen's right to a healthy environment. It thus places obligations on the State towards citizens. However, in return for these rights, Article 29 of the Constitution places an obligation on citizens to protect, defend and promote the environment;
- Article 30: recognises another important right of the citizen, that of initiating or joining a collective action in the form of a petition against acts that damage the environment or the cultural or historical heritage.

The present study is concerned with the preservation of natural resources and the risk of environmental pollution, and must therefore comply with the provisions of the constitution relating to the protection of the environment and the improvement of the living conditions of the populations living in the vicinity of the sub-project.

Environmental Code of Burkina Faso

It was adopted by law N°006-2013/AN of 02 April 2013, the Environment Code is devoted to the Strategic Environmental Assessment (SEA), the Environmental Impact Assessment and Notice (EIA, NIE) in its articles 25 to 34. According to Article 25 of this law, activities likely to have significant impacts on the environment are subject to the prior opinion of the Minister in charge of the environment. The opinion is established on the basis of a Strategic Environmental Assessment (SEA), an Environmental Impact Assessment (EIA) or an Environmental Impact Statement (EIS).

Forestry Code of Burkina Faso

Adopted by loin°003/2011/AN of 05 April 2011 *"The purpose of the code is to set the fundamental principles of sustainable management and development of forest, wildlife and fisheries resources"* (Article 1). Paragraph 2 of article 4 stipulates that: *"...the sustainable management of these resources is a duty for all. It implies the respect of the regulations in force concerning the protection, exploitation and*

development of the forest, wildlife and fisheries heritage'. To this end, Article 48 of the law states that*: 'any major work involving land clearing is subject to prior authorisation by the Minister in charge of forests on the basis of an environmental impact assessment'.* Any major clearing operation must be reported to the forestry administration so that appropriate measures can be taken to preserve the vegetation.

- **Agrarian and land reorganisation**

It is governed by the provisions of law n°034-2012/AN of 02 July 2012 on Agrarian and Land Reorganisation (RAF).

It determines, on the one hand, the status of land in the national land domain, the general principles governing the planning and sustainable development of the territory, the management of land resources and other natural resources as well as the regulation of real property rights and, on the other hand, the orientations of an agrarian policy.

The provisions of the law relevant to the project are :

The principles of sustainable land use planning and development, in addition to the general principles set out in Article 3 above, are

-the principle of conservation of biological diversity;

-the principle of water and soil conservation. (Article 40)

- **Water Management Act**

Law N°002-2001/AN of February 6, 2001, a guideline law on water management in Burkina Faso, was adopted in 2001 and replaces the Water Code. Articles 24, 26 and 27 indicate that hydraulic developments and, in general, installations, works and activities carried out by any natural or legal person, public or private, and likely to present dangers for public health and safety, to reduce water resources, to substantially modify the level, the flow mode or the regime of water, or to seriously affect the quality or diversity of aquatic ecosystems, are subject to prior authorisation or declaration.

- **Rural land tenure**

Article 2 of the law specifies that it applies to rural land located within the administrative boundaries of communes, including land in villages attached to urban communes, and intended for production and conservation activities.

Article 5 states that rural land is divided into the following categories

- State rural land ownership;
- rural land ownership by local authorities ;
- rural land of private individuals.

Article 6 specifies that rural land tenure is the legitimate de facto power exercised over rural land with reference to local land use and customs, and Article 34 completes that rural land tenure may be exercised individually or collectively.

This law on rural land tenure defines local land charters as 'local conventions inspired by local customs, practices or land uses, drawn up at the local level and aiming, within the framework of the application of this law, to take into consideration the diversity of ecological, economic, social and cultural contexts in rural areas' (art. 6).

Local land charters contain four headings (art. 13). The modalities of access to and use of rural land specify the nature of the land rights granted to each user (temporary, permanent) and all local land uses (inheritance, loan, transfer, lease, sale).

These legislative and regulatory texts highlight the commitment of each ministry to sustainable development and, more specifically, the need to take the environment into account during the execution of projects or programmes.

- **General code of local authorities**

Law N°055-2004/AN of 21 December 2004 on the General Code of Territorial Communities stipulates that territorial communities have their own land domain, consisting of the parts of the national land domain transferred as property by the State. The development and management of the transferred land is the responsibility of the communes, with prior authorisation from the supervisory authority (Article 84). This justifies the need to involve the communes directly concerned by the present project.

- **Water Management Policy Law**

Law No. 002-2001/AN on the orientation law on water management was adopted on 8 February 2001. It defines the main orientations through which the National Policy for Sustainable Development (PNDD) will be implemented. It sets out the essential rules and principles for the sustainable management of water resources in Burkina Faso. The project must avoid damaging the quality of water in accordance with the provisions of Article 24, which stipulates that "Hydraulic developments and, in general, installations, works and activities carried out by any natural or legal person, public or private, are subject to authorisation or declaration and entail, as the case may be :

- surface or groundwater withdrawals, whether or not returned;
- a change in water level or flow pattern;
- direct or indirect, chronic or episodic spills, flows, discharges or deposits, even if they are not polluting.
-

Law on the Orientation of Pastoralism

Article 1 of Law n°034-2002/an on the orientation law on pastoralism in Burkina Faso sets out the principles and modalities for the sustainable, peaceful and integrated development of pastoral, agropastoral and sylvopastoral activities.

Article 28 of this law states that 'in application of the provisions relating to the water regime, pastoralists have the right to access water points in order to water their animals. Access to water for watering animals shall be in accordance with this law and the law on water management. This article adds that the pastoral use of water resources in times of drought is done in compliance with the measures provided by the government in application of the provisions of the water regime. The conditions of access to water are spelled out in Articles 29 to 35. Pollution or dumping of toxic products in an animal watering point is prohibited (Article 29).

Article 32 of this law specifies that the conditions for the exploitation of the surroundings of watercourses and watering places are to be respected. Indeed, clearing and cultivation of land in the immediate vicinity of animal watering points are prohibited. A joint decree of the Ministers of Agriculture, Livestock, Forestry and Water specifies the distances to be respected for the cultivation of land located near watercourses and water points.

In view of the recurrent conflicts encountered in the management of pastoralism, the development of the future project will have to take account of pastoral areas which will have to be compensated for if they exist.

Health Code

Law No. 23/94/ADP of 13 May 1994 on the Public Health Code in Burkina Faso defines in its fundamental principles *"the rights and duties inherent in the protection and promotion of the health of the population",* as well as *"the promotion of environmental health"*. In addition, the code deals with several other matters in the field of the environment, including atmospheric pollution, toxic waste, noise and various nuisances, as well as the sanctions incurred for non-compliance with the regulatory provisions in force.
The implementation of the project will take into account the provisions made in this code.

Public Health Code

Law n°0022-2005/AN of 24 May 2005, on the public hygiene code in Burkina Faso, in its article 3 mentions that*: "Any natural or legal person who produces or holds waste under conditions likely to produce harmful effects on the soil, flora or fauna, to degrade the landscape, to pollute the air or water, to generate noise or odours and generally to harm human and animal health and the environment is required to ensure or*

have ensured the elimination of such waste in accordance with the provisions of this law under conditions likely to avoid the said effects.

As for Article 106, it makes the communes responsible by mentioning that: *"each decentralised community is required to set up a treatment system for its hazardous industrial or commercial waste. The technical conditions of the treatment system are set by regulation*. In addition, Article 124 specifies that: *'Noise emissions from vehicles and other motorised equipment must comply with the regulations in force'.*

As hygiene is an essential parameter for the well-being of the population, the project takes into account the provisions contained in the Public Hygiene Code.

- **Labour Code**

Law 28-2008/AN of 13 May 2008 on the Labour Code in Burkina Faso provides a framework for working conditions through its provisions on the prohibition of discrimination in employment and work, as well as the worst forms of child labour (Articles 149 and 153). Also, according to Article 36 of the same law, the employer is obliged on the construction site *"to comply with the health and safety conditions set out in the regulations in force".*

1.1.1 National regulatory framework

For the conduct of the Environmental and Social Impact Assessment, a number of regulatory texts at national level have been listed:

- Decree N°2015-1187/PRES-TRANS/PM/MERH/MATD/MME/MS/MARHASA/MRA/MICA/MHU/ MIDT/MCT of 22 October 2015 on the conditions and procedures for carrying out and validating the strategic environmental assessment, the study and the environmental and social impact notice;
- Decree n°2015-1470/PRES-TRANS/PM/MEF/MARHASA of 7 December 2015 determining the rates and collection methods of the raw water withdrawal tax;
- Decree N°2004-581/PRES/PM/MAHRH/MFB of 15 December 2004 - definitions and procedure for the delimitation of protection areas for water intended for human consumption;
- Decree No. 2005-515/PRES/PM/MAHRH of 6 October 2005 on procedures for authorising and declaring installations, structures, works and activities;
- Decree n°98-322/PRES/PM/MEE/MCIA/MEM/MS/MATS/METSS/MEF of 28 July 1998 on the conditions of opening and operation of dangerous, unhealthy and unsuitable establishments;
- Decree n°2015-1203/PRES-TRANS/PM/MERH/MJDHPC of 28 October 2015 on the organisation and conduct of environmental inspections;
- Decree n°2015-1204/PRES-TRANS/PM/MERH/MME/MS/MARHASA/MICA/ MIDT/MRSI of 28 October 2015 on the management of radioactive waste;

- Decree N°2015-1205/PRES-TRANS/PM/MERH/MEF/MARHASA/MS/MRA/MICA/MME/MIDT/MATDC/ of 28 October 2015 on the standards and conditions for the discharge of waste water;
- Order n°2004-019/MECV of 7 July 2004 determining the list of forest species benefiting from special protection measures;
- Decree No. 98-321/PRES/PM/MEE/MIHU/MATS/MEF/MEM/MCC/MCIA of 28 July 1998 on the regulation of landscaping in Burkina Faso;
- Decree n°2007-408/PRES/PM/MRA/MAHRH/MATD of 03 July 2007 on the conditions for exploiting water resources for pastoral purposes: this text specifies the characteristics of access corridors (width of at least 100 metres) and the safety zone (radius of at least 100 metres) around livestock watering points (ponds, wells, boreholes, etc.);
- Decree No. 2014-481/PRES/PM/MATD/MEF/MHU of 03 June 2014 determining the conditions and modalities of application of law No. 034-2012/AN of 02 July 2012 on agrarian and land reorganisation in Burkina Faso;
- Decree No. 2001-251/PRES/PM/MS of 30 May 2001 adopting the documents entitled "Strategic framework for the fight against HIV/AIDS 2001-2005" and "Plan of action to fight HIV/AIDS in Burkina in 2001";
- Decree No. 2001-731/PRES/PM/MJDH of 28 December 2001 on the adoption of the policy and action plan for the promotion and protection of human rights;
- Order No. 2009-20/MRA/SG/DGEAP of 8 June 2009 on standards for cattle tracks, which specifies the methods and criteria to be respected for the fixing of track markers;
- Decree N°2004-262/PRES/PM/MECV/MAHRH/MESSRS/MRA/MCPEA/MJGS of 18 June 2004 on the adoption of national rules on safety in biotechnology.

1.2 Policy framework

In the context of environmental protection, Burkina Faso has adopted a wide range of relevant policies, strategies and legal instruments, the main points of which are presented in this Environmental Impact Statement.

National Economic and Social Development Plan (PNDES II) 2021-2025

The National Economic and Social Development Plan (PNDES II), aims at a democratic, stable, prosperous and just nation for all, through a structural transformation of the national economy to put it on a high growth trajectory, while profoundly reducing social inequalities and rural and urban poverty.

Based on these foundations and considering the challenges of the structural transformation of the national economy, the RND's vision for 2025 is as follows *"Burkina Faso, a nation of solidarity, democracy,*

resilience and peace, transforming the structure of its economy to achieve strong, inclusive and sustainable growth".

To realise its vision, the RND 2021-2025 has set itself the overall objective of restoring security and peace, strengthening the nation's resilience and structurally transforming the Burkinabe economy for strong, sustainable and inclusive growth.

- **Energy Sector Policy 2014-2025**

Adopted in November 2016, the main vision of this policy is to rely on endogenous resources and regional cooperation to ensure universal access to modern energy services. Achieving this vision will result in universal access to energy services through, among other things, supplying the country with energy at lower cost, developing the supply of modern energy in rural areas, accessible to all sections of the population and respectful of the environment, and developing the use of renewable energy sources.

- **National Gender Policy (NGP)**

The general objective of the National Gender Policy is to promote participatory and equitable development of men and women (by ensuring equal and equitable access and control over resources and decision-making spheres) in respect of their fundamental rights. The project, in its design and implementation, is sensitive to the living conditions of vulnerable groups in accessing energy.

- **National Spatial Planning Policy (PNAT), 2006**

Adopted by decree n° 2006-362/PRES/PM/MEDEV/MATD/MFD/MAHRH/MID/MECV of 20 July 2006. It constitutes an orientation guide for planning studies and actors acting on the ground, in order to translate the strategic orientations contained in the national prospective study 2025 into spatial terms.

- **Health development policy**

The main aim of Burkina Faso's national health policy is to promote the well-being of the population. This goal is defined by the vision of a national health system that must be an integrated system, guaranteeing health for all with solidarity, equity, ethics and offering quality promotional, preventive, curative and rehabilitative care, accessible geographically and financially, with the effective and responsible participation of all actors.

Thus, the national health policy is implemented through National Health Development Plans (NHDP) planned by decade.

The general objective of the second PNDS 2011-2020 is to improve the state of health of the population in a context marked by the imperative of achieving the MDGs and by the national development

perspectives defined through the PNDS 2015-2020, the National Territorial Development Plan (SNAT), and the National Prospective Study "Burkina 2025".

National policy for securing land in rural areas

The PNSFR adopted by decree N°2007-610/PRES/PM/MAHRH of 04 October 2007, which adopts the National Policy on Land Tenure Security in Rural Areas (PNSFMR), formulates for 10 years (2007-2017) the directions to be given to public action in the field of land tenure security for rural development actors. It aims to ensure that all rural actors have equitable access to land, that their investments are guaranteed and that land disputes are managed efficiently, in order to contribute to poverty reduction, the consolidation of social peace and the achievement of sustainable development. Its objectives are therefore to

- guarantee the legitimate right of access of all rural actors to land, in a dynamic of sustainable rural development, poverty reduction and promotion of equity and legality;
- to contribute to the improvement of conflict prevention and resolution related to land and natural resource management;
- to help create the basis for the viability and development of local authorities by providing them with their own land resources and effective management tools;
- increase the effectiveness of state and local government services in providing an appropriate and effective public service for securing land in rural areas;
- promote the effective participation of grassroots actors and civil society in the implementation, monitoring and evaluation of the PNSFMR.

The adoption on 16 June 2009 of Law 034/2009/AN is part of the implementation of this policy.

National public health policy

Approved by the Government in March 2003, the PNHP aims to, among other things (i) prevent diseases and poisoning.

It is also important to mention that Burkina Faso has had a sanitation sub-sector strategy since 1996, the objectives of which are to safeguard the natural and human environment.

National Environmental Action Plan (NEAP)

The elaboration of the national environmental policy is part of a context marked by the political will to create a reference framework for the consideration of environmental issues in development policies and strategies. This has already been reflected in the adoption and implementation of several frameworks, instruments and tools.

In 1991, Burkina Faso adopted a National Action Plan for the Environment (PANE), which was revised in 1994 following the United Nations Conference on the Environment held in Rio de Janeiro
in 1992. This concept, although logical and allowing all aspects of environmental preservation to be covered, proved insufficient from the point of view of intersectoral coordination and monitoring of its implementation. Indeed, the practical implementation of each of the NAP programmes was the responsibility of several ministerial departments, which are more concerned with the implementation of sectoral strategies developed within them than with those relating to the NAP programmes.

- **National Action Plan of the Sustainable Energy for All Initiative "SE4ALL" 2030 ;**

Burkina Faso recognises access to modern energy services as an essential component of the government's energy policies and an indispensable element. Also, the Government has adhered to the United Nations Secretary General's "Sustainable Energy for All (SE4ALL) " initiative which aims to achieve, by 2030, three major goals:

- ensure universal access to modern energy services;
- double the rate of energy efficiency improvement ;
- double the share of renewable energy in the global energy mix.

The objective of doubling energy efficiency is not operational for a country like Burkina Faso where this potential is still very little exploited. Similarly, Burkina Faso's contribution to doubling the share of renewable energy in the energy mix is difficult to quantify. It will be replaced by a target in terms of RE penetration in the electricity mix.

- **National Climate Change Adaptation Plan (NAP) Horizon 2050 ;**

The content of the NAPs has been reviewed and a new programming framework called the National Climate Change Adaptation Plan (NAP) has been adopted. The vision of the NAP is to manage economic and social development more effectively through the implementation of planning mechanisms and measures that take into account resilience and adaptation to climate change by Burkina Faso
This new vision has the advantage of taking greater account of climate change .

1.2.1 International regulatory framework

- **International Conventions**

Several major international conventions on environmental protection have been ratified by Burkina Faso. These include

Table 1 Main conventions related to the project

Title of the agreement	Links to the project	Date of ratification
Convention on Biological Diversity	Article 14 of the Convention provides that each Contracting Party shall, as far as possible and as appropriate, : - adopt procedures to require the assessment of the environmental impacts of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding and minimising such effects, and, where appropriate, allow for public participation in such procedures ; - take appropriate steps to ensure that the environmental effects of its programmes and policies that are likely to have significant adverse effects on biological diversity are duly taken into account.	02-09-1993
United Nations Framework Convention on Climate Change	As mining activities have the potential to increase the emission of greenhouse gases, and thus to contribute further to the concentration of greenhouse gases in the atmosphere, the Convention calls for practices to prevent dangerous anthropogenic interference with the climate system.	02-09-1993
United Nations Convention to Combat Desertification	The project will have to take measures against abusive deforestation and the protection of local species in accordance with the requirements of the convention	26-01-1996
Vienna Convention for the Protection of the Ozone Layer	The products and substances to be used in the project should be chosen so as not to further destroy the ozone layer	28-06-1988
Paris Convention concerning the Protection of the World Cultural Heritage	As the subsoil of Burkina Faso is very little explored, the project activities, in that they will consist of excavations, could lead to the discovery of priceless hidden cultural and natural heritage of universal significance. The Convention will be applied in dealing with such situations.	03-06-1985
African Convention on the Conservation of Nature and Natural Resources	The Contracting States shall be under an obligation (i) to conserve and improve the soil, and shall pay particular attention to combating erosion and land measurement; (ii) to conserve ground and surface water, and shall endeavour to ensure an adequate and continuous supply of suitable water for the population; (iii) to protect the flora; (iv) to give special protection to animal and plant species which are threatened with extinction or which may become so, and to the habitat necessary for their survival; (v) to protect the environment and the health of the population; (iii) the protection of flora; (iv) the special protection of animal and plant species threatened with extinction or likely to become so, as well as the habitat necessary for their survival; (v) the conservation, rational use and development of wildlife and their environment. Measures will be taken by the project to ensure compliance with these obligations.	28-09-1969

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Article 4, which deals with the obligations of the parties, provides: To ensure that the generation of hazardous wastes and other wastes within the country is minimised; To ensure the provision of adequate disposal facilities, which shall, as far as practicable, be located within the country, for the environmentally sound management of wastes; To ensure that those engaged in the management of hazardous wastes or other wastes within the country take the necessary measures to prevent pollution resulting from such management.	Other waste
Bamako Convention on the Ban of the Import into Africa of Hazardous Wastes and on the Control of Transboundary Movement and Management of Hazardous Wastes within Africa	Article 4 of the Convention sets out the obligations of each party in relation to the import of hazardous waste into the sea, inland waters and waterways, and the generation of waste in Africa. The promoter will ensure that Burkina Faso's commitments in this area are respected by making sure at all times that no material used in the project works is prohibited by this convention or by national legislation. Appropriate measures will also be taken in conjunction with the competent bodies if prohibited pollutants are found during the works.	20-09-1993
Bern Convention on the conservation of wild fauna and flora and their natural habitats	Article 4, paragraph 1: "Each Contracting Party shall take the appropriate legislative and regulatory measures necessary to protect the habitats of wild species of flora and fauna, in particular those listed in Annexes I and II, to safeguard natural habitats threatened with extinction.	28-09-1969
Stockholm Convention on Persistent Organic Pollutants	A specific legal instrument to limit the lists of products that accumulate in terrestrial and aquatic ecosystems and have the potential to enter humans through the food chain. The mine complies with measures taken to reduce the total volume of anthropogenic discharges of certain substances such as: Aldrin; Chlordane; Dieldrin; Endrin; Heptachlor; Hexachlorobenzene; Mirex; Toxaphene; Polychlorinated biphenyls	20-07-2004
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	aims to promote shared responsibility and cooperation among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to the environmentally sound use of such chemicals by facilitating the exchange of information on their characteristics, by establishing a national decision-making process for their import and export, and by communicating such decisions to Parties	11-11-2002

- **The International Finance Corporation (IFC) Performance Standards**

The IFC's Sustainability Framework sets out the Corporation's strategic commitment to promoting sustainable development, and is an integral part of the institution's approach to managing risk. The Framework consists of the IFC's Environmental and Social Sustainability Policy, the corresponding Performance Standards and the Access to Information Policy. The Environmental and Social Sustainability Policy describes the IFC's commitments, roles and responsibilities in this area. The Access to Information Policy represents the IFC's commitment to promoting transparency and good governance in its operations, and sets out the conditions for disclosure of information required of the IFC in connection with its investments and advisory services.

