NOOR Boujdour 22 kV Power Line
Boujdour Province

Specific Environmental and Social Impact Assessment

Vol. 2 - Main Text

Prepared for:

ACWA Power

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NON-TECHNICAL SUMMARY

The Non-technical summary for the Boujdour PV and Power Line (PL) is presented on a separate document (SESIA Vol.1 Non-technical Summary).

The power line is an ancillary facility of the Boujdour 20 MW photovoltaic power project and therefore, in order to follow Good International Practice, the scope of the NTS report has considered both infrastructures.

CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Meaning
As	Arsenic
BAT	Best Available Techniques
BMP	Best Management Practice
BS	British Standards
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
Cd	Cadmium
CESMP	Construction Environmental Social Management Plan
CN	Cyanide
CO	Carbon Monoxide
CO2	Carbon Dioxide
Cr	Chromium
Cu	Copper
dB(A)	A-weighted decibels
dB(C)	C-weighted decibels
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EPs	Equator Principles
EPC	Engineering, Procurement and Construction
EPFIs	The Equator Principle Financial Institutions
Hg	Mercury
IFC	International Finance Corporation
Laeq	A-weighted Equivalent Continuous Sound Level
Lamax	A-weighted Maximum Sound Level
MASEN	Moroccan Agency for Solar Energy
MSDS	Material Safety Data Sheet
Ni	Nickel
NOx	Nitrogen Oxides
NO_2	Nitrogen Dioxide
O_2	Oxygen
OESMP	Operational Environmental and Social Management Plan
ONE	Office National d'Electricité et de d'Eau Potable
O&M	Operation and Maintenance
Pb	Lead
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 micrometres.
Se	Selenium
SESIA	Specific Environmental and Social Impact Assessment

Abbreviation	Meaning
SO_2	Sulphur Dioxide
VOC	Volatile Organic Compounds
WHO	World Health Organisation
Zn	Zinc
5 Capitals	5 Capitals Environmental and Management Consulting

1 INTRODUCTION

The Moroccan Agency for Solar Energy (MASEN – the Sponsor) has declared ACWA Power (the Developer) as the preferred bidder to develop a 20 MW photovoltaic (PV) power project in Boujdour. The NOOR Boujdour Project (the Project) includes the construction of a 22 kV Power Line (PL) to connect the power plant to an existing substation located in Boujdour province. The environmental and social assessment of the PV plant and the power line has been through separate Environmental and Social Impact Assessment (SESIA) reports upon MASEN's request.

ACWA Power aims to manage the Environmental and Social (E&S) aspects of the 22 kV Power Line (PL) Project in accordance with all national requirements and international best practice, including the World Bank/International Finance Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability, and the IFC Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution. To achieve this, ACWA Power has engaged 5 Capitals Environmental and Management Consulting (5 Capitals) to prepare the environmental and social assessment for the project.

5 Capitals and Phenixa (a Moroccan environmental and social consultancy firm) have prepared this SESIA report for the Project in coordination with MASEN and ACWA Power. This SESIA has also adopted the requirements established by the Moroccan regulations and in the project-specific Framework Environmental Impact Assessment (FESIA) of the Boujdour PV, prepared by NOVEC for MASEN, May 2016.

1.1 Assessment Objectives

The following SESIA document has several objectives in relation to its preparation, use and application for the Boujdour PL Project. Such objectives include and are not limited to the following:

- The assessment of baseline conditions prior to development;
- The identification and implementation of national and international regulations applicable to the project;
- The assessment of potential impacts of the project during construction, operation and decommissioning;
- Ensuring that potential impacts are avoided or minimised through the recommendation of mitigation measures;
- Inclusion, information and consultation with affected stakeholders (e.g. public, public bodies and local populations) regarding the project, and
- Exploration of alternatives that can be used for the Project leading to greater social and environmental gains.