The Performance Standards are intended to provide guidance to clients in identifying risks and impacts, and are designed to help them avoid, mitigate and manage risks and impacts so that they can continue to operate in a sustainable manner. In this regard, they also cover clients' obligations to engage with stakeholders and communicate information about project-level activities. The IFC requires its direct investment clients (including project finance and corporate finance provided through financial intermediaries) to apply the Performance Standards to manage environmental and social risks and impacts in ways that enhance development opportunities.

The eight (8) Performance Standards (PS) define the criteria that a client must meet over the life of an IFC investment:

Table 2 Requirements of the International Finance Corporation (IFC) Performance Standards

PERFORMANCE STANDARDS	SUMMARISED REQUIREMENTS
Assessment and management of social and environmental risks and impacts	Implement a Social and Environmental Management System (SEMS) to ensure the continuation of a dynamic and continuous process that involves meaningful communication between the client, its agents, the local communities directly affected by the project and, where appropriate, other stakeholders.
Workforce and working conditions	Promote sound management-worker relations and working conditions in line with IFC requirements and applicable national laws (e.g. fair treatment of employees, safe and healthy working conditions, tangible benefits, avoidance of forced labour). Provide workers with a grievance mechanism.
Resource efficiency and pollution prevention	Take into account the environmental conditions and apply the most appropriate resource efficiency and pollution prevention principles and technologies that are technically and financially practical to avoid or, where this is not possible, limit negative impacts on human health and the environment. Adapt the principles and techniques applied during the life of the project to the hazards and risks associated with the nature of the project and in line with international good practice in the sector.
Health, safety and security of communities	Prevent or minimise risks or effects on the health, safety and security of communities that may result from project-related activities, with particular attention to vulnerable population groups.
Land acquisition and involuntary resettlement	Anticipate and avoid, or where avoidance is not possible, limit negative social and economic impacts resulting from land acquisition or restrictions on land use by: i) providing compensation for loss of assets at replacement cost and ii) ensuring that resettlement activities are accompanied by appropriate provision of information, consultation and informed participation of those affected. Improve or at least restore the livelihoods and living conditions of displaced people. Establish a grievance resolution process.

Biodiversity conservation and sustainable management of living natural resources	Protect and conserve biodiversity; maintain the benefits derived from ecosystem services; promote sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities. Requirements based on the Convention on Biological Diversity.
Indigenous populations	Ensure that the development process promotes full respect for the human rights, dignity, aspirations, cultures and natural resource-based livelihoods of indigenous peoples. Anticipate and avoid negative impacts of projects on indigenous peoples' communities or, if this is not possible, reduce, restore and/or compensate for such impacts. Provide opportunities for indigenous peoples to share in the benefits and outcomes of sustainable development in a culturally appropriate manner. Establish and maintain an ongoing relationship with indigenous peoples affected by a project throughout the life of the project based on consultation and informed participation. Obtain the free, prior and informed consent of indigenous peoples where the circumstances described in this Performance Note exist. Respect and preserve the culture, knowledge and practices of indigenous peoples.
Cultural heritage	Protect cultural heritage from the negative impacts of project activities and support its conservation. Promote the equitable distribution of benefits from the use of cultural heritage

1.3 Institutional framework

The management of environmental policy has been entrusted to a ministerial department. However, given the cross-cutting nature of the field, a large number of actors, including ministerial departments whose activities have an environmental impact, are involved in its protection.

- **Ministry of Environment, Energy, Water and Sanitation**

It is the main institutional guarantor for environmental management in Burkina Faso. The Ministry comprises five main structures in charge of environmental issues and natural resource management on the one hand and the EIA/EIS procedure on the other: the Directorate General for Environmental Preservation (DGPE), the Directorate General for Water and Forests (DGEF), the Directorate for Institutional Development and Legal Affairs (DDIAJ) and the National Environmental Assessment Agency (ANEVE), 13 regional directorates, 45 provincial directorates and the departmental environmental services.

- **National Environmental Assessment Agency**

At the operational level, ANEVE will ensure the examination and approval of the environmental classification of the sub-projects as well as the approval of the NIES and participates in external monitoring, particularly with regard to pollution and nuisances, and the improvement of the habitat and living environment.

- **The Directorate of Electrical Energy is responsible for :**

- collect data on electrical energy, in collaboration with the sub-sector actors;
- Contribute to the development of any electrification policy in the country in collaboration with the departments of the ministries concerned;
- to contribute to the development of any interconnection policy;
- to propose administrative, financial and technical measures to ensure the coverage of the national territory in electrical energy;
- to centralise the results of the various electrification works and any other document that the services and organisations, companies and individuals are likely to acquire in the course of their activities;
- to keep an updated technical file of all the projects in progress in the country with an electricity component;
- to control the infrastructure related to the production, transmission and distribution of electrical energy;
- to contribute, in conjunction with the relevant departments of the ministries concerned, to the setting and regulation of electricity tariffs.

- **National Renewable Energy Agency**

In application of article 12 of law n°14 AN of 20 April 2017 on electricity regulation in Burkina Faso, ANEREE's mission is to promote, encourage, coordinate, facilitate and carry out any operation aimed at developing renewable energy and energy efficiency.

- **Minister of Agriculture, Animal Resources and Fisheries**

The Ministry of Agriculture, through the General Directorate of Land Tenure, Training and Organisation of the Rural World (DGFFOMR), is responsible for carrying out actions to secure rural land tenure and for contributing to studies and research for the sustainable management of land resources.

Within the framework of the sub-project, the DGFFOMR can be a key player in contributing to the resolution of land conflicts and the purging of customary rights.

- **Ministry of Territorial Administration, Decentralisation and Security**

This ministry, through the General Directorate of Local Authorities, is responsible for assisting and supervising local authorities in the areas of planning, equipment and local development.

In this respect, the commune of Kona is called upon to contribute to the implementation of the project.

- **Other actors involved**

The other actors involved in the project are, among others, the company in charge of carrying out the activities, NGOs or associations.

2 PROJECT DESCRIPTION

2.1 Presentation of the promoter

The promoter of this project is ZINA SOLAIRE SA, a company incorporated under Burkinabe law and owned by AMEA POWER based in Dubai. AMEA POWER has solar projects all over Africa. The Deputy Managing Director of the company is M. Assane YAMEOGO.

Tel: 00226 70 45 49 85, postal address: 14 BP 318 Ouaga ZAD Burkina Faso; sector 13, Avenue Babanguida, porte 333.

2.2 Location of the project

The 33kV power line that will be built to transport the energy produced by the solar power plant in Zina runs alongside the village of Dagouna to the Wona transformer station. It should be noted that the route chosen has been optimised to avoid crossing villages and also to minimise the negative impact on the environment. This 33 kV line with a length of 7.8 km will carry energy to the 90kV transformer station that was built in Wona by SONABEL. A corridor 14 metres wide and 7.8 km long will be opened along the entire route of the line, covering an area of 10.92 ha.

It should be noted that the 90 kV substation will serve, among others, the SEMAFO mine via a 90 kV power line that will link Pâ to Wona.

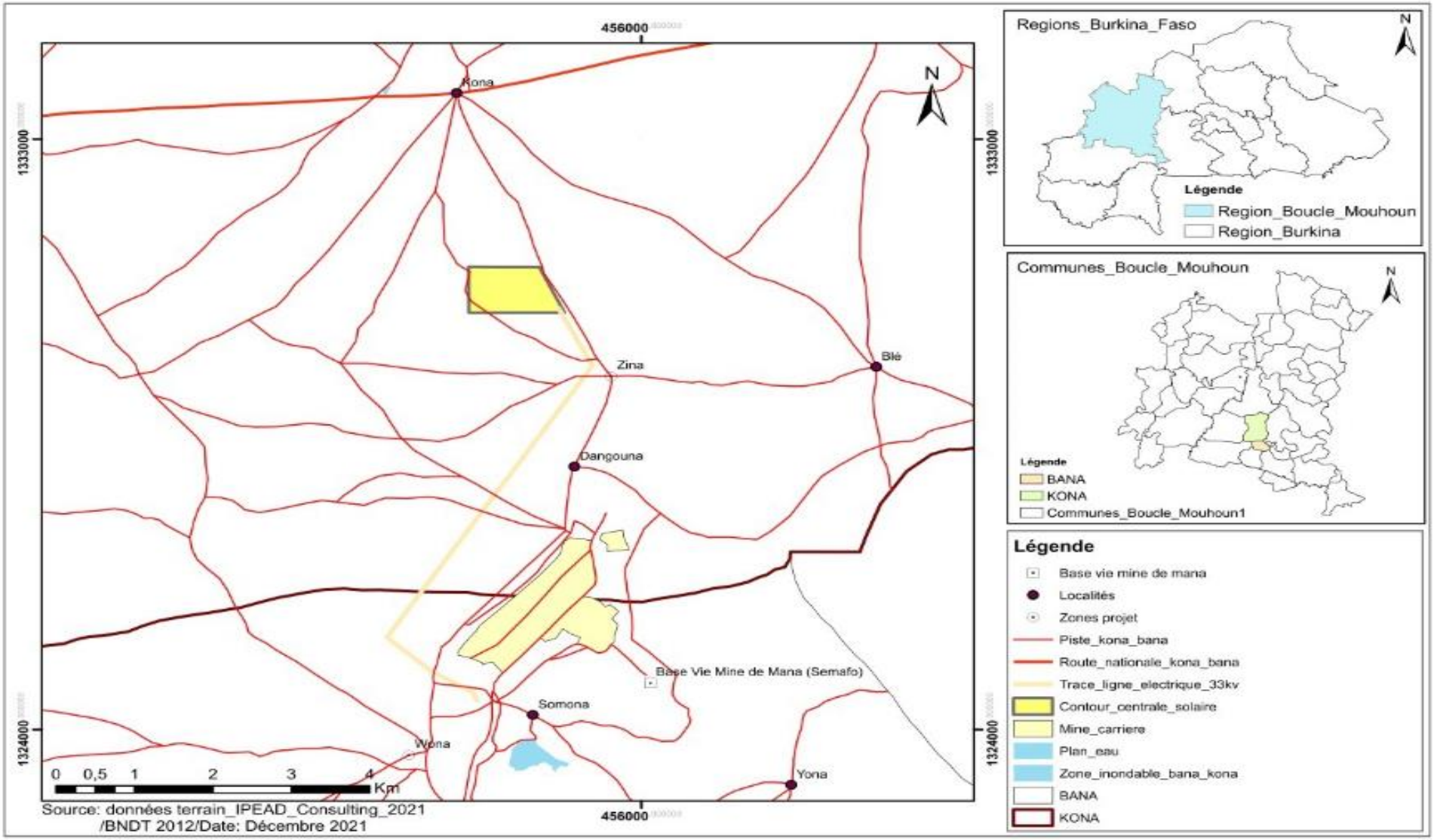
The table below shows the geographical coordinates of the 33kv power line route.

Table 3 Geographical coordinates in UTM WGS 84, Zone 30P

Summits	X	Y	Comments
PS01	453919	1324412,97	Wona transformer station
PS02	453851	1324573,97	
PS03	453318	1324892,97	and crosses the departmental road, passing through the
PS04	452757	1325407,97	Near the Kona-Wona road
PS05	455378	1329545,97	Side of the village of Zina
PS06	454939	1330436,97	60 m from the departmental road Kona-Wona.
PS07	454648,01	1330580,98	Connection at the solar power plant

Source: Powerline NIES 2016

Map 1 Location of the power line route



2.3 33kv Transmission Line Project Description

The main activities to be carried out in the context of the construction of the 33 kV transmission line are as follows

- the opening of a corridor of 7m on either side of the voltage line, i.e. a width of 14 metres;
- the installation of a 228mm AAAC phase conductor line[2] with a fibre optic guard cable type OPGW;
- the installation of 88 steel posts with concrete foundations, i.e. 4xHEB 220 single, 3xHEB 220 double, 68xHEB 180 single, 5xHEB 180 double.

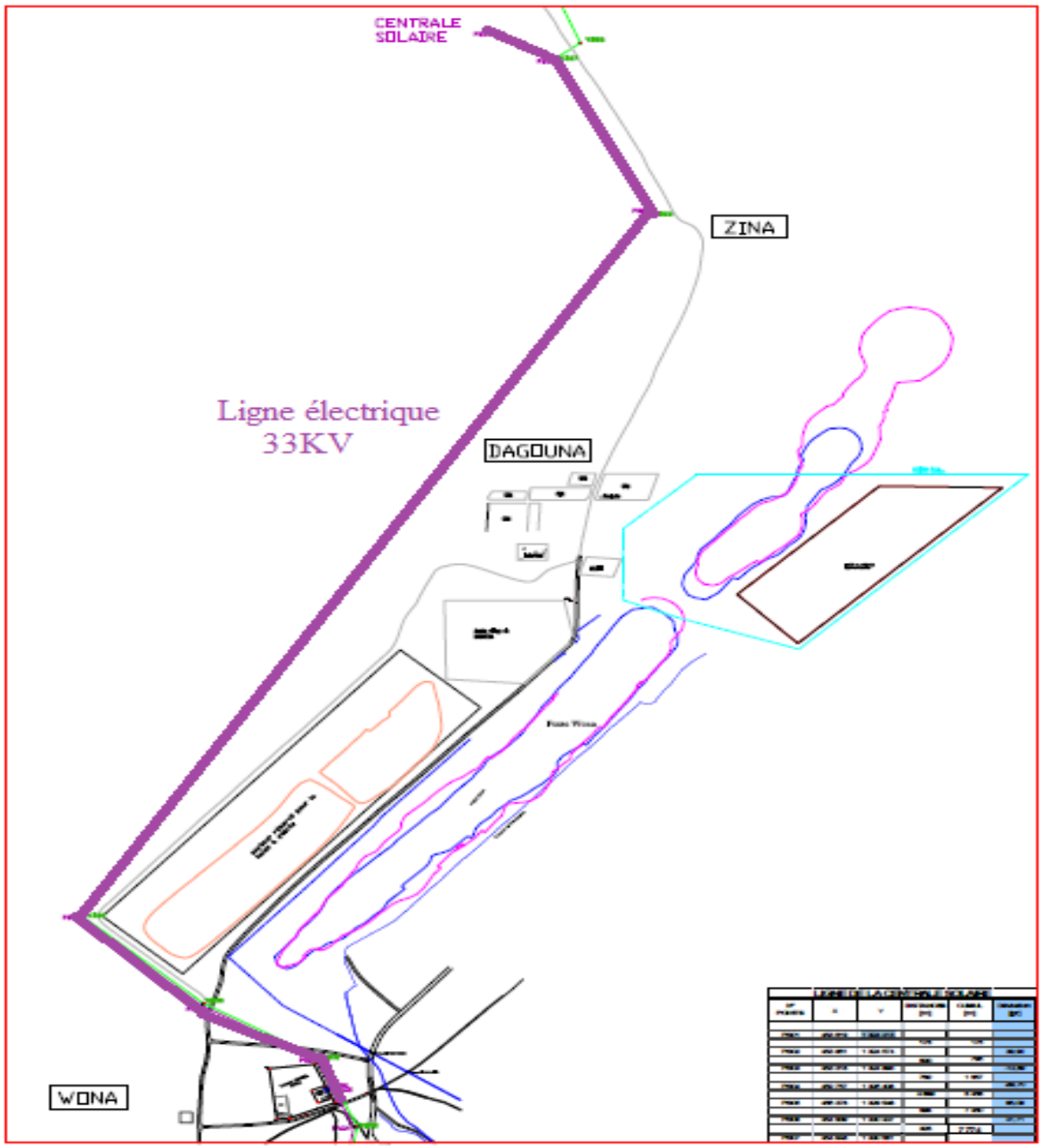


Figure 1Route of the 33kV transmission line from Zina to Wona
Source: NIES power line data 2016

2.3.1 Construction method

The work in the pre-construction period is essentially the delimitation and demarcation of the axis in the centre of the line in a first step and in a second step the acquisition of the project's right-of-way surfaces. As noted above, the route has been optimised. The construction of the line will be carried out in several stages:

- pruning and felling of trees within the line's right-of-way and fixing the location of the feet of each pole;
- excavation and installation of the posts (setting and concreting of the post bases);
- fixing the armaments, pulling the electric cables and the guard wire will continue the work.

Construction equipment is also generally used. These are mainly two trucks for transporting materials, light cranes for lifting poles and backloaders for site development and access.

2.3.2 Main equipment

- **The posts**

For 33 kV overhead lines, SONABEL generally uses steel HEB poles. Their function is to support and maintain the conductors at a sufficient distance from the ground and from obstacles. As the cables are bare, this ensures safety and insulation from the ground. The contact of a person with the steel does not pose a health hazard.

- **Insulators**

Insulation between the conductors and the pylons is provided by insulators. Historically, these were made of glass and ceramic. Nowadays, glass and ceramics are increasingly replaced by synthetic materials. These composite materials, like other materials, are safe for human contact. They are combined with each other to form insulator chains.

- **The drivers**

The electric current is carried in conductors. Since electrical energy is transported in three-phase form, there will be at least three conductors per line. Copper conductors are used less and less. Conductors made of aluminium-steel alloys (type AAAC) are generally used. Contact with aluminium has no negative impact on health.

- **Guard cable**

Guard wires do not carry current. They are located above the conductors. They act as lightning conductors above the line, attracting lightning strikes and preventing the conductors from being struck by lightning. They are usually made of steel-aluminium. In the centre of the guard cable a fibre optic cable is sometimes placed, which is used for the operator's communication.

- **Transformer station**

The line will be connected to SONABEL's transformer station, which was built in 2014 as part of the 90kV line project linking Pâ to Wona.

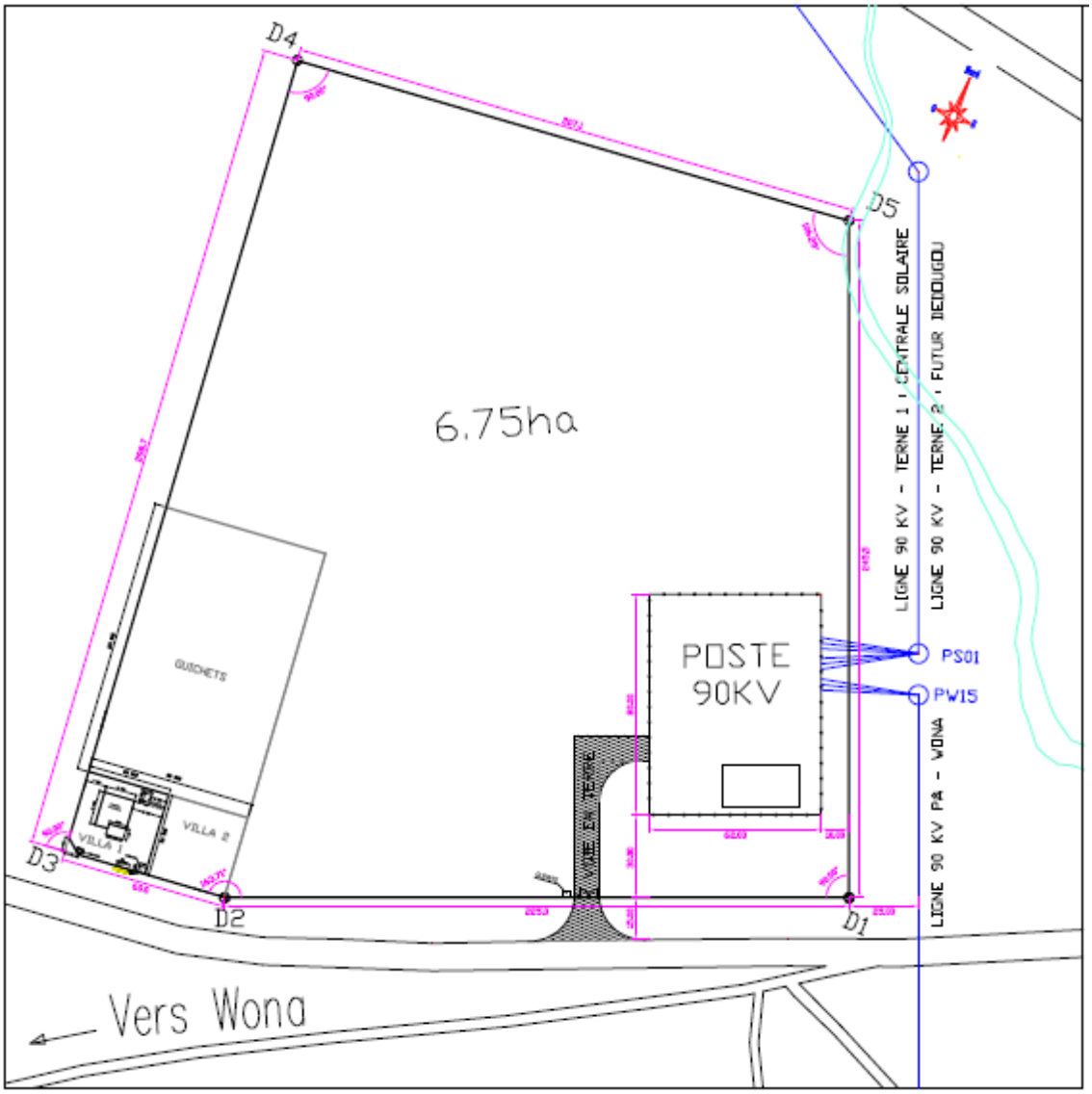


Figure 2 : 90/33kV transformer station in Wona

Source: NIES power line 2016

3 DESCRIPTION OF THE INITIAL STATE OF THE ENVIRONMENT

As part of the updating of biophysical and human data. Three zones of influence were defined, taking into account the administrative division and the radii of the inventories. These zones are defined as follows:

3.1 Area of influence of the project

The areas of influence of the project are as follows:

- zone of direct influence: This zone concerns the 7 m on either side of the power line route.
- extended zone of influence: This zone concerns the communes of Kona and Wona
- remote zone of influence: This takes into account the Boucle du Mouhoun region.

3.2 Physical environment

3.2.1 Relief

The relief of the project area, from which the project right-of-way was taken, is very similar. It is characterised by a vast plateau dissected by rivers. The peaks are armour-plated knolls, located in the south-eastern part of the Kona commune. The communes are dotted with hills or small elevations towards Lah, Nana, Blé, Dangouna, Soungoulé and Yankoro. There are also many low-lying areas in Zina and other localities.

3.2.2 Soil resources

The project area is crossed by three main types of soil (BUNASOL) in the commune of Kona which are, the soils with little evolution which are favourable to the culture of millet and groundnut but more favourable to the course of the cattle, the soils with mull which belong to the group of the eutrophic brown soils are found mainly in the South-East part and the sesquioxides soils which are soils with alteration of primary minerals very pushed cover 432,07 km^2 .In the commune of Bana, four types of soil are found: brown soils, which are the most common type of soil, rich and suitable for all crops; gravelly soils, which are not very rich and very vulnerable to erosion; hydro morphic soils, which are rich and found in the lowlands and plains; and sandy soils, which are light and require water.

3.2.3 Climate and climate change

The rural communes of Kona and Bana, like all the communes of the Mouhoun loop region, are located in the Sudanian climatic zone with isohyets ranging from 700 to 1000 mm. They are characterised by two (2) main seasons:

- **a rainy season** from June to October. Rainfall is usually concentrated between July and August but in recent years and with climate change, significant isohyets are recorded from August to September. The prevailing wind at this time is the monsoon with average temperatures around 28°C.
- **a dry season** from November to May with high temperatures sometimes exceeding 40°C. The harmattan is the dominant wind during this period. A long dry season generally from November to

May, with high temperatures sometimes exceeding 40°C. The harmattan is the dominant wind during this period.

3.2.4 Hydrography

The study area is located entirely in the upper part of the Mouhoun watershed. Locally, it is possible to distinguish two sub-watersheds separated by the chain of hills to the south-east of the village of Wona, namely those of the Karouko river in the northern part and the Grand Balé river in the southern part.

The northern part, consisting of the regions of Wona, Kona, Bombouéla, Yona, Blé and Dangouna, is at the beginning of the Karouko sub-watershed with a surface area of 1,400 km^2 and a rainfall of 760 mm. There is no large reservoir in this sub-basin, but there is a small reservoir not far from the Dédougou - Tchériba axis. The inter-annual flow in this basin is 3.6 million m3/year.

The southern part, where the Grand Balé sub-basin is located, covers the areas of Yona, Mana, Sienkoro, Kongoba, Fofina, Bissa and Bana. This sub-basin of 6400 km^2 has an interannual flow of 234 million m3.

The hydrogeology of the area consists mainly of two sets:

- a group of rocks composed of granitoids, greenstone and volcano-sedimentary shales;
- a collection of sedimentary rocks.

Both of these sub-areas are hydrogeologically characterised by the basement zone aquifer system, which consists of a sequence of three overlying aquifers:

- Fissure aquifers: the resource is located in the fractures of the rocks and circulates in them. These aquifers are tapped by drilling;
- the aquifers of the semi-fissured and altered zone: the resource is located in the porous medium and circulates in the fractures. These aquifers are tapped by modern and some traditional wells; and
- Alteration aquifers: the resource is located in the porous medium associated with the alteration. This is the preferred catchment area for traditional wells.

The behaviour of these aquifers is of two types:

- a homogeneous medium with interstitial porosity, forming a semi-permeable reservoir represented by the weathered zone;
- a slightly to semi-homogenous environment represented by the fissured zone, forming a captive reservoir with an essentially conductive function.

3.3 Biological environment

3.3.1 Vegetation

The project area (communes of Bana and Kona) belongs to the Sudanian phytogeographic domain, which is characterised by a shrubby to woody savannah with gallery forests along the rivers. Thus, the very varied vegetation is dense and is favourable to the creation of protected areas and the development of

forestry potential. However, there are climatic hazards and significant pressure on plant resources (uncontrolled clearing, bush fires, overgrazing, demographic pressure).

The natural formations are dominated by the following species: *Vitellaria paradoxa (shea), Parkia biglobosa (cowpea)*, *Lannea microcarpa...*). In the shrub layer, we find a fairly dense and varied herbaceous carpet. This very varied and dense vegetation is favourable to the creation of protected areas and the development of forestry potential.

Table 4 List of species present on the 14 m corridor of the line

ORDER NUMBER	SPECIES	WORKFORCE	FREQUENCY
01	*Acacia dudgeonii*	01	0,35
02	*Acacia macrostachya*	04	1,41
03	*Acacia seyal*	05	1,77
04	*Acacia sieberiana*	03	1,06
05	*Adansonia digitata*	01	0,35
06	*Albizia chevalerii*	01	0,35
07	*Balanites aegyptiaca*	01	0,35
08	*Cassia sieberiana*	01	0,35
09	*Combretum molle*	05	1,77
10	*Daniellia oliveri*	09	3,18
11	*Detarium microcarpum*	05	1,77
12	*Dichrostachys cinera*	01	0,35
13	*Diospyros mespiliformis*	02	0,71
14	*Entada africana*	03	1,06
15	*Eucalyptus camaldulensis*	35	12,37
16	*Faidherbia albida*	18	6,36
17	*Feretia apodanthera*	01	0,35
18	*Khaya senegalensis*	01	0,35
19	*Lannea acida*	03	1,06
20	*Lannea microcarpa*	06	2,12
21	*Lannea velutina*	01	0,35
22	*Mitragyna inermis*	09	3,18
23	*Parkia biglobosa*	29	10,25
24	*Pericopsis laxiflora*	01	0,35
25	*Pericopsis laxiflorus*	02	0,71
26	*Piliostigma thonningii*	01	0,35
27	*Pterocarpus erinaceus*	06	2,12

28	*Saba senegalensis*	01	0,35
29	*Sclerocarya birrea*	06	2,12
30	*Tamarindus indica*	02	0,71
31	*Terminalia avicinoides*	01	0,35
32	*Terminalia laxiflora*	01	0,35
33	*Vitellaria paradoxa*	112	39,58
34	*Vitex doniana*	01	0,35
35	*Ziziphus mauritiana*	04	1,41
Grand total		**325**	**100**

Source: NIES 2016 data

From the analysis of this table, it appears that *Vitellaria paradoxa, Parkia biglobosa and Eucalyptus camaldulensis* are the most abundant species on this site. However, plant species such as *Adansonia digitata, Faidherbia albida, Khaya senegalensis, Parkia biglobosa, Pterocarpus erinaceus, Tamarindus indica and Vitellaria paradoxa benefit from special protection measures according to Article 1 of Order No. 2004-019/MECV of 7 July 2004 determining the list of species benefiting from special protection measures. As regards the IUCN red list, Khaya senegalensis, Tamarindus indica and Vitellaria paradoxa are listed as threatened species.* This table also highlights the species that are poorly represented on this site (relative frequency less than 1)

3.3.2 Wildlife

As the wildlife habitat is highly degraded, no wild mammals were observed in the project area. However, among the avifauna, species of the Yellow-billed Woodpecker (*Buphagus erythrorhynchus*), Cape Dove (*Oena capensis*), Collared Dove (Streptopelia enegalensis), Common Guineafowl (*Numida eleagris*) and Francolinus *bicalcartus* were observed. Surveys of local people show that the mammals have migrated to other habitats, away from the pressure of the agricultural front and poachers.

In the Boucle du Mouhoun region, the presence of *Loxodonta africana, Damaliscus lonatus, Panthera pardus, Cephalophus sylvicultor*, Orycteropus, Golden cats, Caracal is reported but specifically in protected areas such as the Parc des deux Balés. The Bale Park is the closest classified area to the project area, located 60 km from Zina.

3.4 Human environment

3.4.1 Demographics

The project area has an estimated population of about 28,321 inhabitants (according to the 2019 RGPH, Kona), in 2024 (at the horizon of the plan), the population of the commune will be 30,311 inhabitants. As for the commune of Bana, the general population is estimated at 17,375 inhabitants in 2018 (based on the natural growth rate of 2.45% per year), i.e. 8,883 men and 8,492 women. This population is spread

over 3301 households and represents 0.91% of the regional population and 6.08% of the regional population. Women represent 48.88% of the municipal population.

In the commune of Kona, two villages are impacted by the construction of the 33 kV line, namely Zina with 6 people affected and Dagouna with 29 people affected. In the commune of Bana, two villages are impacted including 2 people affected in Somona and 22 people affected in Wona. Thus, a total of 59 PAPs have been identified within the power line right-of-way. All these PAPs have been compensated within the framework of property compensation activities.

3.4.2 Social organisation

The traditional socio-political organisation sees three orders of power coexist: traditional power, decentralised administrative power held by the prefect and decentralised power exercised by the Municipal Council.

In the two communes (Bana and Kona) there are mainly four ethnic groups, in numerical order: the Marka, the Bwabas, the Mossis and the Peulhs. Islam is the dominant religion, followed by Christianity. Traditional religion (the cult of the ancestors) is the least widespread religion officially, but in reality, the populations live a religious syncretism, because almost all the natives submit to certain rites pertaining to ancestral religions.

3.4.3 Activities socio-economic

The economic activities of the population of Kona and Bana are essentially agro-sylvo-pastoral production, handicrafts and small-scale trade.

- **Agriculture**

Agriculture is one of the main activities in these communes. It is highly dependent on rainfall. The communes of Bana and Kona have relatively good rainfall. It occupies more than 90% of the working population and the main crops are of two types: cereal crops (sorghum, maize, millet, rice) and cash crops (groundnuts, cotton, sesame, cowpeas, voandzou, soya). Agricultural equipment is in most cases made up of animal traction equipment such as cattle or donkey ploughs, manga hoes, rakes, buteurs and carts. In recent years, tractors have been introduced due to the increase in the area sown and the government's agricultural policy.

- **Breeding**

The Boucle du Mouhoun region ranks fourth in the national livestock industry. Within this region, the population of the provinces (Balé, Banwa, Kossi.) is very keen on this activity. Poultry farming occupies a prominent place in the commune with a rate of more than 61.62%, followed by goat farming (13.28%), sheep farming (10.32%) and cattle farming (5.46%) of the communal livestock.

Small ruminant farming is more dominant, and is practised by both herders and farmers. Cattle rearing is more the preserve of Fulani pastoralists and sometimes of farmers who entrust their livestock to the

Fulani. The animal pathology is generally peste de petits ruminants, bovine and caprine pasteurellosis, and avian pseudopeste. Most of the time, these diseases are due to the failure to respect the vaccination calendar and the fact that the animals are not vaccinated.

- **Handicrafts**

The crafts are organised around basketry, weaving, pottery, blacksmithing, carpentry and sewing. There are also butchers, restaurant owners, and processors of harvested and agricultural products. Although it provides substantial income to the population, the handicraft sector faces a number of difficulties such as the low level of organisation and equipment of the craftsmen, the lack of training and the absence of a vocational training centre. In order for this sector to be more profitable, it is necessary to make it more dynamic by supporting the structuring of craftsmen, supporting the acquisition of processing equipment and setting up a vocational training centre. The revitalisation of the craft industry could contribute to food security by raising the level of income of the population, and to the fight against the lack of jobs in the dry season.

- **Trade**

The communes of Bana and Kona have diverse but small-scale economic units, indicating a relatively sluggish local economy. Furthermore, these economic units are dominated by the trade in shops, grain shops, millers and retail. In terms of infrastructure, these communes have a small-scale market infrastructure. There is a communal market in Kona and four other markets in the villages of Pié, Kouana, Lah and Nana, and markets in Wona and Bana.

Apart from these markets, people also frequent the markets in neighbouring communes and localities such as Safané and Ouarkoye.

- **School infrastructure**

The communes of Bana and Kona have Basic Education Districts (CEB). The CEB of Kona has a total of 24 schools, all of which are functional and spread over the different villages. One of them is in the village of Zina. The commune of Kona has a total of 4 post-primary schools (Kona, Dangouna, Pié, Lah), 2 secondary schools including the departmental high school and a public school. As for the CEB of Bana, it has 13 primary schools including a Franco-Arabic school built by the population. All the schools in the district have a total of 53 classes.

- **Health infrastructure**

The commune of Kona has five health facilities. These are the CSPSs of Kona, Kouana, Dangouna, Lah and Pié. In addition, there is only one hospitalization room (in Kona) and one pharmaceutical warehouse (in Lah). Of the CSPSs mentioned above, all five are functional. The commune has a total of 17 qualified health workers for 13 nursing units. As for the commune of Bana, it has three (03) CSPSs located in Bana,

the main town of the commune, in Wona and in Yona. All these health facilities are functional. They come under the Boromo health district.

The CSPSs in the commune are not in good condition in general. Except for the CSPS in Yona, which is more or less acceptable, the other two are in a state of disrepair.

- **Water infrastructure**

The commune of Kona has 125 water points divided into 76 boreholes (12 of which are non-functional), 5 AEPS (1 of which is non-functional) and 4 standpipes. The drinking water coverage rate is relatively satisfactory. Of which one (01) borehole is functional and one (01) is non-functional in Zina. In terms of water infrastructure, the commune of Bana is well served and has a total of 54 boreholes, 46 of which are functional, and 13 large-diameter boreholes, 10 of which are functional. All the boreholes are managed by the Health Management Committee (COGES). The ratio shows that there is one borehole for every 285 people, which respects the national norm of one borehole for every 300 inhabitants.

3.4.4 Development actors

Decentralised services

The administrative services present in the project area (departments/communes of Bana and Kona) are the prefectures and the town halls. The technical services are the responsibility of the Provincial Directorates based in Dédougou and Boromo. These include the departments of agriculture (ZAT), livestock (veterinary station), health, primary education and the environment.

- **Mining company**

The company SEMAFO BF S.A., currently owned by the subsidiary ENDEAVOUR MINING SA, obtained from the Burkinabe government by ministerial decree N°02/040/MCE/SG/DGMGC/DG of 31 May 2001, the 112.5 km Kona exploration permit[2] located in the vicinity of the village of Dangouna. In March 2007, the Mana project received its mining permit from the Burkinabe government by decree N2007-144/PRES/PM/MCE/MFB/MEDEV/MECV. A mining convention was signed between the Burkinabe party and SEMAFO to govern the terms and conditions relating to taxation, employment, property and mining guarantees, and environmental protection. In May 2006, construction of the mine was officially launched and in March 2008, the first gold pour was achieved. The mining project covers the communes of Bana and Yaho in the Balés province, as well as Kona in the Mouhoun province.

The houses that were impacted in the mining perimeter have been rebuilt. The mining company recruits its unskilled staff locally. Accessibility to the community has improved significantly thanks to the tracks built by the company, which also maintains these tracks to facilitate transport.

- **Société Burkinabè des Fibres Textiles**

SOFITEX is a limited company comprising the Burkinabe State, private companies and the National Union of Cotton Producers. Its missions are to

- purchase, transport and ginning of seed cotton ;
- marketing of fibre and seed ;
- supply of agricultural inputs to farmers ;
- to assist in the development of cotton and associated crops through technical support, services and participation in the financing of necessary research and development measures;
- direct promotion of textile fibres.

- **Farmers' associations and organisations**

The socio-professional associations and groups that operate in the communes of Bana and Kona work in the areas of social infrastructure, training, agricultural equipment, rural credit and women's IGAs. There are several cotton producers' groups (GPC) and village development associations in the commune.

4 ANALYSIS OF VARIANTS

The 33 kV line project does not require major construction work for its implementation. Various concepts were developed on the basis of an analysis of alternatives during the various engineering and development phases of the project. The choice of variants was based on decisions respecting the sustainability performance of the IFC by minimising the environmental, economic and operational impacts. The analysis of alternatives and variants has two (2) objectives

- compliance with national and international requirements, including those of the IFC;
- reducing negative impacts and enhancing positive impacts in the design and implementation of projects.

Thus two (02) variants relating to the route of the 33kV power line for supply to the national grid were studied.

4.1 Description of the variants

4.1.1 Variant 1: the 33 kV line, straight from the solar power plant to the Wona transformer station with a length of 6.1 km

Environmentally, it had a direct impact on the village of Dangouna and SEMAFO's infrastructure. Socio-economically, it resulted in considerable losses to housing and mine infrastructure. Financially, this option was not profitable.