1.2 Report Structure

To comply with the requirements for environmental assessment and international best practice, this report is presented in the following format:

Volume 1: Non-Technical Summary

Volume 2: Main Text

Volume 3: Environmental and Social Management Plan (ESMP)

Volume 4: Technical Appendices

Volume 1 contains the Non-Technical Summary (NTS), which provides an overview of the main elements of the PL and summarises the main E&S impacts and recommended mitigation measures. In line with GIIP, the NTS has considered both the PL and the PV project, as the PL is considered an ancillary facility of the PV.

Volume 2 comprises the Main Text of the report with the issues identified that the project may impact upon each following a similar general structure:

- Introduction and Project Background;
- Legal Framework, Standards and Guidelines;
- SESIA Assessment Method;
- Baseline Information;
- Methodology
- Assessment of Effects/Impacts, Mitigation Measures, and Residual Effects During Construction Phase;
- Assessment of Effects/Impacts, Mitigation Measures, and Residual Effects During Operational Phase; and
- Assessment of Effects/Impacts, Mitigation Measures, and Residual Effects During Decommissioning Phase, where relevant.

Volume 3: provides the framework for the development of the Construction Environmental Social Management Plan (CESMP) by the main contractor (the EPC) and all sub-contractors; and the Operational Environmental and Social Management Plan (OESMP) to be developed and implemented by the Operation and Management (O&M) team. The CESMP and the OESMP include an Environmental and Social Monitoring Program (ESMP). The ESMP will provide procedures to ensure the implementation and monitor the performance of the mitigation measures and other elements.

Volume 4 comprises all Technical Appendices (consultation meeting, baseline survey reports and other technical studies).

2 LEGAL AND ADMINISTRATIVE FRAMEWORK

The proposed Project will adopt and comply with the following regulations and standards:

- National regulations and standards;
- International and Regional Treaties ratified by Morocco, and
- International requirements applicable to the project (Equator Principles. IFC Environmental and Social Performance Standards and IFC Environmental, Health and Safety Guidelines).

1.1 National Framework

1.1.1 Environmental protection

Law No 11-03 concerning Protection and improvement of the Environment

This law sets the general framework for the protection of the environment in Morocco, by identifying:

- Principles of environmental protection related to human settlements and the protection of nature and natural resources;
- Principle for establishing discharge standards and the definition of nuisances;
- Management tools and protection of the environment that are described within the impact studies, plans and standards;
- Standards of environmental quality and financial and tax incentives. The law also establishes a national fund for the protection and enhancement of the environment; and
- Procedural rules defining the responsibilities and obligations in the event of damage.

Law No. 99-12 on the National Charter of Environmental and Sustainable Development.

This law sets the basic objectives of state action in the field of environmental protection and sustainable development. It aims to: improve the protection and conservation of resources and the natural environment, biodiversity and cultural heritage, to prevent and fight against the pollution, integrate sustainable development in sectoral public policies and adopt a national development strategy, harmonize the national legal framework with international conventions and standards relating to environmental protection and sustainable development, improve measures for climate change adaptation and measures against desertification, and lead institutional, economic, financial and cultural reforms on environmental governance defining State commitments, among others.

1.1.2 Environmental Impact Assessment

Law No 12-03 concerning Environmental Impact Study Process and implementing decrees.

Promulgated by Dahir No. 1-03-06 of 10 Rabii I 1424 (12 May 2003) lists the projects subject, the procedure of implementation and methodology of impact studies.

This Act establishes the creation of a national committee and regional committees entrusted with the review of the environmental impact studies.

The "Décret n° 2-04-563 du 5 kaada 1429 relatif aux attributions et au fonctionnement du comité national et des comités régionaux des études d'impact sur l'environnement" outlines the responsibilities of the National Committee on the review and approval processes of the environmental impact assessments.

1.1.3 Public Consultation

The "Décret n° 2-04-564 du 5 kaada 1429 (4 novembre 2008) fixant les modalités d'organisation et de déroulement de l'enquête publique relative aux projets soumis aux études d'impact sur l'environnement".

This decree establishes the considerations to follow when undertaken public consultation procedures. Public consultation will include, as minimum, the following:

- Fact sheet outlining the main technical characteristics;
- Nontechnical Summary, and
- Site plan clearly showing the project boundaries.