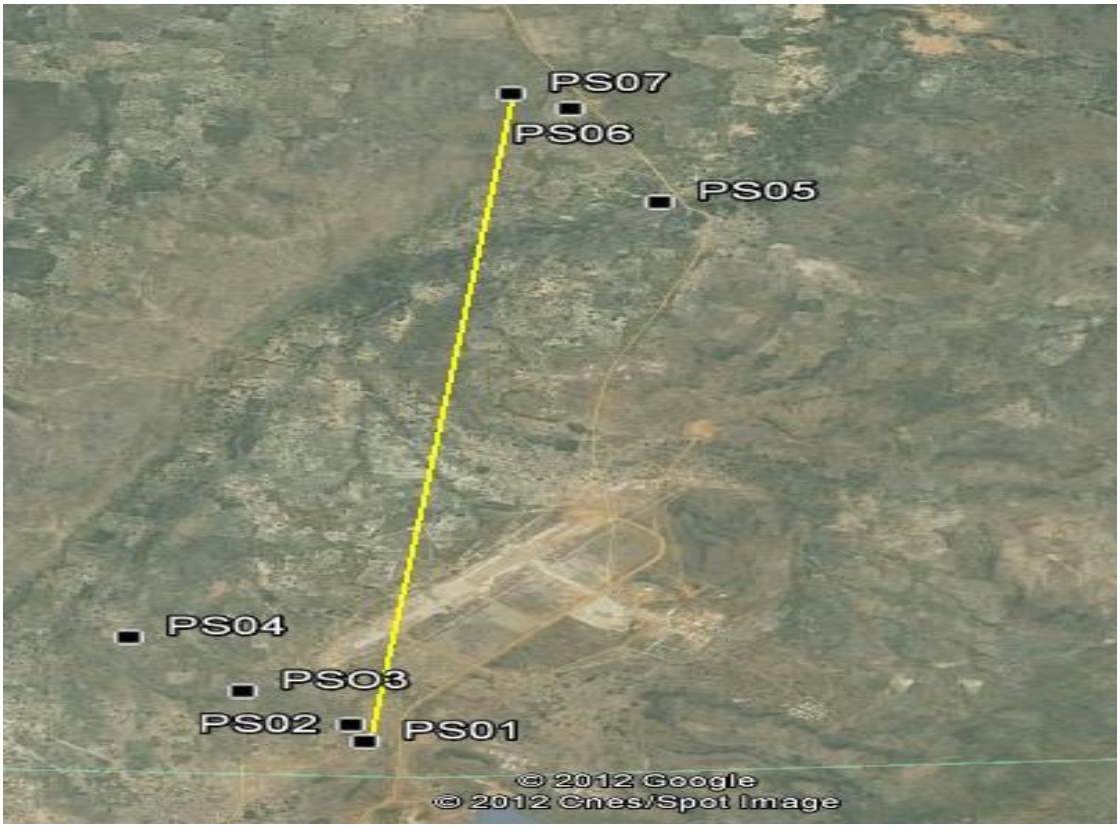


Figure 3 Variant 1
Source: NIES of the line, 2016

4.1.2 Variant 2: the 7.8 km long 33 kV line that bypasses the obstacles.

It has the advantage of having fewer impacts because it bypasses the village, as well as SEMAFO's infrastructure. In addition, it runs alongside an existing road, making it easier to build and maintain. The analysis of these two alternatives is summarised in the table below.

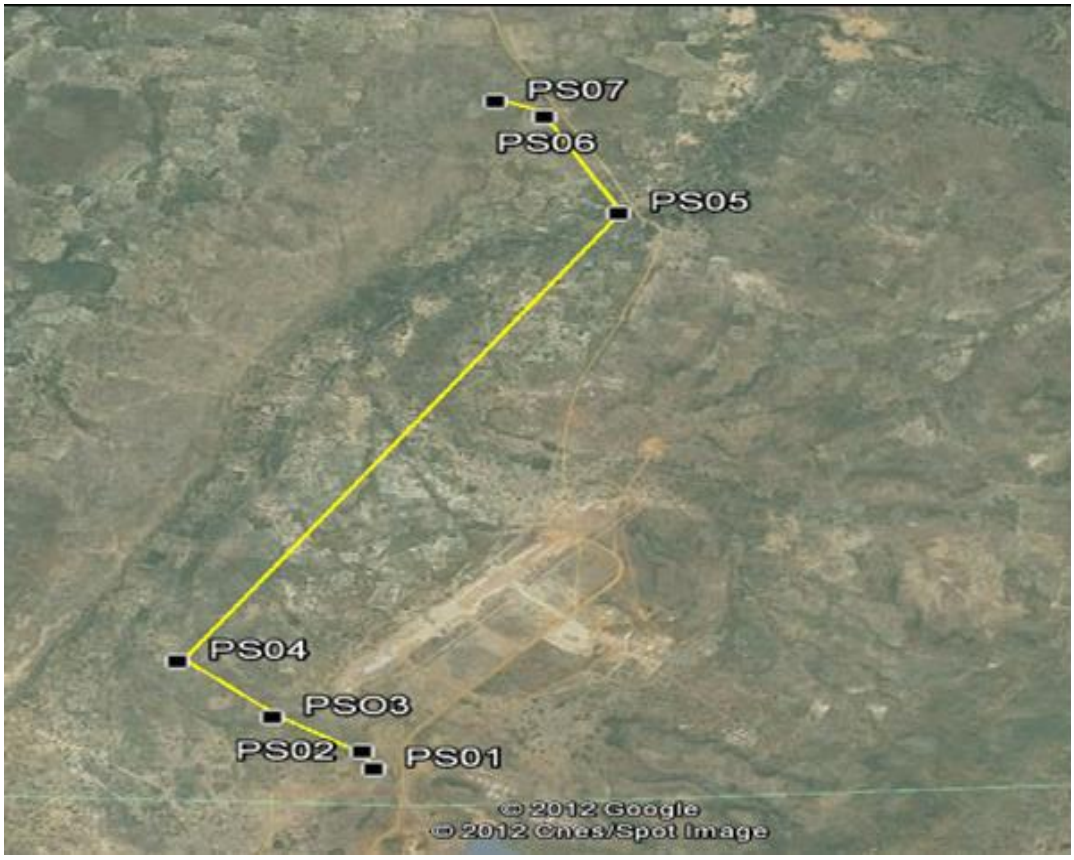


Figure 4 Variant 2
Source: NIES of the line, 2016

Table 5comparative analysis of variants

VARIANTS	Environmental	Socio-economic	Operational
Variant 1	Direct impacts on Dangouna mango orchards	Losses of land	Will require relocation of a sterile storage area
Variant 2	No impact on the village orchard	Temporary loss of land, business opportunity for local residents	Technically feasible

The alternative chosen is the construction of variant 2 as it is the most practical, the most economical and the least damaging in socio-economic and environmental terms. This route takes into account a number of factors to minimise the impact on the environment and the lives of the population. It therefore bypasses all the houses. The bypass variant in this case aims to avoid the destruction of houses and to preserve the cultural heritage.

This route avoids all villages, as well as the SEMAFO mine facilities. The impacts in this case are mainly related to the loss of arable land and the loss of biodiversity; these are temporary losses for a significant part of the areas other than those necessary for the installation of the pylons.

5 IMPACTS OF THE PROJECT ON DIFFERENT ENVIRONMENTAL DOMAINS

The impacts generated by the 33 kV line project on the different components of the environment are considered through two main steps: the identification and analysis of the environmental and social impacts and then the assessment of the relative importance of the identified impacts.

5.1 Methodology for identifying impacts

Impacts are identified by comparing the components of the receiving environment with the activities of each phase of the 33 kV line project. The most frequently used method is the Luna Leopold matrix (1971). It is an interrelationship matrix, linking the project activities that cause impacts with the components of the project environment. Each interrelationship identified represents a likely impact of a sub-project activity on a component of the environment.

5.1.1 Identification of sources of impacts

These are the project activities that may cause impacts (positive or negative) on the various components of the physical and biological environment. Depending on the project's implementation phases, these impact-causing activities are described below.

- **Preparatory phase and implementation of the 33 kv line**

In the preparatory phase, the activities that cause impacts are

- the opening of the 7m corridor on both sides of the line;
- tree felling and clearing within the project right-of-way;
- excavation work and pole site ;
- transport of equipment and construction materials for the line;
- masonry work for the installation of the posts ;
- solid and liquid waste management;
- the presence of workers.

Some activities, such as land acquisition and compensation, were taken into account and carried out in the past study.

- **Operating phase of the 33 kV line**

In the operational phase, the activities that cause impacts are the following:

- maintenance work on the line;
- the cutting of shrubs and branches.

- **Dismantling phase of the 33 kV line**

The main activities that cause impacts are

- dismantling of pole and cable installations ;
- filling or refilling of post holes ;
- transport and circulation of equipment ;

- presence of workers on the site.

5.1.2 Identification of impact receptors

The identification of positive or negative impacts due to the implementation of the project is based on the analysis of the effects resulting from the interactions between an affected environment and the different facilities or activities implemented within the framework of the project. The analysis allows the establishment of a relationship between the sources of the impacts or activities of the sub-project and the components of the different environments that could be affected. As such, in the context of this project, the receptors are recorded in the table.

Table 6Environmental components likely to be affected by the project

Environment	Receivers
Biophysics	- the relief - soil resources - air ; - Climate and climate change - the sound environment ; - surface water and groundwater; - vegetation/ wildlife and its habitat
Socio-economic	- health and safety ; - employment ; - socio-economic activities; - the living conditions of the population; - cultural and archaeological heritage (monuments, sacred sites, etc.); - land (agricultural land, housing, etc.); - social cohesion ; - vulnerable people (women, girls, widows, children, people living with a disability, etc.)

Source: IPEAD, field data 2022

Table 7: Interaction matrix of impact sources and impact receptors of the 33kv line project

PHASES	Designation	Biophysical environments						Socio-economic environment							
	Impact receptors / Sources of impacts	Air	Sound environment	Surface water and underground	Soils	Vegetation/ Fauna and habitat	Relief (Landscape and morphology)	Health and safety	Employment	Activities socio-economic	Cultural heritage and archaeological	Land	Living conditions of the populations	Social cohesion	Vulnerable persons
Preparatory/ Construction	opening the line corridor by 7m on either side	N	N	N	N	N	N	N	P	P	O	N	N	N	N
	tree felling and clearing within the project right-of-way	O	N	O	N	N	O	N	P	P	O	O	N	N	N
	excavation work and pole site	N	N	N	N	N	O	N	P	P	N	O	N	N	N
	transport of equipment and construction materials for the line	N	N	N	N	N	N	N	P	P	N	N	P	P	P
	masonry work for the installation of posts	N	N	N	N	N	N	N	P	P	N	N	P	P	P
	solid and liquid waste management	N	N	N	N	N	N	N	P	P	N	N	N	N	N
	presence of workers	O	O	O	N	N	N	N	P	P	O	O	N	N	N
Operation	maintenance work on the line	N	N	N	N	N	N	O	P	P	O	O	N	O	O
	cutting of shrubs and branches.	N	N	N	N	N	O	O	P	P	O	O	P	O	O
Closure and rehabilitation	dismantling of pole and cable installations	N	N	N	P	P	P	N	P	N	O	O	N	N	N
	Filling or refilling of post holes	N	N	O	P	P	P	P	P	O	O	O	P	O	O
	transport and circulation of equipment	N	N	N	N	N	N	N	P	P	N	N	P	P	P

PHASES	Designation	Biophysical environments						Socio-economic environment							
	Impact receptors / Sources of impacts	Air	Sound environment	Surface water and underground	Soils	Vegetation/ Fauna and habitat	Relief (Landscape and morphology)	Health and safety	Employment	Activities socio-economic	Cultural heritage and archaeological	Land	Living conditions of the populations	Social cohesion	Vulnerable persons
	presence of workers on the site	O	O	O	N	N	N	N	P	P	N	N	P	P	P

Source: IPEAD 2022 data

Legend - Y: Negligible, P: Positive, N: Negative. Source: IPEAD mission January 2022 for the elaboration of the NIES of the 33kv line

5.1.3 Results of impact identification

The potential impacts of the proposed line are shown in the table below.

Table 8 Potential impacts of the project

Components of the environment	Potential impacts
Air	Degradation of air quality
Sound environment	Vibration and noise
Surface water and water Underground	Surface and groundwater pollution Disruption of natural surface water flow
Floors	Modification and weakening of soil structure and texture Soil pollution
Landscape, vegetation / wildlife and its habitat	Destruction of trees and shrubs Loss of wildlife habitat Disturbance of wildlife tranquillity Changes to the natural landscape
Health and safety	Increased respiratory infections (for company employees working on site); Increase in STI/AIDS and VCT-19 prevalence rates Increase in unwanted pregnancies Traffic accidents, work accidents, incidents on construction sites for both workers and members of the surrounding communities.
Employment	Creation of permanent and temporary posts
Socio-economic activities	Development of economic activities
Business opportunities and tax revenues	Business opportunities for domestic companies and increased tax revenues
Living conditions	Improvement of living conditions Improving access to basic social services
Land	Loss of arable land, trees and other livelihoods
Cultural and archaeological heritage (monuments, sacred sites, etc.)	Desecration of places of worship and cultural/sacred objects Loss of cultural objects
Social cohesion	Disruption of social cohesion (Social conflicts)
Vulnerable persons	Improving the situation of vulnerable people

Source: IPEAD, 2022

5.2 Impact assessment methodology

It aims to determine the degree of importance of the impacts in the disturbance of the environment. The method used consists of determining, through a combination of well-defined criteria, the importance (absolute or relative) of the impact on the socio-economic and biophysical environment.

The relative importance of the impact, whether positive or negative, is determined by its intensity, extent, duration, but also by the value placed on the affected component. The relative importance of the impact is in fact proportional to these four specific criteria and will be qualified as weak, medium or strong. The absolute significance is determined by combining the criteria of intensity, extent and duration. It is classified as minor, medium or major.

Table 9 Fecteau grid

Intensity	Scope	Duration	Absolute importance
Strong (Fo)	Regional (R)	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Strong or Major (Ma)
		Momentary (Short or C)	Strong or Major (Ma)
	Local (L)	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Strong or Major (Ma)
		Momentary (Short or C)	Average (MB)
	Punctual (P)	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Average (MB)
		Momentary (Short or C)	Average (MB)
Average (M)	Regional	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Strong or Major (Ma)
		Momentary (Short or C)	Average (MB)
	Local	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Average (MB)
		Momentary (Short or C)	Average (MB)
	One-off	Permanent (Long or L)	Average (MB)
		Temporary (Medium Mo)	Average (MB)
		Momentary (Short or C)	Low or Minor
Low (F)	Regional	Permanent (Long or L)	Strong or Major (Ma)
		Temporary (Medium Mo)	Average (MB)
		Momentary (Short or C)	Average (MB)
	Local	Permanent (Long or L)	Average (MB)
		Temporary (Medium Mo)	Average (MB)
		Momentary (Short or C)	Low or Minor
	One-off	Permanent (Long or L)	Average (MB)
		Temporary (Medium Mo)	Low or Minor
		Momentary (Short or C)	Low or Minor

Source: Research data, IPEAD, 2022

5.3 Impact assessment steps

The assessment of the relative significance of impacts involves four steps:

Step 1: Establish the list of impact-source activities and determine the environmental components likely to be affected by them;

Step 2: Assess the intensity of the disturbance imposed on each component and determine the duration and extent of the effects generated by each activity;

Step 3: After characterising the impact according to the criteria of intensity, duration and extent, the Fecteau matrix is used to determine the absolute significance of impacts. This matrix is based on the following principles:

- all the criteria used have the same weight;
- if two criteria have the same level of severity, the importance rating corresponding to that level is given, regardless of the severity level of the third criterion;
- if the values of the three criteria are different, the average importance rating is given.

The resulting matrix of these rules includes both major and minor importance ratings. The advantage of this arguable arrangement of criteria is that it is transparent and avoids distortions in favour of minor or major impacts. Thus absolute significance, which is qualified as :

- **minor**: when damage is observed but does not affect the receiving environment. The impact is not very significant, but should still be reduced by adequate mitigation or compensation measures;
- **medium**: when there is partial degradation of the receiving environment. The impact is noticeable and undesirable. It is strongly recommended that mitigation or compensation measures are implemented;
- **major**: in case of degradation of the receiving environment. The potential impact is unacceptable. Mitigation or compensation measures must be implemented.

Other parameters for characterising the impact are: reversibility, occurrence, value of the affected component and cumulative nature. The situation is of concern when the impact is irreversible, certain, cumulative and the affected component is highly valued (or of high value).

The environmental or social measure is proposed according to materiality. After application of this measure, a residual impact may remain. This is considered in terms of the effectiveness of the proposed environmental measure. All the residual impacts will allow the overall assessment of the project on the environment. Overall, the final assessment of the project's effects on the environment will be made on the basis of the significance of the residual impacts.

Step 4: Record the results of the significance assessment in an impact fiche which presents the details of the assessment. Each sheet presents a justified assessment of the impacts, a factual description, proposed mitigation measures and monitoring and follow-up measures if required.

Impact assessment criteria

- **The intensity of the impact**

It reflects the extent of the changes observed in the affected component.

- **strong**: the activity significantly affects the integrity of the component or its use and compromises its sustainability. This means that the activity significantly alters or enhances one or more environmental components, calling into question their integrity or significantly diminishing their use, characteristic or quality;
- **Medium**: the activity significantly affects the integrity of the component or its use, but does not compromise its sustainability;
- **low**: the activity has little effect on the integrity of the component or its use, i.e. the activity alters or improves one or two environmental elements in a barely perceptible way, without significantly modifying their use, their characteristic or their quality.

- **The duration of the impact**

It refers to the period during which the effects of an intervention on the environment are felt. The following variants can be distinguished:

- **long**: the duration is long when the disturbance goes beyond 5 years and continues even after the end of the sub-project;
- **medium**: the duration is medium when the disturbance continues after the end of the activity and can reach about 5 years;
- **short or temporary**: the impact is limited to the construction period of the sub-project or less. This means that the disturbance is well circumscribed in time and stops with the end of the activity causing the impact.

- **The extent of the impact**

It reflects the scope of the impact.

- **regional**: the impact extends over the municipality;
- **local**: the impact extends to the villages or districts surrounding the sub-project;
- **one-off**: the impact extends over the site's footprint up to 500 metres from the site, or affects only a few people.

5.4 Environmental and social impact assessment and analysis

As well as the identification, assessment and analysis of the impacts will be done in the different phases of the 33 kv line implementation project.

5.4.1 During the preparation and implementation phase of the 33kv line

During the preparation and construction phase of the line, the activities that will have an impact on the biophysical and socio-economic environment are the opening of the line corridor by 7m on either side, the felling of trees and clearing of land within the project right-of-way, excavation work and pole siting, transportation of line construction equipment and materials, masonry work for pole installation, solid and liquid waste management, and the presence of workers that will affect the biophysical and socio-economic environments.

- **Impact on the physical environment**

Impact on air quality and noise environment

During the preparation and installation phase of the line, atmospheric emissions will be mainly related to dust generated by the various activities of opening the corridor, excavation work and the circulation of site vehicles on the unmade roads. In addition, there will be exhaust emissions from vehicles, concrete mixers and vibrators. These exhaust gases are generally made up of carbon dioxide (CO2), sulphur dioxide (SO2), nitrogen oxides (NOx) and carbon monoxide (CO). The impact of dust emissions will be accentuated by wind action.

Noise emissions from activities during these phases of the project will come mainly from trucks and tree felling equipment, concrete mixers and vibrators. These noises will be more noticeable at night if the work continues. No significant noise-generating activities are planned between 6 p.m. in the evening and 7 a.m. in the morning, except in the case of a major imperative related to the planning of the phase.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Transport of equipment and construction materials for the line ; Masonry work for the installation of the posts ; Solid and liquid waste management ;	Degradation of air quality and changes to the microclimate	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Alteration of the quality of the sound environment and vibrations	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**

Impact on the relief and geomorphology of the soil

During the preparation and implementation phase of the line, the activities of opening the line corridor by 7m on either side, tree felling and clearing, excavation, transportation of equipment and construction materials, masonry, solid and liquid waste management and the presence of workers will result in soil compaction and partial sealing along the corridor. Soils exposed as a result of felling and clearing activities will be subject to wind and water erosion. Soil pollution is likely to occur as a result of accidental hydrocarbon spills caused by possible technical failure or accidents involving site machinery. These works will also cause soil pollution as a result of poor waste management.

Source of impact	Impact	Criterion	Relative importance
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Transport of equipment and construction materials for the line ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Changes in the physical properties of soils	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Soil erosion	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Soil pollution	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**

Impact on surface and groundwater

The activities of the preparatory phase and the implementation of the line will not require the withdrawal of any quantity of water. However, the clearing activities will increase the runoff coefficient with soil leaching that may lead to changes in surface water turbidity. The use of concrete mixers and vibrators during the works can lead to spills if the equipment is not well maintained. These spills can also lead to pollution of surface waters due to spills of hydrocarbons and chemical waste (paints). Groundwater will not be negatively impacted as the depth of the water table is between 90m and 120m. In addition, the soil in the area has a low permeability.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Transport of equipment and construction materials for the line ; Masonry work for the installation of the posts Solid and liquid waste management ; Presence of workers	change in surface water turbidity surface water pollution	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor
	Groundwater pollution	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor

Impact on climate change

The project area, like the rest of the country, is experiencing disturbances linked to climate change: extremely violent winds, torrential rains, long and recurrent droughts, extreme temperatures, etc.

The climatic issues related to this project for the installation of the line are mainly the occurrence of strong winds, temperature increases, thunderstorms, lightning strikes, hail, etc. These climatic events can have impacts and present risks for the plant facilities: the power plant is not a "natural" facility, but a "human" one. These climatic events can have impacts and present risks for the power plant installations:

- winds can cause cables to become detached from poles and increase the frequency of power transmission disruption or cause poles to fall down;
- torrential rain, lightning, hail and strong winds can destroy cables or topple poles.

This may result in a disruption of the electricity supply, with consequent disruptions to the operation of government and technical services, basic social services, socio-economic activities and security services.

Impact on the biological environment

Impact on the landscape and vegetation

The preparatory and installation activities for the 33kV line will cause deterioration and destruction of the plant cover (felling, uprooting of trees and shrubs). The disappearance of certain species of economic or social value may result in a loss of income for the populations of the area in terms of harvested products (fruits, leaves and flowers for food or medicine).

Several species of trees of food value have been identified within the power line right-of-way, including *Adansonia digitata, Capparis corymbosa, Daniella oliveri, Detarium microcarpum, Diospyros mespiliformis, Piliostigma thonningii, Saba senegalensis Lannea microcarpa, Sclerocarya birrea, Tamarindus indica, Balanites aegyptiaca Parkia biglobosa and Vitellaria paradoxa*. Their destruction will constitute a loss for the population of the area. The same applies to the loss of species that have a protected status by law (*decree n°2004-019/MECV of 07 July 2004 determining the list of species benefiting from special protection measures in its article 1 and in the IUCN red list)* such as *Khaya*

senegalensis, Vitellaria paradoxa and part of the herbaceous vegetation, shrubs and certain trees that constitute the source of food for the animals in the area.

This component will be particularly affected by the clearing of trees to clear the right-of-way for the line. A total of 325 forest species will be felled. The quantitative impact on the vegetation cover remains modest. As trees act as carbon sequestration sinks, the environmental impact on the climate, although real, will be modest.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ;	Destruction of vegetation and loss of rare, vulnerable or endangered species, Loss of income for the population	Nature: negative impact Intensity: medium Scope: one-off Duration: long	**Average**

Impact on wildlife and wildlife habitat

The preparatory and implementation activities for the 33kV line, which will result in the destruction of vegetation along the section, will result in the disturbance of wildlife, the destruction of its habitat and the reduction of space for microfauna.

The various clearing activities will cause nuisances such as noise and dust for wildlife. Certain groups of animals such as birds, bats or certain small mammals (hares, rats) or reptiles could be considered as populations at higher risk of exposure to the potential impacts of the project.

The digging and clearing operations that follow deforestation will lead to the deterioration of refuge areas and habitats for animals, particularly those living in burrows, and birdlife. This loss of refuge areas and habitats as a result of the fragmentation of ecosystems will lead to the scarcity of nesting sites, resulting in the disappearance or displacement of certain wildlife species to habitats more suitable for their ecological niche, feeding and reproduction.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Habitat destruction and mortality of small mammals and birds	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**
	Wildlife migration	Nature: negative impact Intensity: low Scope: one-off Duration: indefinite	**indefinite**

- **Impact on the human environment**

Impact on demography and habitat.

The preparatory implementation activities may have impacts in terms of inflow of potential job seekers in the villages crossed by the line corridor, which may constitute a possibility of migration of new people in the population. The workers of the company carrying out the work will be housed in a base. However, the personnel of the subcontractors will be housed off-site, which will contribute to increased pressure on housing in the project area.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Demographic and human habitat pressure	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**

Impact on land management and loss of habitat and property

The preparatory and construction works for the line will require the mobilisation of 10.92 ha of fields along a 14m strip over the 7.8 km. This loss of land will result in the loss of agricultural land. The loss of land generally affects 59 PAPs.

The loss of this land contributes to the reduction of the landowners' portions of the land. There are no built-up areas in the corridor right-of-way. Compensation operations for PAPs were carried out during the 2016 Environmental Impact Assessment of the line. The compensation covered loss of land, loss of trees.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Loss of 10.92 ha of agricultural fields	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**

Impact on community health and safety and on workers

The preparatory activities and the installation of the line would have an impact on the security of the community because the work may constitute acts of aggression on the part of the community. In addition, the work will limit the population's access to certain medicinal plants. For the workers, this impact will be

low because the ZINA SOLAIRE project has an occupational and environmental health and safety team that deals with the issue of health and safety at work.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Health and safety impact on communities and workers	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**

Impact on cultural and archaeological heritage (monuments, sacred sites, etc.)

No cultural heritage sites have been identified along the line . However, the preparatory and implementation activities may lead to archaeological materials. In addition, the presence of workers can lead to the desecration of forbidden sites in the localities crossed by the line.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Desecration of locality bans; Archaeological discovery	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**

Impact on socio-economic activities and livelihoods

Local employment

During the preparatory and construction phases of the line, the work will require a large workforce. This is a job opportunity for young people in the municipalities crossed. This impact is a positive impact for young people.

Local economy and other activities

The implementation of the activities of the preparatory and implementation phase of the line will contribute to increasing the fiscal revenues of the municipalities and the State through income tax and article fees. Also, the recruitment of companies, subcontractors and employees will generate profits for the State through the collection of taxes.

The direct and indirect jobs created will also be sources of tax collection: withholding tax for service providers and the Single Tax on Salaries (IUTS) for employees.

Public infrastructure

No public infrastructure is present along the line corridor. No impact is expected. Furthermore, the tracks used by the works will be rehabilitated, so no impact is expected.

Living conditions, social cohesion and vulnerable people

During the preparatory and implementation phase of the line, risks to the health, social cohesion and safety of workers, neighbouring populations and the safety of property will be observed. The use of construction equipment, excavation work, tree felling, the opening of the corridor and the transport of equipment and materials, as well as failure to follow safety instructions, will expose workers and local populations to the risk of personal injury if certain precautions are not taken.

Similarly, the presence of workers on the site will also lead to changes in the lifestyle of the local population.

Conflicts could arise as a result of a possible non-respect of local customs and habits. Practices such as adultery, rape, theft, assault, failure to recruit local people, especially for unskilled jobs, and nepotism in recruitment could be sources of disruption to the existing social organisation.

The cohabitation between the local population and the company's staff in charge of the works could lead to GBV and ECV: rape, harassment, all kinds of abuse, negligence, exploitation, etc. This violence could also be observed among the company's staff.

Source of impact	Impact	Criterion	Materiality
Opening of the line corridor of 7m on both sides; Tree felling and clearing within the project right-of-way ; Excavation works and pole site ; Masonry work for the installation of the posts ; Solid and liquid waste management ; Presence of workers	Creation of temporary jobs Compensation for losses of affected property Business opportunities and payment of taxes	Nature: positive impact Intensity: medium Scope: one-off Duration: long	**Minor**

5.4.2 During the operational phase

The operation phase of the line will be carried out through the following activities: maintenance work on the line and cutting of shrubs and branches.

- **Impact on the physical environment**

Impact on air quality and noise environment

The operations of the 33 kV line will not have any impact on air quality as they will consist of maintenance of the right-of-way area through periodic clearing of bushes and pruning of tree branches. Such operations

will produce only small quantities of dust and the quantity of exhaust gases from vehicles will be small because the number of vehicles used for maintenance work will be reduced.

The noise level will be low because the equipment used for maintenance work will be machetes.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Degradation of air quality and changes to the microclimate	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor
	Alteration of the quality of the sound environment and vibrations	Nature: negative impact Intensity: low Scope: one-off Duration: long	Minor

Impact on the relief and geomorphology of the soil

During the operational phase, the line's maintenance activities will hardly cause any pollution on the ground, nor any modification of the structure or composition of the soil. However, pollution due to oil spills may occur during maintenance work and pruning of tree branches obstructing the line if the vehicles used for the work are not well maintained.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Soil pollution	Nature: negative impact Intensity: low Scope: one-off Duration: long	Minor

Impact on surface and groundwater

Maintenance and shrub cutting during the operational phase does not require water abstraction. An impact on the surface water resource may occur when using the maintenance works with poor condition machinery. This can lead to oil spills and surface water pollution. As far as groundwater is concerned, no pollution can occur during this phase of the project.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Deterioration of surface water quality	Nature: negative impact Intensity: low Scope: local Duration: short	Minor

- **Impact on the biological environment**

Impact on the landscape and vegetation

During the operational phase, apart from the plant species that were felled during the preparatory phase, the impact of the species may be reduced by the felling of shrubs and branches during the maintenance works. It is also noted that during the maintenance of the compensatory planting of plant species will have

a beneficial effect on the recovery of vegetation and as a result, the impact in terms of improving biological diversity will be positive.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Loss of plant species and microflora	Nature: negative impact Intensity: low Scope: one-off Duration: long	Minor
	restoration of vegetation	Nature: positive impact Intensity: low Scope: local Duration: long	Average

Impact on wildlife and wildlife habitat

In terms of fauna, the return of calm during the operation should allow a return of fauna to the project area. This return will be facilitated by the reforestation campaign planned to mitigate the loss of vegetation during the preparation of the project area.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Gradual return of wildlife to the right-of-way area	Nature: positive impact Intensity: low Scope: one-off Duration: long	**Minor**

- **Impact on the human environment**

Impact on demography and habitat.

Operational activities will require a reduced number of workers. The presence of these personnel will only be noted during the maintenance periods of the corridor and the power line. The temporary presence of these workers will not have a significant impact on the demographics and habitats of the villages crossed by the line.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Demographic pressure and on human habitats	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor

Impact on land management and loss of habitat and property

The operation of the line will not have a negative impact on land or on the loss of habitat and property. On the other hand, it will have a positive impact because this period will coincide with the time when the project is accompanied by the PAPs who have received compensation for their property. In addition, there is also the implementation of measures foreseen in the PRME.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Compensation for losses of agricultural land and fields	Nature: positive impact Intensity: medium Scope: one-off Duration: long	Average

Impact on community health and safety and on workers

During the operation phase, there will be no real negative impact on the health and safety of workers, local populations and on the safety of property. The work in this phase will use rudimentary tools. On the other hand, it will make it possible to preserve the installations and to secure the supply of energy in the localities crossed and in the mine.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Preservation of the health and safety of communities and workers	Nature: positive impact Intensity: medium Scope: one-off Duration: long	Average

Impact on socio-economic activities and livelihoods

Local employment

In the operational phase, the work will not require a large number of workers. Nevertheless, it will be an employment opportunity for young people in the communities. This impact is a positive impact for young people.

Local economy and other activities

The major positive impact is the accessibility and availability of electrical energy for the local population. The access of the population to electricity will have positive effects on the living conditions of the population (health, education, quality of life...).

The operation of the line will make energy available in the Boucle du Mouhoun region and will contribute to the connection of a significant number of households to the electricity network. It will also inject a new dynamic into the life of the local community and sustainably improve their living conditions through the development of the local formal and informal economy.

Public infrastructure

The operating phase of the line will enhance the safety of public infrastructure and improve services to the population.

Living conditions, social cohesion and vulnerable people

Conflicts could arise as a result of a possible failure to respect local customs and traditions. Practices such as adultery, rape, theft, assault, failure to recruit local people, especially for unskilled jobs, and nepotism during recruitment could be sources of disruption to the existing social organisation.

The cohabitation between the local population and the temporary staff working on the project is likely to encourage GBV and ECV: rape, harassment, all kinds of abuse, negligence, exploitation, etc. This violence can also be observed among the company's staff. This violence can also be observed among the company's staff.

Source of impact	Impact	Criterion	Materiality
Work on the maintenance of the line and the cutting of shrubs and branches	Creation of temporary jobs Combating GBV Business opportunities and tax payments	Nature: positive impact Intensity: medium Scope: local Duration: long	**Average**

5.4.3 During the dismantling and closure phase

The dismantling and closure phase of the 33kV line will be carried out through the following activities, dismantling of pole installations and cables, filling or refilling of pole holes, transport and circulation of equipment and the presence of workers on site.

- **Impact on the physical environment**

Impact on air quality and noise environment

Some air pollution could be caused by vehicle traffic during the dismantling works. The section of the line will be subject to repeated vehicle traffic during the work. The frequency of these vehicles on the track will probably lead to an additional dust load on the section. The villages of Dangouna and Zina, whose buildings are close to the corridor, are the most likely to experience airborne dust episodes. In addition to dust, exhaust fumes from vehicles and machinery could contribute to temporary air quality degradation, especially for workers and nearby populations. Traffic could also cause a degradation of the noise environment during the period.

Source of impact	Impact	Criterion	Materiality
Dismantling of pole and cable installations, Filling or refilling of post holes, Transport and circulation of equipment presence of workers on the site.	Degradation of air quality and changes to the microclimate	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Alteration of the quality of the sound environment and vibrations	Nature: negative impact Intensity: low Scope: one-off Duration: long	**Minor**

Impact on the relief and geomorphology of the soil

During the dismantling and closure phase, the repeated passage of machinery and vehicles is likely to result in soil compaction, partial sealing and structural changes. The work of digging up the poles and filling in the holes can lead to changes in the physical (density, depth, structure, etc.) and chemical

(fertility) properties of the soil. During this phase, soil pollution may occur if the equipment used or the machinery is not of good quality or poorly maintained (hydrocarbon leaks), or if demolition waste is poorly managed. At the end of the dismantling phase, the disturbed areas must be rehabilitated and vegetated to mitigate any negative impact.

Source of impact	Impact	Criterion	Materiality
Dismantling of pole and cable installations, Filling or resealing of pole holes, transport and circulation of equipment Presence of workers on site.	Soil pollution	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Partial soil sealing	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**
	Changes in the physical and chemical properties of soils	Nature: negative impact Intensity: low Scope: one-off Duration: short	**Minor**

Impact on surface and groundwater

The dismantling and closure activities of the line will not require any water withdrawal. However, the movement of machinery along the line corridor will result in the sealing of the soil, which will increase the amount of water to be runoff. This will lead to an increase in soil leaching, which may lead to a change in the turbidity of surface waters. The use of dismantling equipment (jackhammers, generators) during the works may lead to spills if not properly maintained. These spills may also lead to pollution of surface water due to oil spills. Groundwater will not be negatively impacted as the depth of the water table is between 90m and 120m. In addition, the soil in the area has a low permeability.

Source of impact	Impact	Criterion	Materiality
Dismantling of pole and cable installations, Filling or resealing of pole holes, transport and circulation of equipment Presence of workers on site.	change in surface water turbidity surface water pollution	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor

- **Impact on the biological environment**

Impact on the landscape and vegetation

No negative impacts on vegetation are expected during the dismantling and closure phase, with the exception of a few trees and bushes that may be affected by the works. However, the revegetation of the corridor once the infrastructure has been removed will constitute a positive impact that is much more important than these negative impacts.

Source of impact	Impact	Criterion	Materiality
Dismantling of pole and cable installations, Filling or resealing of pole holes, transport and circulation of equipment Presence of workers on site.	Re-vegetation of the line corridor	Nature: positive impact Intensity: medium Scope: local Duration: long	Average

Impact on wildlife and wildlife habitat

During the dismantling and closure phase, the removal of equipment and infrastructure will create a disturbance to terrestrial fauna that had recolonised the right-of-way. However, after closure and rehabilitation, wildlife can reestablish themselves and build their living environments.

Source of impact	Impact	Criterion	Materiality
Dismantling of pole and cable installations, Filling or resealing of pole holes, transport and circulation of equipment Presence of workers on site.	Habitat destruction and mortality of small mammals and birds	Nature: negative impact Intensity: low Scope: one-off Duration: short	Minor
	Recolonisation of fauna	Nature: positive impact Intensity: low Scope: local Duration: long	Average

- **Impact on the human environment**

Impact on demography and habitat.

The dismantling and closure activities will not have an impact in terms of inflow of potential job seekers in the villages crossed by the line corridor. The work in this phase does not require a large number of workers. Thus, the workers will be housed in the base camp by the Zina Solaire project.

Impact on land management and loss of habitat and property

The dismantling and closure of the line will allow the land to be returned to the PAPs. The land will be rehabilitated so that it can be used for agriculture. Support will be given to PAPs to improve the value of the land.

Source of impact	Impact	Criterion	Materiality
- Dismantling of pole and cable installations, - Filling or resealing of pole holes, transport and circulation of equipment - Presence of workers on site.	upgrading of the 10.92 ha of reclaimed agricultural land	Nature: positive impact Intensity: low Scope: local Duration: long	**Average**

Impact on community health and safety and on workers

The dismantling and closure activities of the line would have an impact on the safety of the community as the works may constitute acts of inconvenience to the community. With regard to workers, the ZINA

SOLAIRE project has an Occupational and Environmental Health and Safety team that deals with occupational health and safety issues.

Impact on socio-economic and livelihood activities

Local employment

During the dismantling and closure of the line, the work will not require a large workforce. This is a very small employment opportunity for young people in the municipalities crossed. This impact is a positive but very weak impact for young people.

Local economy and other activities

The dismantling and closure of the line will result in a loss of tax revenue for the municipalities and the State, which will be collected through income tax and entry fees. Also, this phase will be the stage of termination of service of the companies, subcontractors and employees that were generating profits for the State through the collection of taxes.

The direct and indirect jobs created that served as sources of tax collection will no longer be effective: withholding tax for service providers and the Single Tax on Salaries (IUTS) for employees.

Public infrastructure

No public infrastructure is present along the line corridor. No impact is expected. Furthermore, the tracks used by the works will be rehabilitated, so no impact is expected.

Living conditions, social cohesion and vulnerable people

During the dismantling and closure phase of the line, there will be risks to the health, social cohesion and safety of workers, neighbouring populations and the safety of property. The transfer of the line's activities may cause a lack of electricity supply in the localities crossed by the line. This lack of supply may hinder a number of activities that improve the living conditions and well-being of communities in the project areas. The loss of the power line will have a negative impact insofar as the power was used to carry out activities to support vulnerable people.