Permission will be addressed to (and granted by) the regional committee of environmental impact studies (secrétariat permanent du comité régional des études d'impact sur l'environnement). The committee is required to designate a commission for the public consultation process.

This decree also establishes the minimum information and timelines that need to be considered during the consultation process.

1.1.4 Ecology and Biodiversity

Law No 11-03 concerning the protection and improvement of the environment provides a framework of legislation under which the Kingdom can meet its obligations as a signatory to the Convention on Biological Diversity (CBD).

Law No 1-11-84 du 29, 1432 (2 July 2011) promulgating the Law no 29-05 with regards to protection of wildlife and trade control.

1.1.5 Air Quality

Law No 13-03 on the Prevention of Air Pollution

Chapter II of the Act, Article 2 states that the Act applies to any person or entity, public or private, who owns or possesses or uses or operates buildings or mining, industrial, commercial, agricultural or crafts. It also applies to motor vehicles, equipment, combustion, waste incineration, heating or cooling.

Chapter III of the Act, Article 4 states that "it is forbidden to release, issue or refuse to allow the release, emission or discharge of pollutants in the air such as toxic gas or corrosive fumes, vapours, heat, dust, odours beyond the quality or concentration allowed by the standards laid down by regulation"

This article states the following "in the absence of standards laid down by regulation, operators of installations referred to in Article II are required to apply the most advanced technologies available to prevent or reduce emissions."

Through Decree No. 2-09-286 of 20 Di Hijja 1430 (8 December 2009), this law sets standards for air quality and air monitoring.

1.1.6 Water Quality

Law 10-95 concerning Water Management. Moroccan Law 10-95 on water and its implementing regulations establish the measures to protect artificial water bodies, the water quality, use of these water systems and protection of the watercourses. This Law the legal basis for the country´s water policy and sets the following objectives:

- Establish a Management Plan on water resource use at a National Level;
- Protect the qualitative and quantitative characteristics of the hydrological resources in Morocco while investing on water project development taking into consideration the economic and social interests of the local population.

Decree No. 2-04-553 concerning Wastewater Management

The Decree paves the way for the effective implementation of reporting procedures for existing discharges and subsequent payment of fees. The implementation of the Decree induces the need to:

- Request authorization to discharge from the concerned water authority;
- Meet the discharge limits set by domestic Order No. 1607-06 (25 July 2006).

Decree 2-97-787 regarding Water Quality Standards defines quality classes to normalize and standardize the assessment of water quality. It also defines orders via quality standards which water must meet depending on the treated water use, including: potable water, irrigation and wastewater for irrigation and aquaculture.

Decree N° 1276-01 concerning Water Quality standards for irrigation

This Decree establishes the standards for water irrigation that will need to be followed for treated sanitary wastewater reuse.

Decree No. 2-97-224: Setting the Conditions Governing the Artificial Accumulation of Water (1997)

Decree No. 2-97-489, February 4 1998. Identifies publicly accessible water bodies, the procedures to manage these waterways, and their safe extraction.

Decree No. 2-04-553. January 24 2005. Identifies measure to prevent spills, leaks, and discharges and protect surface and ground waters from direct or indirect contamination events.

1.1.7 Soil Quality

The "Dahir n° 1-69-170 du 10 joumada I 1389 (25 juillet 1969) sur la défense et la restauration des sols" determines requirements for soil restoration on high erosion risk areas and the creation of creation of buffer areas where appropriate.

1.1.8 Seismicity

Decree No 2-02-177 of February 2002 (RPS 2000) concerning seismicity areas

This regulation was issued by the National Committee of Seismic Engineering (NCSE). The objectives of this Decree are:

- Establishing a seismic zonation within Morocco;
- Improving urban and development planning through seismic micro-zonation.

The RPS 2000 is applicable for new constructions exceeding 50m2 and existing buildings. It covers structures in reinforced and steel concrete.

1.1.9 Protected Areas

Law n° 22-07 concerning Protected Areas

Promulgated by Decree n° 1-10- 123 (16 July 2010), this Law, encourages the environmental protection by the establishment of national protected areas.