Source of impact	Impact	Criterion	Materiality
- Dismantling of pole and cable installations, - Filling or resealing of pole holes, transport and circulation of equipment - Presence of workers on site.	- Loss of temporary and permanent jobs - Loss of business opportunities and payment of taxes - Loss of energy	Nature: negative impact Intensity: medium Scope: one-off Duration: long	Average

5.5 Proposal of mitigation, compensation and enhancement measures for impacts

This section is devoted to the formulation of mitigation, compensation and enhancement measures for the potential impacts identified and assessed in the previous sections. Mitigation measures are actions

that aim to prevent or reduce the significance of a negative impact on the environment. This is done in order to allow a better integration of the project in the receiving environment and to maximise the benefits. Compensation measures aim to offset the effect of an impact that cannot be mitigated. Finally, the measures to improve the positive impacts concern the measures to be taken to enable the population to improve their living environment and standard of living. These measures are described according to the three main phases of the project: preparatory/implementation, operation and dismantling and closure.

5.5.1 Preparation/construction phase, operation phase , decommissioning and closure phase

The measures will be presented according to the different receiving environments: physical, biological and human

- **Measures for the protection of the physical environment**

The measures will be presented according to the different components of this environment. These are: air quality and noise environment, relief and soil geomorphology, surface and groundwater and climate change.

Air quality and noise environment

- comply with the various standards on ambient air quality and emissions from facilities and logistics in accordance with national regulations and WHO standards;
- watering the traffic lanes on and around the site at least twice a day;
- providing workers with appropriate work equipment (PPE)
- adapting work periods to the local context where possible;
- install mufflers on the engines of generators and trucks and adjust the orientation of the exhaust;
- choose low-noise equipment.

Relief and soil geomorphology

- Set up a systematic system for the recovery of engine oil and its proper storage;
- set up a system for the regular collection and removal of waste and its disposal at an authorised landfill;
- carry out regular inspections of machinery to avoid accidental spills of toxic or hydrocarbon products;
- Establish an adequate effluent management system to avoid deliberate or accidental spills.

Surface and groundwater

- minimise the pressure on surface waters used by communities;
- make payments of the surface water abstraction tax (cfe) for surface water abstractions for the execution of the works;
- implement an adequate effluent management system to avoid deliberate or accidental spills;

- Establish an adequate effluent management system for the base camp to avoid any deliberate or accidental spills;
- ensure the maintenance and washing of machinery and vehicles at the sites provided for this purpose;

Climate change

- respecting the limits of deforestation ;
- carry out compensatory reforestation.

Measures for the protection of the biological environment

The measures will be presented according to the different components of this environment. These are: the landscape and vegetation and the fauna and its habitat.

Landscape and vegetation

- minimise the number of trees to be felled during the works;
- to accompany local reforestation initiatives by supporting village groups, local associations, non-governmental organisations (NGOs), etc. in their environmental activities;
- Carry out and maintain compensatory planting on the site and in community locations (schools, health centres, communal forests, etc.);
- support PAPs in the management of compensatory plantings.

Wildlife and its habitat

- prohibit the hunting of animal species on the site;
- help restore wildlife habitats on sites and access routes;
- contribute to limiting the degradation of surface water quality, which in turn will limit the loss of wildlife (terrestrial and aquatic) and domestic animals.

4.1.3. Measures for the protection of the human environment

The measures will be presented according to the different components of this environment. These are: demography and habitat, land management and loss of habitat and property, health and safety of communities and workers, cultural and archaeological heritage (monuments, sacred sites, etc.) and socio-economic activities and livelihoods.

Demography and housing and social cohesion

- provide housing in the base for subcontractors' workers to avoid pressure on the village habitat;
- to have adequate health care facilities on site to avoid pressure on workers in the health centre of the localities crossed:
- communicate with the communities affected by the project - ;
- encourage the recruitment of local workers;
- raising workers' awareness of the customs and habits of the environment.

Health and safety of communities and workers

- setting up an in situ health unit to provide first aid in the event of accidents or illnesses before transfer to a reference health centre.
- Strengthen the capacity of health centres with health care products and materials;
- Implement a programme to combat STIs, HIV/AIDS and unwanted pregnancies for site staff and the population.
- set up a system of user awareness signs.
- Conducting disease awareness sessions (STIs and HIV, COVID 19).

Cultural and archaeological heritage (monuments, sacred sites, etc.)

- set up a preventive archaeology procedure to avoid the destruction of potential remains.
- Establish an incidental findings procedure and require subcontractors to comply with this procedure as part of their contract.
- make all workers aware of the content of the stop procedure in case of a threat to an archaeological or culturally important site.

Socio-economic activities and livelihoods

- encourage local employment by security subcontractors and inform them of local specificities and validate their methods and rules to avoid conflicts with local actors.
- Raising awareness among local people about the possibilities of developing local entrepreneurship initiatives, in particular catering and the sale of food and basic necessities.

6 RISK ANALYSIS

The assessment methodology is based on the International Finance Corporation (IFC) General EHS Guidelines: Environment - Hazardous Materials Management (Environmental, Health and Safety Guidelines, 30 April 2007) and the US Environmental Protection Agency (US EPA) Title 40 CFR parts 68, 112 and 355.

More specifically, the methodology used for hazard and risk assessment is Preliminary Risk Analysis (PRA), which is based on hazard identification and risk estimation (HAZID).

The risk assessment is used to plan preventive actions during the implementation works, taking into account the priorities. The methodology used consists mainly of three steps:

- the identification of risk situations related to the implementation of the 33kV line;
- the estimation for each hazardous situation of the severity of the potential damage and the frequency of exposure;
- prioritisation of risks to determine the priorities of the action plan.

6.1 Risk identification and assessment

The identification of risks was based on feedback (occupational accidents and illnesses) from electricity infrastructure sites and site visits to other similar projects in the region. The stakeholder consultation campaign was also a means of identifying and assessing the potential risks of the project on the biophysical and human environment of the area. The risks identified are as follows:

- risk of hearing impairment for local residents and construction site personnel;
- risks of contamination of surface water and groundwater ;
- risks of accidents and incidents at work and occupational diseases related to the handling of machinery ;
- risks of falling on the same level and when working at height;
- risk of developing gender-based violence (GBV) ;
- risks of EAS/HS ;
- risk of social conflict ;
- risk of transmission of sexual diseases (STI/HIV/AIDS);
- risk of spreading COVID-19;
- risk of damage to the health, safety and hygiene of workers and the surrounding population;
- risk of deterioration of archaeological remains ;
- risk of fire and electric shock ;
- risk of destruction of facilities and disruption of energy production due to the effects of climate change;
- risk of proliferation of waste electrical and electronic equipment (WEEE);

- risks of terrorist attacks
- risk of falling poles.

For risk assessment, a scoring system has been adopted. This scoring is done in order to define the important risks and prioritise prevention actions. The criteria that were taken into account in this assessment are: the frequency of the task to be performed that contains the risk and the severity of the accident/incident.

6.2 Presentation of the risk assessment grid

The estimation of risk consists of considering two factors for each hazardous situation: the frequency of exposure to the hazard and the severity of the potential damage. The frequency levels can range from low to very frequent and the severity levels from low to very severe.

Table 10 Levels of factors in the risk assessment grid

Probability scale (P)		**Gravity scale (G)**	
Score	**Meaning**	**Score**	**Meaning**
P1 = Very unlikely	Once every 10 years,	G1 = low	Reversible accident or illness without time off work
P2= Unlikely	Once a year,	G2 = average	Reversible accident or illness with time off work
P3= Likely	Once a month,	G3 = severe	Accident or illness with partial permanent disability
P4= Very likely	Once a week or more,	G4 = very severe	Accident or fatal illness

Source: IPEAD 2022 Mission

The risk is evaluated by the formula: R (risk) = G (severity) x P (probability), a "criticality matrix" is established and makes it possible to see the acceptable and unacceptable risks, but also the prioritisation of actions, which go from 1 to 3. Crossing frequency and severity gives the level of priority

Table 11 Risk assessment grid

	Probability			
Gravity	P1	P2	P3	P4
G4	4	8	12	16
G3	3	6	9	12
G2	2	4	6	8
G1	1	2	3	4

Source: IPEAD 2022 Mission

Table 12 : Meaning of the colours in the risk assessment grid

Colour code	Priority level	Meaning of the colours
	Priority 1	While the red colour represents an unacceptably high risk that requires one of the highest priority actions
	Priority 2	The colour yellow indicates a high risk. In this case the priority for action is 2
	Priority 3	A very limited risk will have a green colour. In this case the priority for action is third order

Source: IPEAD 2022 Mission

6.3 Analysis of the environmental and social risks of the project

Among the risk situations linked to the project, the present study has identified risks of hearing disorders for local residents and site personnel, surface and groundwater pollution, accidents and work-related incidents and occupational illnesses linked to the handling of machinery, falls from the ground during work at height, the development of gender-based violence (GBV), EAS/HS, social conflicts, the spread of COVID-19 and STIs, and the risk of accidents to workers and the neighbouring population, the proliferation of WEEE, fire and electrocution, the destruction of installations and the disruption of energy production due to the effects of climate change, and security (vandalism of the park, theft, terrorist attack). The risks of fire and electrocution, the spread of COVID-19, the development of gender-based violence (GBV), EAS/HS, accidents and incidents at work and occupational diseases are assessed as high and will require the implementation of priority actions. The summary of the results of the analysis of the identified risks is shown in Table 11.

Table 13 : Summary of the environmental and social risk assessment

Component	Risks	Description and analysis	Risk assessment before prevention		
			Probability	Gravity	Level of risk
Sound environment	Risk of hearing impairment for local residents and construction workers	The main risks arising from the implementation of the project stem from the traffic flow of the trucks, their speed and the noise generated. With regard to noise, the World Health Organisation suggests a maximum peak level of 45 dB(a) at night in a bedroom. During the day, a maximum level of 55 dB(a) is proposed outside. The outdoor level may be exceeded occasionally when trucks are passing by	2	2	**4**
Surface and groundwater	Surface and groundwater contamination	The use of equipment and machinery running on hydrocarbons could lead to accidental spills and discharges of waste oil from the operation of the machinery. The discharge of these wastes would contribute to the pollution of the soil and, through the phenomenon of run-off/infiltration, of surface and ground water, the consumption of which could lead to illnesses	2	2	**4**
Health and safety	Occupational accidents and incidents and occupational diseases related to the handling of machinery and equipment	During the preparatory and construction phases, there will be risks of accidents related to the movement of construction equipment, the transport of personnel and the movement of people. Occupational illnesses due to physical effort or repetitive movements and bad posture, etc., may also occur. These risks of accidents and occupational diseases are linked to handling activities. However, they could also be caused by the movement of mobile machinery (collision, skidding), by the load being handled (falling objects, tipping over), or by the poor handling of work tools. Illnesses can also be caused by inhalation of various building site dusts.	3	3	**9**
	Falls on the ground and when working at height	Free falls of people or objects could occur during work at height (raising poles, setting up scaffolding, fixing electrical poles, etc.). Falls on the same level and falls from height are respectively the second and third most common causes of work accidents in the construction industry	3	3	**9**
Health and safety	Spread of COVID-19 and communicable diseases (STI AIDS)	The project to implement the line will be carried out with the COVID 19 pandemic. Indeed, during the preparatory, construction, operation and dismantling phases, there will be a large influx of people, including company staff, members of control missions, suppliers and other service providers, and local workers. All these people are exposed to COVID-19 and the mixing with the local population could lead to an	4	4	**16**

Component	Risks	Description and analysis	Risk assessment before prevention		
			Probability	Gravity	Level of risk
		aggravating situation. The presence of these personnel can lead to the proliferation of sexual diseases (STI-AIDS)			
	Deterioration of the health, safety and hygiene of workers and the surrounding population	During the preparation/construction, operation and decommissioning phase, poor waste management could lead to health and safety problems and thus in the short to medium term to occupational diseases. Also the intense work without rest could lead to health problems.	2	2	**4**
	Risk of fire and electric shock	This is a serious risk of burns or injury to people as a result of fire or electrocution. They can lead to material and physical damage (to staff during network and cabin maintenance activities) or even to the beneficiary population. These dangerous situations may well be encountered in the work area and among new subscribers; indeed, ignorance of the risks associated with electricity may lead to electrocution of unwary users, and failure to follow safety instructions may lead to this phenomenon among workers during line maintenance.	4	4	**16**
VBG	Increase in gender-based violence (GBV)	During the construction phase, the project could lead to an influx of workers into the area. This influx of workers from various backgrounds could lead to deviant behaviour (sexual harassment, violence against children etc.).	3	3	**9**
Human	Risk of social conflicts	The arrival of the personnel of the contracting companies will certainly contribute enormously to the animation of the social life of the localities concerned by the Project, but it is also likely to generate conflicts and real upheavals in the existing social relationships. Indeed, the staff, having relatively large financial means at their disposal, could voluntarily or involuntarily disrupt the pre-existing social order in the villages adjacent to the project site and cause the dislocation of certain social links (families, households, traditional, etc.). Such situations could be a source of conflict and/or confrontation that could threaten social cohesion and peace. Furthermore, social conflicts could possibly arise as a result of the non-recruitment of young people in the localities concerned or the non-respect of local customs and habits (acts of adultery, non-respect of prohibitions, theft, etc.). Behaviour that defies local customs and mores (adultery, theft, failure to respect prohibitions, etc.) attributable to site personnel can lead to conflicts and block the progress of work. The same applies to gender-based violence, in particular sexual and moral harassment, sexual abuse,	2	2	**4**

Component	Risks	Description and analysis	Risk assessment before prevention		
			Probability	Gravity	Level of risk
		attempted rape and rape of young girls, widows and minors, not to mention the use of prostitutes.			
Archaeological remains	Deterioration of archaeological remains	No sacred sites were identified during the acquisition of the line corridor. However, it is possible that cultural property may be discovered during excavation activities. Incidental finds will be subject to appropriate measures as recommended by international good practice.	2	2	**4**
Operation of services and security	Risk of destruction of facilities and disruption of energy production due to climate change effects	Climate change events such as increased temperature, increased wind speed, thunderstorms, lightning, hail, etc., can pose risks to the line's facilities: winds can cause cable disturbances and even cause poles to fall down; torrential rain, lightning, hail and strong winds can destroy cable supports and poles. This may result in a disruption of the electricity supply, with consequent disruptions to the operation of government and technical services, basic social services, socio-economic activities and security services.	4	2	**8**
Climate	Risk of proliferation of WEEE	During implementation and operation, the project activities will generate waste electrical and electronic equipment (WEEE) and hazardous industrial waste (HIW). If not managed within a controlled system, these wastes can be misused or proliferate in nature with negative impacts on the environment and health. The environmental damage is most harmful during the final disposal of these wastes, as the toxic substances are discharged directly onto the soil, which can contaminate it and contaminate water. When burned, WEEE and IEDs contribute to polluting the ambient air and form polluting ash heaps and substances that contribute to the production of greenhouse gases in the atmosphere. The implementation of hazardous waste management systems will clean up the environment of the area and thus protect the biophysical environment and the climate.	2	4	**8**
Safety and security of facilities	Park vandalism, theft, terrorist attack	During the operating phase, the line's facilities may be destroyed, which could be due to Failure to meet people's expectations of the project can lead to angry mobs whose anger can be directed at the line.	2	4	**8**

Source: IPEAD 2022 Mission

6.4 Environmental and social risk management measures

Environmental and social risk management measures have been proposed. These measures take into account the potential risks of the project. The table above presents the different measures observed.

Table 14Environmental and social risk management measures

Components	Risks	Description and analysis	Risk management measures
Sound environment	**Risk of hearing impairment for local residents and construction workers**	The main risks arising from the implementation of the project stem from the traffic flow of the trucks, their speed and the noise generated. With regard to noise, the World Health Organisation suggests a maximum peak level of 45 dB(a) at night in a bedroom. During the day, a maximum level of 55 dB(a) is proposed outside. The outdoor level may be exceeded occasionally when trucks are passing by	Implementation of the accident prevention and safety plan : - inform users and local residents of the safety instructions for the corridor; - install signage inside and outside the site - ensure that drivers are properly trained; - carry out proper maintenance and regular testing to reduce the possibility of brake failure; - Equip all machines with a protective structure associated with a safety belt to keep the driver safe in the event of a rollover, a reversing display and warning system, ergonomic access, adapted cabs and protection against falling objects; - Implementation of the internal regulations and posting of safety instructions on the site;
Surface and groundwater	**Surface and groundwater contamination**	The use of equipment and machinery running on hydrocarbons could lead to accidental spills and discharges of waste oil from the operation of the machinery. The discharge of these wastes would contribute to the pollution of the soil and, through the phenomenon of	Implementation of measures to reduce surface and groundwater contamination : - prepare and implement a construction waste management and disposal plan; - implement IEC practices towards workers and local populations;

Components	Risks	Description and analysis	Risk management measures
		run-off/infiltration, of surface and ground water, the consumption of which could lead to illnesses	- set up storage and retention bins for waste;
Health and safety	**Occupational accidents and incidents and occupational diseases related to the handling of machinery**	During the preparatory and construction phases, there will be risks of accidents related to the movement of construction equipment, the transport of personnel and the movement of people. Occupational illnesses due to physical effort or repetitive movements and bad posture, etc., may also occur. These risks of accidents and occupational diseases are linked to handling activities. However, they could also be caused by the movement of mobile machinery (collision, skidding), by the load being handled (falling objects, tipping over), or by the poor handling of work tools. Illnesses can also be caused by inhalation of various building site dusts.	Implementation of the Occupational Injury and Illness Prevention Plan : - ensure that drivers are properly trained; - carry out proper maintenance and regular testing to reduce the possibility of brake failure; - Equip the machines with a protective structure associated with a safety belt that holds the driver in place in the event of a rollover, a display and reversing warning system, ergonomic access, adapted cabs and protection against falling objects; - Establish internal regulations and post safety instructions on the site; - train staff in workplace safety; - Establish procedure sheets for the use of machines ; - ensure that personal protective equipment (PPE) is worn: helmets, safety boots, appropriate gloves etc.
	Falls on the ground and when working at height	Free falls of people or objects could occur during work at height (raising walls, setting up scaffolding, fixing electricity poles, etc.). Falls on the same level and falls from heights are respectively the second and third most common causes of work accidents in the construction industry	
Health and safety	**Spread of COVID-19 and communicable diseases (STI AIDS)**	The project to implement the line will be carried out with the COVID 19 pandemic. Indeed, during the preparatory/construction and operation phases, there will be a large influx of people, including company personnel, members of control missions, suppliers and other service providers, and local labour. All these people are exposed to COVID-19 and the mixing with the local population could lead to an aggravating situation. The presence of these	- Risks of COVID-19 contamination: - Develop a pandemic influenza prevention plan for COVID19 to address risks and sources of exposure, transmission routes; - raise awareness among workers and local populations about the fight against COVID19 ; - Wear medical masks or other locally made masks;

Components	Risks	Description and analysis	Risk management measures
		personnel can lead to the proliferation of sexual diseases (STI-AIDS)	- apply social distancing throughout the sub-project area - confine people contaminated with COVID-19; - observe the barrier measures ; - develop and implement company procedures for worker protection and infection control. - ensure that women are able to obtain information on how to prevent and respond to the epidemic in an understandable way - developing targeted strategies for women's economic empowerment
	Deterioration of the health, safety and hygiene of workers and the surrounding population	During the preparation, construction and operation phase, poor waste management could lead to a deterioration in health and safety and thus in the short to medium term to occupational diseases. Also the intense work without rest could lead to health problems.	Implementation of the special health, safety and hygiene plan for workers and the surrounding population: - Use approved products in the maintenance of green spaces and premises; - ensure proper waste management (sorting, storage and disposal ; - respecting working time and avoiding intense mental work Equipping facilities with fire extinguishers and training staff in their use
	Risk of fire and electric shock	This is a serious risk of burns or injury to people as a result of fire or electrocution. They can lead to material and physical damage (to staff during network and cabin maintenance activities) or even to the beneficiary population. These dangerous situations may well be	Implementation of the fire and electrocution risk reduction plan : - to raise awareness of the risks of electrocution due to misuse or incorrect household connections;