1.1.10 Waste Management

Law No 28-00 concerning Waste Disposal and Management

This Law adopted in 2006 aims to prevent and protect human health, fauna, flora, water, air, soil, ecosystems, and landscapes and the environment in general against the effects of harmful waste, by ensuring the reduction of harmful waste production; the organization of the collection, transport, storage, waste treatment and disposal in an environmentally sound manner; the recovery of waste by waste hierarchy, planning national, regional and local management and disposal waste; informing the public about the harmful effects of waste

on public health and environment as well as measures to prevent or compensate for their adverse effects; and the establishment of a system of control and punishment for offenses.

Consequently, several decrees have been promulgated, which outline the procedures and standards that will be implemented to ensure compliant transport and disposal of wastes based on their classification. With respect to this project the following Decrees have been applied:

- Decree No. 2-07-253 Identifies and lists hazardous wastes by Industrial process.
- Decree No 2-09-538 Identifies hazardous wastes management procedures.
- Decree No. 2-09-683 Identifies non-hazardous wastes management procedures.

1.1.11 Labour

Law n° 65-99 promulgated by Decree 1-03-194 of 11 September 2003

Article 9 of the Moroccan Labour Code prohibits discrimination based on race, colour, gender, handicap, marital situation, religion, political opinion, union participation, national origin, social origin for any employment matters notably hiring, distribution of work, training, salary, promotion, granting of benefits, disciplinary measures and termination.

1.1.12 Socio-Economic

Moroccan Labour Law no 65-99 concerning the Labour Code, is applicable to this project. Other legislation relating to the social and health sector includes:

- 17-08 (dahir 1-08-153 du 18 février 2009) regarding the Communal Charter
- Dahir 1-60-063 (25 June 1960) for the development of rural communities Order 23 November 1950. Ensures that medicinal products and medical equipment should be provided on-site, where 100 workers are permanently stationed or where projects are located more than 10 km from a supply centre.
- Decree 2-70-510 (8 October 1970) identifies preventive measures that should be implemented on construction sites.

1.1.13 Cultural Heritage

Law 22-80 (1981) regarding the conservation of Cultural Heritage

This Law establishes measures for the protection of Historic Monuments and sites.

1.1.14 Traffic and Road Safety

The following national laws have been considered:

- Decree No. 2-03-169 of 22 Muharram 1424 (26 March 2003) on the transport of goods by road;
- Law 52-05 relating to traffic.

Dangerous goods must be transported by vehicles or trailers appropriately equipped. The characteristics of these vehicles must be established by a statutory instrument, which will in turn respect those outlined in the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

1.1.15 Landscape and Visual

No standards exist with regard to landscape or visual impact in the guidance. In the absence of specific standards with regards to landscape or visual impact, the existing visual characteristics of the PL corridor have been assessed using professional judgment and experience.

1.1.16 Urban Planning

- Loi 12-90 relative à l'urbanisme (dahir 1-92-31 du 17 juin 1992) ;

Dahir n° 1-92-31 du 15 hija 1412 (17 juin 1992) portant promulgation de la loi n° 12-90 "relative à l'urbanisme".

1.1.17 Project Development

Law No. 13-09 regarding Renewable Energy

The key objectives of this law are to:

- Reduce the oil-dependency of the Kingdom of Morocco;
- Diversify the sources and resources of energy production;
- Use an indigenous natural resource; and
- Reduce CO2 emissions to the atmosphere.

Law no. 37-16 for the creation of the Moroccan Agency for Sustainable Energy

Provides the legal framework for the NOOR Boujdour Project and outlines how it aligns with the national economic and social development strategy.

1.2 International and Regional Conventions

The international and regional conventions and protocols ratified by the Kingdom of Morocco that are relevant to protection of the environment will be acknowledged in relation to the environmental impact assessment of the proposed NOOR Boujdour project are provided below:

The international and regional conventions and protocols that are relevant to protection of the environment are summarised below:

Berne Convention (1979):

The Bern Convention on the Conservation of European Wildlife and Natural Habitats, also known as the Bern Convention, is a bindings international legal instrument on the filed of Nature Conservation. It covers the natural heritage in Europe, as well as in some African countries. The Convention was open for signature on 19 September 1979 and came into force on 1 June 1982. It is particularly concerned about protecting natural habitats and endangered species, including migratory species.

Bonn Convention on Migratory Species of Wild Animals (1983).

This global convention created in 1979 by the United Nations Environment Program (UNEP) is an agreement for the conservation of migratory species of wild animals. Two appendices list migratory species that require conservation measures.

Under the Bonn Convention Morocco has signed several agreements including the Agreement on the Conservation of Migratory Waterbirds in Africa - (AEWA). To this end the Contracting Parties "... investigate problems that arise due to human activities and endeavour to implement remedial measures including restoration and habitat rehabilitation and compensatory measures for loss of habitat. "

Washington Convention on International Trade in Endangered Flora and Wildlife (CITES 1975).

Morocco has signed the Convention in 1975 and entered into force in 1976. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 34,000 species of animals and plants. This convention is regularly cited as a reference to the threat level of the species.

Protecting the ozone layer: the Montreal Protocol (1992);

As a party to the Montreal Protocol, has the obligation to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge, taking into account technical and economic considerations and bearing in mind the developmental needs of developing countries.

RAMSAR convention on the protection of Wetlands of International Importance (1971, updated 1980).

Morocco has committed to maintain the ecological character of its Wetlands of International Importance and to plan for the sustainable use, of all of the wetlands in its territories.

The Convention uses a broad definition of the types of wetlands covered in its mission, including lakes and rivers, oases, estuaries, and human-made sites such as fish ponds, and reservoirs, to name a few.

Climate Change Framework: United Nations Convention on Climate Change (1995) and protocol of Kyoto (2002)

Morocco has committed to develop national inventories of anthropogenic emissions and removals of greenhouse gases, consider climate change in policies and actions and adopt methods such as impact assessments, and formulate mitigation measures.

Biodiversity Convention of Rio Janeiro on Biological Diversity (1995)

Morocco has committed to the conservation and maintenance of biological diversity alongside economic development.

Vienna Convention and the London amendment (1995)

Morocco was committed to adopt appropriate legislative or administrative measures and co-operate in harmonizing appropriate policies to control, limit, reduce or prevent human activities under their jurisdiction or control should it be found that these activities have or are likely to have adverse effects resulting to the depletion of the ozone layer.

African Convention on the Conservation of Nature and Natural Resources whose acts were reaffirmed at Earth Summit in Johannesburg in South Africa in 2002

This agreement was signed in Algiers on 15 September 1968, replacing the London Convention 1933. Its objectives include the conservation of species, the creation of protected areas and conservation, utilization and development of soil, water, flora and fauna. The Convention establishes three categories of protected areas in parks, reserves and special reserves and introduces the concept of optimal handling for sustainable wildlife resources.

The International Convention for the Protection of Birds

Replaces and enhances the Convention for the Protection of Birds Useful to Agriculture, held in Paris in 1902. The updated convention is essentially based on ecological considerations, even if Article 5 introduces an ethical argument and it prohibits the infliction of unnecessary suffering to birds. This Convention shall be applied without exception to all wild birds and designed specifically to protection of all species during their breeding and migration.

The World Heritage Convention

The World Heritage Convention was adopted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) General Conference, in Paris 1972. It aims to promote cooperation among nations to protect heritage around the world that is of such outstanding universal value that its conservation is important for current and future generations. It is intended that, unlike the seven wonders of the ancient world, properties on the World Heritage List will be conserved for all time.