Components	Risks	Description and analysis	Risk management measures
		encountered in the work area and among new subscribers; indeed, ignorance of the risks associated with electricity may lead to electrocution of unwary users, and failure to follow safety instructions may lead to this phenomenon among workers during line maintenance.	- Develop and distribute awareness-raising manuals on good practice in the use of electricity; - require the wearing of appropriate PPE during maintenance work on the electricity network; - train staff in fire extinguishing.
VBG	**Increase in gender-based violence (GBV)**	During the construction phase, the project will result in an influx of workers into the area. This influx of workers from various backgrounds could lead to deviant behaviour (sexual harassment, unwanted pregnancies, violence against children etc.).	Implementation of the GBV risk reduction plan : - raise awareness of GBV among workers - avoiding the use of minors on the site - raising awareness of unwanted pregnancies
Human	**Risk of social conflicts**	The arrival of the personnel of the contracting companies will certainly contribute enormously to the animation of the social life of the localities concerned by the Project, but it is also likely to generate conflicts and real upheavals in the existing social relationships. Indeed, the staff, having relatively large financial means at their disposal, could voluntarily or involuntarily disrupt the pre-existing social order in the village adjacent to the project site and cause the dislocation of certain social ties (families, households, traditional, etc.). Such situations could be a source of conflict and/or confrontation that could threaten social cohesion and peace. Furthermore, social conflicts could possibly arise as a result of the non-recruitment of young people in the localities concerned or of the non-respect of local customs and habits (acts of adultery, unwanted pregnancies, non-respect of prohibitions, theft, etc.). Behaviour that defies local customs and mores (adultery,	Implementation of the risk reduction plan on social conflicts : - continue to recruit local labour for unskilled work - fencing off the site of the solar power plant so that it can be better monitored - raise awareness - Establish a framework for consultation and complaint management

Components	Risks	Description and analysis	Risk management measures
		theft, non-respect of prohibitions, etc.) attributable to site personnel can lead to conflicts and block the progress of work. The same applies to gender-based violence, in particular sexual and moral harassment, sexual abuse, attempted rape and rape of young girls, widows and minors, not to mention the use of prostitutes.	
Archaeological remains	**Deterioration of archaeological remains**	No sacred sites were identified at the time of land acquisition. However, it is possible that cultural property may be discovered during excavation activities. Incidental discoveries will be subject to appropriate measures as recommended by international good practice.	Implementation of the safeguarding plan for cultural goods : - stop the work immediately and inform the services in charge of culture and the local authorities if cultural or archaeological remains are discovered; - to accompany the location and protection of the remains discovered on the sub-project site; inform staff in advance of what to do in the event of an accidental discovery of remains.
Operation of services and security	**Risk of destruction of facilities and disruption of energy production due to climate change effects**	Climate change events such as increased temperature, increased wind speed, thunderstorms, lightning, hail, etc., can pose risks to the poles and cables of the line: winds can cause dust to settle and increase the frequency of cleaning; torrential rain, lightning, hail and strong winds can destroy poles and cables. This may result in a disruption of the electricity supply, with consequent disruptions to the operation of government and technical services, basic social services, socio-economic activities and security services.	- Consider wind speed and heavy rainfall in the sizing of post holes and structuring; - take into account the deficit in the management of energy distribution in the event of a temperature rise; - maintain a strong collaboration with the weather service to have up-to-date data; - install a lightning protection system.

Components	Risks	Description and analysis	Risk management measures
Climate	**Risk of proliferation of WEEE**	During construction and operation, project activities will generate waste electrical and electronic equipment (WEEE) and hazardous industrial waste (HIW). If not managed under a controlled system, these wastes can be misused or proliferate in nature with negative impacts on the environment and health. The environmental damage is most harmful during the final disposal of these wastes, as the toxic substances are discharged directly onto the soil, which can contaminate it and contaminate water. When burned, WEEE and IEDs contribute to polluting the ambient air and form polluting ash heaps and substances that contribute to the production of greenhouse gases in the atmosphere. The implementation of hazardous waste management systems will clean up the environment of the area and thus protect the biophysical environment and the climate.	- store in a container and then evacuate (Europe or elsewhere) at the end of the work to - store in a dedicated area and then recycle - Selective storage on site to avoid leakage of oils and hydrocarbons into the soil, surface or ground water. - send to a specialised disposal facility, or recycling if available; - IEC campaign on hazardous waste for populations and workers
Safety and security of facilities	**Park vandalism, theft, terrorist attack**	During the operating phase, the line's facilities may be destroyed, which could be due to The failure to meet people's expectations of the sub-project could lead to angry mobs whose anger may be directed at the line.	- install surveillance cameras ; - collaborate with the national defence and security forces ; - raise awareness of the protection of facilities

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The objective of this ESMP is to ensure that the project complies with Burkina Faso's national legislation and the International Finance Corporation's international standards for environmental and social management. The ESMP describes the following programmes:

- programme for the implementation of mitigation, compensation and risk mitigation measures ;
- environmental monitoring and follow-up programme ;
- capacity building programme ;
- cost estimates for the various ESMP programmes.

7.1 Programme for the implementation of mitigation, compensation and enhancement measures for impacts and risks ;

This section presents the monitoring and performance indicators, the implementing actors and the costs of the programme for the implementation of impact and risk mitigation, compensation and enhancement measures;

The table above shows the implementation programme for the mitigation and compensation measures.

Table 15: Implementation programme for impact mitigation and compensation measures

Project phases	Environmental component affected	Potential impacts	Mitigation or compensation measures	Performance monitoring indicators	Responsibility			Timetable for implementation	Costs (FCFA)
					Execution	Monitoring	Follow-up		
In environmental terms									
Preparation/Construction	Landscape and topography	Changes in landscape and morphology	Implementation of a plan for the rehabilitation of degraded and deforested areas	100% of the degraded areas have been rehabilitated; 80% of the plants planted have reached a height of 1.5m	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE	During the works	3 500 000
	Air	Degradation of air quality	Implementation of a plan to reduce dust and gas emissions	Number of driveway sprays per day and 100% of vehicles fitted with catalytic converters	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE, Town Hall	During the implementation works	1 000 000
	Sound environment	Noise pollution	Implementation of a plan to reduce or eliminate noise pollution	100% of workers are equipped and wear PPE including ear muffs 100% of the equipment on site is in good condition.	Contracting company	Environmental expert of the contracting company	ZINA SOLAR, ANEVE, DRE, Town Hall	During the implementation works	1 500 000
	Surface and subterranean water	Water pollution and water quantity reduction.	Implementation of a Surface and Groundwater Protection Plan	100% of the storage and retention bins have been installed 100% of solid and liquid waste is collected and transferred to the city's landfill for recycling	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During the implementation works	1 000 000
	Floors	Pollution, modification and weakening	Implementation of a Soil Protection Plan	100% of degraded areas are restored	Project and Contractin	Environmental expert of the	ZINA SOLAR ANEVE, DRE Town Hall	During the works	1 500 000

Project phases	Environmental component affected	Potential impacts	Mitigation or compensation measures	Performance monitoring indicators	Responsibility			Timetable for implementation	Costs (FCFA)
					Execution	Monitoring	Follow-up		
		of soil structure and texture			g Company	contracting company			
	Vegetation	Loss of trees	Reforestation to compensate for trees (felled on the project site) Purchasing plants	100% of the felled trees were compensated 80% of the plants planted have reached a height of 1.5m	Project and Company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During the works	8 000 000
	Wildlife	Disturbance of wildlife tranquillity / destruction of wildlife habitat	Implementation of a plan for the restoration and protection of natural wildlife habitats	100% of identified stakeholders are reached by IEC (Information Education Communication) actions	Project	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During the works	500 000
	Soil, water, air	Waste generation	Implementation of a waste management plan	100% of the WEEE and IDW produced is sorted. The WEEE and WID treatment sites are identified; A protocol for transfer to treatment sites is established.	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During the works	500 000
Operation	Groundwater Floors	Water quantity reduction, water and soil pollution.	Implementation of a plan to reduce water consumption	Level of water consumption	Project	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During operation	PM
Closing	Soil Water Air	Deterioration of soil, water and air quality	Development and implementation of a closure and	Existence of a closure plan	Project	Environmental expert of the	ZINA SOLAR ANEVE, DRE	End of operation	1 000 000

Project phases	Environmental component affected	Potential impacts	Mitigation or compensation measures	Performance monitoring indicators	Responsibility			Timetable for implementation	Costs (FCFA)
					Execution	Monitoring	Follow-up		
			rehabilitation plan at the end of the works and at the end of the line's life	100% of registered complaints are dealt with		contracting company	Town Hall		
	Landscape and topography	Degradation of the line corridor and modification of the landscape	refurbishment of the corridor	100% of the land restored	Project	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	End of operation	5 000 000
	Vegetation	Degradation of the line corridor and modification of the landscape	Reforestation following dismantling works	Reforestation planting of the corridor carried out	Project	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	End of operation	9 200 000
Total 1									**32 200 000**
On a human level									
Preparation/Construction	Land	Loss of arable land and other land resources	Implementation of the compensation plan for Project Affected Persons Implementation of the MGP	100% of PAPs were compensated	Project	Environmental expert of the contracting company Monitoring actors	ZINA SOLAR ANEVE, DRE Town Hall CVDs	Before the work	PM
	Public health and safety of vulnerable people	Damage to human health, safety of workers and the general public	Implementation of the safety plan for the execution of the work	100% of the access roads to the line site have traffic signs and speed bumps. 100% of workers wear PPE	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall	During the works	1 000 000

Project phases	Environmental component affected	Potential impacts	Mitigation or compensation measures	Performance monitoring indicators	Responsibility			Timetable for implementation	Costs (FCFA)
					Execution	Monitoring	Follow-up		
	Social cohesion	Disruption of social cohesion	Implementation of the recruitment plan at local level	At least 25% of unskilled workers are from the region Customary obligations are respected	Contracting company	Social expert of the contracting company	DRE Town Hall	During the works	1 000 000
	Cultural and archaeological heritage	Destruction or disturbance of cultural and archaeological heritage	Implementation of a safeguarding plan for religious property	The remains discovered are protected	Contracting company	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall DVC and customary leaders	During the works	500 000
	Vulnerable persons	Deterioration of the situation of vulnerable people	Implementation of the vulnerable persons protection plan	Number of temporary signs at work sites. Number of awareness campaigns carried out.	Project	Environmental expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall CVD	During the works	600 000
	Workers and local communities	EAS/HS claims	Compliance with the code of conduct Implementation of the MGP	Number of EAS/HS claims processed	Project	Social expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall DRFPTPS	During the works	PM
Operation	Social cohesion	Disruption of social cohesion	Implementation of the recruitment plan at local level during operation	Presence of unskilled workers are from the region Customary obligations have been met	ZINA SOLAR	Social expert	AMEA Power, ANEVE, DRE Town Hall DRFPTPS	During operation	PM

Project phases	Environmental component affected	Potential impacts	Mitigation or compensation measures	Performance monitoring indicators	Responsibility			Timetable for implementation	Costs (FCFA)
					Execution	Monitoring	Follow-up		
	Health and safety and vulnerable people	Damage to human health and safety of workers and the general public	Implementation of the safety plan for the execution of operational works	No injuries 100% of workers are wearing PPE Presence of awareness panels	ZINA SOLAR	Social expert	AMEA Power, ANEVE, DRE Town Hall DRFPTPS	During operation	PM
Closing	Health and safety and vulnerable people	Damage to human health, safety of workers and the general public	Implementation of the safety plan for the execution of the dismantling works	No injuries 100% of workers are wearing PPE Presence of awareness panels	Project	Social expert of the contracting company	ZINA SOLAR ANEVE, DRE Town Hall DRFPTPS	During the dismantling works	4 000 000
Total 2									**7 100 000**
Grand total (1+2)									**39 300 000**

Table 16: Environmental and social risk implementation programme

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
Preparation/Construction	Sound environment	Risk of accidents to staff and local residents due to machine movements	Implementation of the accident prevention and safety plan : - inform users and local residents of the safety instructions along the line corridor; - install signage along the entire line corridor - Ensure that drivers are properly trained; - carry out proper maintenance and regular testing to reduce the possibility of brake failure; - Equip all machines with a protective structure associated with a safety belt that holds the driver in place in the event of a rollover, a reversing display and signalling system, ergonomic access, adapted cabs and protection against falling objects; - Implement the internal regulations and post safety instructions on the site;	Contracting company	ZINA SOLAR ANEVE DRE	1 000 000
	Surface water and groundwater	Surface and groundwater contamination	Implement measures to reduce surface and groundwater contamination: - prepare and implement a construction waste management and disposal plan; - carrying out IEC towards workers and local populations; - Set up waste storage and retention bins;	Contracting company	ZINA SOLAR ANEVE DRE	850 000

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
	Health and safety	Occupational accidents and incidents and occupational diseases related to the handling of machinery	Implementing the Occupational Injury and Illness Prevention Plan : - ensure that drivers are properly trained; - carry out proper maintenance and regular testing to reduce the possibility of brake failure; - Equip the machines with a protective structure associated with a safety belt that holds the driver in place in the event of a rollover, a display and reversing warning system, ergonomic access, adapted cabs and protection against falling objects; - Establish internal regulations and post safety instructions on the site; - train staff in workplace safety; - Establish procedure sheets for the use of machines ; - ensure that personal protective equipment (PPE) is worn: helmets, safety boots, appropriate gloves, safety harnesses etc.	Company	ZINA SOLAR ANEVE DRE Regional Labour Directorate	PM
	Security	Falls on the ground and when working at height	Implementation of measures to reduce falls from the ground and during work at height : - wear collective protection: - organise storage (reserved spaces, storage methods adapted to the objects, width of aisles compatible with the handling equipment used). - Use appropriate ladders for work at height; - mark out risk areas; - backfill the excavations ; - properly secure the loads being handled; - raise awareness of safety measures among site personnel. - Make people wear personal protective equipment (harnesses, safety shoes, helmets, etc.)	Company	ZINA SOLAR ANEVE DRE Direction Régionale du Travail	PM

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
	Vulnerable persons	Increase in gender-based violence (GBV)	Implementation of measures to combat gender-based violence (GBV) : - take into account the aspects of GBV/ASR/HS when developing environmental and social contractual clauses; - train workers on GBV/ASR/HS (including code of conduct, house rules, case management, PMM, etc.); - have workers sign the Code of Conduct before they are hired on site; - identify and train community sensitizers to inform the community about GBV risks; - Raise awareness in the community about GBV/ASA/HS risks and HIV - Ensure wide dissemination of job offers to ensure equal opportunities for all applicants; - Provide separate male and female toilets and changing rooms that can be locked from the inside; - raise awareness of gender-based violence among company staff, monitoring missions and the community; - Primary and secondary health care facilities may be called upon to manage the number of GBV survivors and only refer to tertiary hospitals when higher level care is needed. GBV referral pathways should be updated to reflect these health facilities; - Promote the provision of psychosocial support for women and girl survivors of GBV; - Measures to ease the workload of primary health care facilities should prioritise access to sexual and reproductive health services, including pre- and post-natal care.	Company CSO	ZINA SOLAR ANEVE DRE Social Action, Health Service, Customary Religious	PM

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
	Social cohesion	Risk of social conflict	Implementation of the plan to reduce the risk of social conflict : solicit the support of administrative (Governors, Prefects), communal (Mayors, Councillors), village (CVD) and customary (Village Chiefs/Land Heads) authorities, youth and women's associations, as well as non-governmental organisations (NGOs), etc., to sensitise company employees on the habits and customs of the project areas; - recruiting the majority of unskilled labour locally; - Develop and disseminate a code of conduct to combat sexual harassment and abuse and raise awareness among construction site personnel of the penalties provided for in the laws in force; - Implement the action plan to combat GBV and violence against children at the worksite level; - prohibit any recruitment of underage children (under 16 years of age) on construction sites and make employers aware of the penalties provided for by the law in force	Company Prefect Traditional authorities CSO	ZINA SOLAR ANEVE DRE Social action	PM

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
	Public health and safety	Contamination of COVID-19	Implementation of the plan for the prevention and reduction of risks of contamination with COVID-19 : - Implement the COVID19 pandemic influenza prevention plan to address risks and sources of exposure, transmission routes; - raise awareness among workers and local populations on the fight against COVID19 ; - Wear medical masks or other locally made masks; - apply social distancing on and off the job site - confine people contaminated with COVID-19; - observe the barrier measures ; - developing and implementing worker protection and infection control procedures. - provide women with the necessary information on how to prevent and respond to the epidemic in an understandable way - develop targeted strategies for women's economic empowerment	Town Hall Contracting company Health service	ZINA SOLAR ANEVE DRE	PM

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
	Public health and safety	Deterioration of the health, safety and hygiene of workers and the surrounding population	Implement the health, safety and hygiene plan for workers and the surrounding population: - Use approved products in the maintenance of green spaces and premises; - raise awareness of the ways in which dangerous products are used and stored; - ensure proper waste management (sorting, storage and disposal ; - respecting working time and avoiding intense mental work - Equipping facilities with fire extinguishers and training staff in their use	Town Hall Company Health service	ZINA SOLAR ANEVE DRE	PM
	Archaeological and cultural remains	Risk of damage to archaeological remains	Implementation of the safeguarding plan for religious properties : - stop the work immediately and inform the services in charge of culture and the local authorities if cultural or archaeological remains are discovered; - to accompany the location and protection of the remains discovered on the sub-project site; - inform staff in advance of what to do in the event of an accidental discovery of remains.	Town Hall MDC Company Traditional authorities	ZINA SOLAR ANEVE DRE	PM
Operation	Health and safety	Risk of fire and electric shock	Implementation of the fire and electrocution risk reduction plan : - to raise awareness of the risks of electrocution due to misuse or incorrect household connections; - Develop and distribute awareness-raising manuals on good practice in the use of electricity; - require the wearing of appropriate PPE during maintenance work on the electricity network; - train staff in fire extinguishing.	Town Hall Fire Brigade	ZINA SOLAR ANEVE DRE	PM
	Operation of services and security	Risk of destruction of facilities and disruption of energy	- take into account wind speed and heavy rainfall in the sizing of poles; - take into account the deficit in the management of energy distribution in the event of a temperature rise; - provide a back-up unit to cover the energy deficit;	Environmental and safety expert from the	ZINA SOLAR ANEVE DRE	PM

Project phase	Environmental component	Risks	Preventive measures	Responsibilities		Costs (FCFA)
				Monitoring	Follow-up	
		production due to climate change effects	- landscaping along the line; - install a lightning protection system.	contracting company	Meteorological Directorate General	
	Climate	Risk of proliferation of WEEE	- storage in a dedicated area and recycling - Selective storage on site to avoid leakage of oils and hydrocarbons into the soil, surface or ground water. Send to a specialised disposal facility, or recycling if available; IEC campaign on hazardous waste for populations and workers	Contracting company	ZINA SOLAR ANEVE DRE Town hall	PM
	Facility security	Park vandalism, theft, terrorist attack	- install surveillance cameras ; - collaborate with the defence and security forces ; - work with the city council. - raise awareness of the protection of facilities	Safety Officer of the Contracting Company	ZINA SOLAR ANEVE DRE, Town Hall Gendarmerie	PM
TOTAL						**1 850 000**

7.2 Environmental and social monitoring and follow-up programme

7.2.1 Environmental monitoring programme and social

The objective of environmental and social monitoring is to ensure that the promoter meets its commitments and obligations to consider the environment and apply the measures envisaged in the NIES and the IFC standards. It also aims to ensure that mitigation and enhancement measures are implemented, that they are achieving their intended results; or if they prove inadequate, that they can be modified, discontinued or replaced. Environmental and social monitoring should be carried out by the main contractor. The project manager must ensure that environmental and safety aspects are recorded in the site reports and the provisional acceptance reports.

During the implementation phase, the consulting engineer in charge of supervising the works on site will have to take on the services of an environmental manager whose main task will be to ensure compliance with all the standard and specific mitigation measures of the sub-project;

- remind contractors of their environmental and social obligations and ensure that these are met during the construction period;
- prepare environmental monitoring reports throughout the works;
- inspect the work and request appropriate corrective action where necessary;
- draft the final report of the environmental and social monitoring programme.

In addition, the social expert of the company in charge of the works will be able to act as an interface between the local population and the contractors in case of complaints. The environmental and social monitoring programme is shown in the table.

Table 17 Environmental and social monitoring programme

Middle element	Aspect to be monitored	Purpose	Means of control	Periodicity of control	Quality level to be maintained	Responsibility	Costs (FCFA)
Biophysical and socio-economic	Application of environmental and safety instructions on the site	Apply environmental and safety instructions on the site	Site visit and consultation with environmental experts	Weekly	Minimise the impact on the environment, the health and safety of site personnel and local residents	Business environment expert	PM
Floors	Existence of bare areas, gullies, etc. induced by the project Storage of topsoil	Limiting physical damage to the soil Limit erosive processes and reduce trampling	Visual observation	Weekly	Minimal loss of soil, reduction of any trampling and damage to the soil	Business environment expert	
Water and soil quality	Check the management of waste and liquid discharges	Prevent, limit or avoid the production of waste and liquid discharges, direct or accidental	- Visual observation of operations. - Document control. - Authorisation management - Recording of waste and discharges	Daily	Compliance with the legislation in force.	Business environment expert	
Public health and safety	Compliance with safety and health provisions	Prevent and avoid accidents	- Visual observation - Maintaining a claims register	Daily	Zero accidents and zero claims.	Business environment expert	
Socio-economic environment	Perception of local residents prior to project development. Respect for the employment of local labour Compliance with CNSS affiliation Respect for the application of the minimum wage for the payment of workers on	Enforce the project's PMM Compliance with national employment legislation	Communication with local authorities and local populations; Hired lists Payment slip for workers' contributions to the CNSS Employment contracts or payment statements of employees and contractors	Fortnightly, and at every incident.	Fluid communication	Corporate social expert	

Middle element	Aspect to be monitored	Purpose	Means of control	Periodicity of control	Quality level to be maintained	Responsibility	Costs (FCFA)
	the site, including service providers and suppliers						
Socio-economic environment	Setting up a local monitoring and social support committee	Achieving better integration and social management of the project	Minutes of the Local Monitoring Committee	Monthly	Strong involvement of the population	Corporate social expert	
Water and soil quality	Water and soil pollution	Prevent, limit or avoid the production of waste and liquid discharges, direct or accidental	Visual observation of operations. Document control. Authorisation management Recording of waste and discharges	Weekly	Compliance with the legislation in force.	Business environment expert	
Public health and safety	Compliance with health and safety regulations	Prevent and avoid accidents, illnesses, STIs/AIDS risks and SIAs/HS	Health and safety diagnosis	Monthly	Zero accidents and zero claims and illness.	Business environment expert	
Socio-economic environment	Gender-based discrimination and vulnerable groups	Anticipating, preventing and avoiding discrimination based on gender and vulnerable groups	Daily report on GBV complaints and vulnerable groups	implementation	Zero discrimination	Corporate social expert	
TOTAL							**PM**

7.2.2 Environmental monitoring programme and social

Environmental and social monitoring is dedicated to monitoring the predicted impacts. It makes it possible to verify the accuracy of the predictions and measure the actual impacts of the power line construction project and to assess the effectiveness of the proposed mitigation and compensation measures. Follow-up can lead the proponent to react promptly to the failure of a mitigation measure or to any new disturbance of the environment by implementing more appropriate measures or new measures for unforeseen impacts. The environmental and social monitoring programme uses environmental and social indicators to verify compliance with applicable national standards and IFC's environmental sustainability performance. The monitoring programme will address the impacts of greatest concern to the project.

The table shows the environmental and social monitoring programme.

Table 18 : Environmental and social monitoring programme

Environmental and social aspects	Monitoring indicators	Monitoring methods and devices	Follow-up officers	Responsible for control	Periodicals	Cost FCFA
Preparatory and works phase						
Air quality	Particulate matter (PM10, PM5 and PM2.5), CO2, NOx, VOCs and heavy metals	Verification of the implementation of dust mitigation measures Conduct air quality measurement campaigns at sensitive receptors in the vicinity of each site	Company in charge of the works	ZINA SOLAR and ANEVE	Monthly	**1 000 000**
Noise	Noise measurements	Verification of the implementation of noise control measures Conduct noise measurement campaigns at sensitive receptors in the vicinity of each site	Company in charge of the works	ZINA SOLAR and ANEVE	Monthly	**1 000 000**
Contamination of people with COVID 19	Number of people infected	Verification of barrier measures	Company in charge of the works	ZINA SOLAR and ANEVE	Daily	**1 000 000**
Vegetation	Survival rate of planted trees	Verification of reforestation success rates	Company in charge of the works	ZINA SOLAR and ANEVE and DRE	annual	**2 000 000**
Floors	Amount of contaminated land	Rate of remediation of contaminated land	Company in charge of the works	ZINA SOLAR and ANEVE and DRE	Monthly	**1 000 000**
Operational phase						
Increased risk of COVID-19 contamination of people	Number of people infected	Verification of barrier measures	Company in charge of the works	ZINA SOLAR and ANEVE	Daily	**1 000 000**
Closing phase						
Air quality, Noise	Particulate matter and heavy metal content	Verification of the implementation of dust and noise mitigation measures Conduct air quality and noise measurement campaigns at sensitive receptors in the vicinity of each site	Company in charge of the works	ZINA SOLAR and ANEVE	Monthly	**2 000 000**
soils	Amount of contaminated land	Rate of remediation of contaminated land	Company in charge of the works	ZINA SOLAR and ANEVE	Monthly	**1 000 000**

Environmental and social aspects	Monitoring indicators	Monitoring methods and devices	Follow-up officers	Responsible for control	Periodicals	Cost FCFA
Vegetation	Survival rate of reforested plants	Verification of reforestation success rates	Company in charge of the works	ZINA SOLAR and ANEVE	annual	**2 000 000**
Contamination of people with COVID 19 and others	Number of people infected	Verification of barrier measures	Company in charge of the works	ZINA SOLAR and ANEVE	Daily	**1 000 000**
Total						**13 000 000**

7.3 Capacity building programme

In order to ensure effective and timely implementation of the project's environmental and social measures, this ESMP provides a detailed description of the measures:

- institutional arrangements ;
- the entity responsible for carrying out the mitigation and monitoring measures (including operation, supervision, implementation, monitoring, corrective action, financing, reporting and staff training).

In order to strengthen the environmental and social management capacities of the project implementing structures, the ESMP recommends

- the creation or strengthening of the entities concerned,
- Staff training and any additional measures that may be required to support the implementation of mitigation measures; this training will cover the following topics: IFC environmental sustainability standards, gender mainstreaming, environmental and social monitoring, risk prevention and disaster management.
- any other recommendations from the Environmental and Social Impact Assessment.

7.3.1 Training of site actors

All site personnel will receive general training on health, safety and environmental issues, with emphasis on the responsibility of each employee. The training will focus on the following elements: health risks related to certain site activities; first aid in case of accidents; emergency response procedures, STIs and HIV/AIDS/COVID 19, risks and consequences of GBV/ASW/HS, code of conduct and sanctions related to GBV incidents, functioning of the MGP-VBG/EAS/HS, response to survivors of such incidents, and waste management.

A detailed training programme is defined in the training and awareness plan to be implemented by the company in charge of the works.

The health and safety training programme to reduce the risks associated with project operations shall include as a minimum

- a summary of the legal, regulatory and policy requirements at local, national, IFC sustainability performance and other levels that apply to the line project;
- training in occupational risk assessment, safety procedures and information sources (safety data sheets, etc.);
- an emergency evacuation plan ;
- firefighting and emergency response procedures; health and safety risks associated with certain tasks; and
- first aid.

Contractors, subcontractors and consultants working on the project will be required to adhere to all safety and environmental policies and procedures included in the CAD and the technical specifications for the work for the duration of their involvement in the work.

Table 19 : Capacity Building Programme

Sub-project phase	Target audience	Actions	Implementer and Monitoring	Cost of implementation (FCFA)
Studies	Administrative authorities, local elected officials, Local associations (nature conservation, environmental Residents, ...) Local communities Inhabitants, Local economic actors (farmers, traders, etc.)	- inform the public about the line project; - inform about the duration of the work public awareness meeting - raise awareness of acts of vandalism	ZINA SOLAR and the company carrying out the work	1 000 000
Work	Staff Company Subcontractors Local authorities and populations Administrative authorities Network managers, local councillors.	- Training and awareness-raising on occupational risk assessment, safety procedures and information sources (safety cards, etc.) and on the emergency evacuation plan; - training and awareness-raising on firefighting and emergency response procedures - training and awareness of health and safety risks associated with certain tasks and first aid for accident victims; - Inform-Educate-Communicate (IEC) on STI/HIV/AIDS and COVID 19 ; - training and IEC on gender-based violence (GBV) ; - IEC on the appropriate provisions envisaged for the information of road users - training and IEC on the monitoring and complaints handling system for local populations - produce an advertorial on the project and disseminate it to the public - waste management	ZINA SOLAR and the company carrying out the work	1 000 000

Sub-project phase	Target audience	Actions	Implementer and Monitoring	Cost of implementation (FCFA)
Monitoring and control of works, marketing Social	Project Monitoring Committee	Inform on the progress of the work and the implementation of the ESMP	ZINA SOLAR and the company carrying out the work	1 000 000
	NGOs and Associations	Training in Citizen Engagement (roles and responsibilities) in the case of monitoring the implementation of the ESMP	ZINA SOLAR and the company carrying out the work	1 000 000
TOTAL				**4 000 000**

7.4 Estimated Cost of ESMP Implementation

The cost of implementing the various ESMP programmes can be estimated at **58,150,000** CFA francs. The table shows the summary budget for the ESMP. The table below shows the details of the costs per component and per activity.

Table 20 : Estimated overall cost of the ESMP

ESMP Programme	**Implementation cost FCFA**
Programme for the implementation of mitigation, enhancement and compensation measures for environmental and social impacts and risks	41 150 000
Environmental and social monitoring and follow-up programme	13 000 000
Capacity building programme	4 000 000
Overall cost of the ESMP	**58 150 000**

8 CLOSURE AND REHABILITATION PLAN (CPR)

The 33kv line will have a life span close to that of the solar plant. At the end of its life, it must be dismantled and the right-of-way corridor restored. The restoration of the site will consist of restoring the land to a state as close as possible to the initial state before the project was implemented.

8.1 Objective

The closure and rehabilitation plan aims to restore the project right-of-way to a similar state as before the project intervention.

8.1.1 Specific objectives

The specific objectives of the closure and rehabilitation plan are

- rehabilitate degraded soils at the end of the works;
- dismantle all installations (poles, inverters, cables, supports, support foundations, premises, etc.);
- draw up a protocol for the clean-up of the site and the management of the various components of the dismantled line (photovoltaic modules, inverters, cables, supports, etc.).

8.2 Closure and rehabilitation methodology

The closure and rehabilitation of the construction site will be carried out through the removal of equipment, the appropriate management of solid, liquid and gaseous waste and the development and cleaning of the sites. The closure and rehabilitation operation will be carried out in consultation with the local authorities (prefect, town halls and Village Development Council), the landowners and the customary authorities (land chiefs). These consultations will focus on the nature of the developments to be carried out. Depending on the choice made during the consultations, the operation will consist of filling in the excavations with tree planting.

8.2.1 Rehabilitation of the site's living quarters

The closure and rehabilitation of the living bases will involve the presence of heavy equipment and machinery on site. The closure and rehabilitation of these bases will be carried out by removing the equipment and reassigning it to other sites. The various wastes produced on these sites will be sorted and recycled or destroyed. The bases will then be cleaned and rehabilitated so that the land can be returned to its pre-project function.

8.2.2 Dismantling and rehabilitation of the pole locations

For the entire length of the line corridor the equipment and poles will be dismantled. The dismantling of the poles will create holes. The rehabilitation of these holes will be done by filling and spreading the materials as well as the stripped topsoil.

Table 21Process for dismantling the line

Equipment	Elements	Type of fixing	Dismantling method
Transport posts	Feet of the posts	Fixed to the ground in concrete holes	Removal with jackhammers
	Delivery station	Placed on the ground without foundation	Removal by crane
Cable supports	Cable supports	Attached to the wooden beam	Unscrewing
Electrical cables	Cables	Fixed on the supports	Unscrewing
Security	Cameras and detectors	Attached to posts	Unscrewing and dismantling of components

8.2.3 Routine maintenance of corridors

This operation takes place during the operational phase. It will consist of regular visits by technical teams for corridor maintenance activities through pruning of branches and cleaning of the corridor for accessibility of poles and cables for maintenance and various repairs.

The reconstitution of the soil on the upper part will be carried out according to the future exploitation of the sites for the activities. To do this, the topsoil stored after stripping and digging is reused and spread out during reclamation.

8.2.4 Rehabilitation programme

At the end of the line works, the necessary means (mini-bulldozer, truck with crane and any other equipment necessary for the closure and rehabilitation works) will be deployed for the pruning of the trees and the periodic cleaning of the corridors. Compensatory planting will take place from June to August, which is the favourable period. The means remain the same and the chronogram is established as follows in Table 20 below.

Table 22Timeline for the implementation of base rehabilitation and corridor maintenance

Measures	Activities	Location	Period	Responsible for
Rehabilitation of the site base	De-installation of equipment	Construction site base	At the end of the work	ZINA SOLAR ENTRPRISE DRE MAIRIE
	Management of the waste produced			
	Revegetation and landscaping of CES/DRS structures			
Dismantling of line equipment	Mechanical separation of line components	Line corridor right-of-way	At end of plant life (line)	ZINA SOLAR ENTRPRISE DRE MAIRIE
	Sorting and recycling of line components			
	Extraction and recycling of supports and posts			
	Filling of post holes			
Rehabilitation of the line right-of-way	Implementation of a site clean-up protocol			

Source: IPEAD, 2022

8.2.5 Monitoring and evaluation of closure and rehabilitation

For a greater success of the closure and rehabilitation activities of the bases and corridors, a daily monitoring will be carried out by the team of the environmental department of the executing company. This monitoring will particularly concern the dismantling of the bases, the filling of holes in the posts and the pruning and cleaning of the corridors. With the exception of the corridor, the sites rehabilitated before total demobilisation will be subject to revegetation. This revegetation will be followed by an inspection and approval by the local council, environment and energy departments and the engineer in charge of supervising the work.

- **Indicators**

The main indicators will come from the various reports on the effective execution of the closure and rehabilitation activities. The satisfaction of the needs expressed by the local population will constitute a second indicator of the success of the activity.

9 ARRANGEMENTS FOR PUBLIC CONSULTATION AND PARTICIPATION

The line project has integrated the issue of stakeholder participation and consultation. In the process of integrating the project with the population, a monitoring committee for the Livelihoods Restoration Plan has been set up. This committee includes the representative of the promoter, the community relations officer, the administrative and decentralised authorities (prefects and mayors) of Kona and Bana, the deconcentrated technical services of the Environment and Livestock, the customary authorities, the CVDs, the women's associations, the PAPs and the representative of the vulnerable people of the communes concerned. As a reminder, the 2015 Notice had identified 59 PAPs whose property was identified and compensated. The project continues to communicate with stakeholders and the population through its social staff, namely the social specialist and the CLOs.

9.1 Purpose of the consultation

The consultation process took into account: (i) the views of both the female and male populations, where necessary in the case of separate forums or meetings, and (ii) the differing concerns and priorities of men and women with regard to impacts, mitigation mechanisms and benefits, as appropriate.

9.2 Consultation process and synthesis of concerns

As part of the NIES update, a public consultation was carried out from Friday 4 to Wednesday 9 February 2022 for all stakeholders to ensure a good understanding of the issues, positive and negative impacts and environmental risks and the various mitigation and compensation measures of the project.

This consultation and participation process has resulted in a more in-depth exchange of views and information, as well as organised and iterative consultations, leading to ZINA SOLAIRE/AMEA POWER taking into account the views of affected communities in its decision-making process on issues that directly affect them, such as proposed mitigation measures, benefit sharing and opportunities generated, and enforcement issues.

During these exchanges the following concerns were listed and are recorded in the table below.

Table 23 : Summary of concerns raised by PAPs during the public consultation

STAKEHOLDERS	CONCERNS	RESULTS AND RECOMMENDATIONS
Representatives of PAPs and CVDs from Kona (Kona, Zina, Blé and Dangouna)	- problem of disseminating information on the local labour recruitment process to the population; Slow implementation of IGAs for women	- Respecting the commitments made to the population and ensuring that they are respected by the service providers; - Review the dissemination of information on the procedure for recruiting local labour; - Involve PAP representatives in the process of recruiting local labour; - Consider the initial inventory of trees on the line; - Recruit neutral and non-political community workers. - Compensatory planting in the village forest.
Representatives of PAP and CVD in Bana (Wona, Somona and Yona)	- problem of disseminating information on the local labour recruitment process to the population - waiting for the implementation of the IGAs promised to women; - Waiting for the trees on the line to be felled; - confusion between the Bobo-Dédougou interconnection line and the 33 kv Wona-Zina line; - high cost of electrical energy.	- explain to the population the difference between the two power line projects in the area (Bobo-Dédougou interconnection line and the 33 kv Wona-Zina line); - make solar panels available to PAPs; - respect the commitments made to the population and ensure that they are respected by the service providers.
Prefect of Kona	- Slow implementation of project activities	- participation in the monitoring committee ;
Kona Department of Agriculture and Environment Services	Failure to carry out IGAs such as : - implementation of anti-erosion devices ; - creation of market gardens; - construction of manure pits ;	- implementation of compensatory planting within the village forest;

Source: Consultation data, IPEAD 2022

The following images illustrate the meetings within the framework of the consultation

Photo 2 Meeting with representatives of the KONA PAPs

Photo 1 Meeting with PAPs representatives

Photo 4 Field visit with the PAPs

Photo 3 Planting of eucalyptus camaldulensis donated by ZINA SOLAIRE for reforestation

CONCLUSION

This ESIA was carried out in accordance with the environmental and social sustainability standards of the International Finance Corporation (IFC) and the national legislation in force in Burkina Faso, as well as the international environmental conventions ratified by the country. It identified and assessed the potential impacts associated with the implementation of the 33kV line and carried out an analysis of the potential risks. It should be noted that the importance of these main negative impacts that have been identified is estimated to be low or minor during the period of implementation works and during the operation of the line. As for the positive impacts, they are considered of major importance for the ZINA SOLAIRE Company and for the populations. Indeed, the implementation of the line will allow ZINA SOLAIRE to supply energy to SONABEL from the solar power plant in order to improve the quality of the electricity supply it provides to its customers in the Boucle du Mouhoun and Hauts Bassins regions and the surrounding areas.

Taking into account these considerations and all the analysis of impacts and risks previously presented, it is recommended to implement the mitigation measures proposed in the ESMP for a good development and acceptance of the project.

The analysis of the biophysical and socio-economic environment of the project area and the public consultations revealed a number of key environmental and social issues and challenges that will require attention during the implementation of the works:

- protection of the soil against erosion ;
- preservation of water quality ;
- good waste management ;
- preservation of vegetation ;
- preservation of health (STI/HIV and COVID 19) and the living environment;
- the safety of workers and local populations;
- respect for customs and traditions;
- the humanitarian and security crisis.

The project raises a lot of hope in the communities concerned. It is seen as a first step towards electrification and development. However, the current enthusiasm of the stakeholders should not obscure the fact that the trust gained will need to be reinforced throughout the implementation of the project.

Based on the results obtained, it can be stated that if the ESMP measures are effectively implemented, they will be sufficiently effective to mitigate the identified negative impacts. Therefore, the project is environmentally and socio-economically feasible.

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