The Kingdom of Morocco has also signed 54 International Labour Organisation (ILO) conventions, including the following:

- Unemployment Convention, 1919 (No. 2)
- Night Work (Women) Convention, 1919 (No. 4)
- Workmen's Compensation (Agriculture) Convention, 1921 (No. 12)
- Holidays with Pay Convention, 1936 (No. 52)
- Labour Inspection Convention, 1947 (No. 81)
- Right to Organise and Collective Bargaining Convention, 1949 (No. 98)
- Equal Remuneration Convention, 1951 (No. 100)
- Abolition of Forced Labour Convention, 1957 (No. 105)
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- Employment Policy Convention, 1964 (No. 122)
- Workers' Representatives Convention, 1971 (No. 135)
- Minimum Age Convention, 1973 (No. 138)
- Minimum age specified: 15 years
- Termination of Employment Convention, 1982 (No. 158)
- Asbestos Convention, 1986 (No. 162)
- Maternity Protection Convention, 2000 (No. 183)

1.3 International Requirements

1.3.1 IFC Requirements

ACWA Power's Policy ascertains that all power assets will be designed, constructed, operated and decommissioned in accordance with the E&S requirements stabilised by the Word Bank Group - International Finance Corporation.

This SESIA has been prepared in accordance with the Performance Standards on Environmental and Social Sustainability (2012) and the General Environmental, Health and Safety Guidelines (2007).

Performance Standards on Environmental & Social Sustainability

The IFC Environmental and Social Sustainability Framework defines the IFC approach towards sustainability and the environment, and the IFC describes the best practices for managing the environmental and social risks associated to asset development. The Performance Standards and how they apply to the proposed Project are outlined below.

Performance Standard 1: covers several types of environmental and social management instruments. These standards require that the environmental and social assessment (SESIA) is undertaken to a high standard and compliant with International Best Practice, and that an Environmental and Social Management System (ESMS) is implemented. Specifically, the objectives required by the PS1 are:

- Establish an overarching environmental and social policy;
- To identify and evaluate environmental and social risks and impacts of the project;
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment;
- To promote improved environmental and social performance of clients through the effective implementation of a management program.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately; and
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

The PS1 also requires the assessment of cumulative impacts that result from incremental impacts on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

Performance Standard 2: Labour and Working Conditions aims to promote the fair treatment, non-discrimination, and equal opportunity of workers; to establish, maintain, and improve the worker-management relationship; to promote compliance with national employment and labour laws; to protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain; to promote safe and healthy working conditions, and the health of workers and to avoid the use of forced labour. This Performance Standard requires overall alignment to the following conventions:

- ILO Convention 87 on Freedom of Association and Protection of the Right to Organize;
- ILO Convention 98 on the Right to Organize and Collective Bargaining;
- ILO Convention 29 on Forced Labour;
- ILO Convention 105 on the Abolition of Forced Labour;
- ILO Convention 138 on Minimum Age (of Employment);
- ILO Convention 182 on the Worst Forms of Child Labour;

- ILO Convention 100 on Equal Remuneration;
- ILO Convention 111 on Discrimination (Employment and Occupation);
- UN Convention on the Rights of the Child, Article 32.1; and
- UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families.

Performance Standard 3: Resource Efficiency and Pollution Prevention, aims to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities, to promote more sustainable use of resources, including energy and water and to reduce project-related GHG emissions.

Performance Standard 4: Community Health, Safety, and Security aims to anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances and to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

The IFC's Guidance Note 4 requires that the exacerbation of impacts caused by natural hazards, such as landslides or floods that could arise from land use changes should be avoided or minimized.

Performance Standard 5: Land Acquisition and Involuntary Resettlement. This PS focuses on project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. A Land Acquisition Review / Plan and a Livelihood Restoration Plan will be prepared to assess, or anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts 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 implemented with appropriate disclosure of information, consultation, and the informed participation of those affected; and to ensure that there is a restoration and improvement of the livelihoods and standards of living of the economically displaced persons.

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. This IFC performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard are guided by the Convention on Biological Diversity.

This standard aims to:

- Protect and conserve biodiversity;
- Maintain the benefits from ecosystem services; and

- Promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

The SESIA will follow the requirements of this standard for the assessment of the project impact on the ecosystem.

Performance Standard 7: Indigenous Peoples. This PS focuses on the protection of indigenous communities. None of the communities around the PL corridor can be classified as indigenous, so this standard is not applicable.

Performance Standard 8: Cultural Heritage. The PS aims to protect cultural heritage from the adverse impacts of project activities and support its preservation and to promote the equitable sharing of benefits from the use of cultural heritage. This standard will be taken into consideration to determine whether the project affects any cultural heritage.

General EHS Guidelines

The IFC EHS Guidelines 'are technical reference documents with general and industry specific examples of good international industry practice'. In addition to this the EHS Guidelines specify limit values for environmental aspects and pollution sources, upon which quantitative project impacts can be assessed.

The updated EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to Performance Standard 3: Pollution Prevention & Abatement, as well as certain aspects of occupational and community health and safety.

When Moroccan regulations differ from the levels and measures presented in the EHS Guidelines, the Project will be expected to achieve whichever is the more stringent.

1.3.2 Equator Principles

Equator Principle	Details
Principle 1	Review and Categorisation of a project proposed for financing based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation (IFC). These categories are: *Category A*- Projects with potential significant adverse social or environmental risks and/or impacts that are diverse, irreversible or unprecedented; *Category B* – Projects with potential limited adverse social or environmental risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and *Category C* – Projects with minimal or no social or environmental risks and/or impacts.
Principle 2	Environmental and Social Assessment For all Category A and Category B Projects, the EPFI (Equator Principle Financial Institution) will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of

	the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project. The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment ESIA (SESIA). One or more specialised studies may also need to be undertaken. Furthermore, in limited high risk circumstances, it may be appropriate for the client to complement its Assessment Documentation with specific human rights due diligence. For other Projects, a limited or focused environmental or social assessment (e.g. audit), or straight-forward application of environmental siting, pollution standards, design criteria, or construction standards may be carried out
Principle 3	Applicable Environmental and Social Standards The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed to protect their people and the natural environment; and some with evolving technical and institutional capacity to manage environmental and social issues. The EPFI will require that the Assessment process evaluates compliance with the applicable standards as follows: 1. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines). 2. For Projects located in Designated Countries, the Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Host country laws meet the requirements of environmental and/or social assessments (Principle 2), management systems and plans (Principle 4), Stakeholder Engagement (Principle 5) and, grievance mechanisms (Principle 6). The Assessment process will establish to the EPFI's satisfaction the Project's overall compliance with, or justified deviation from, the applicable standards. The applicable standards (as described above) represent the minimum standards adopted by the EPFI. The EPFI may, at their sole discretion, apply additional requirements.
Principle 4	Environmental and Social Management System and Equator Principles Action Plan For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.
Principle 5	Stakeholder Engagement For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an on-going process in a structured and culturally appropriate manner with Affected Communities and,

	where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation. To facilitate Stakeholder Engagement, the client will, commensurate to the Project's risks and impacts, make the appropriate Assessment Documentation readily available to the Affected Communities, and where relevant Other Stakeholders, in the local language and in a culturally appropriate manner. The client will take account of, and document, the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts, disclosure should occur early in the Assessment process, in any event before the Project construction commences, and on an on-going basis. EPFIs recognise that indigenous peoples may represent vulnerable segments of project-affected communities. Projects affecting indigenous peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for indigenous peoples contained in relevant national law, including those laws implementing host country obligations under international law. Consistent with the special circumstances described in IFC Performance Standard 7 (when relevant as defined in Principle 3), Projects with adverse impacts on indigenous people will require their Free, Prior and Informed Consent (FPIC).
Principle 6	Grievance Mechanism For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.
Principle 7	Independent Review Project Finance For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible. Project-Related Corporate Loans An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high risk impacts including, but not limited to, any of the following:

	• adverse impacts on indigenous peoples • Critical Habitat impacts • significant cultural heritage impacts • large-scale resettlement In other Category A, and as appropriate Category B, Project-Related Corporate Loans, the EPFI may determine whether an Independent Review is appropriate or if internal review by the EPFI is sufficient. This may take into account the due diligence performed by a multilateral or bilateral financial institution or an OECD Export Credit Agency, if relevant.
Principle 8	Covenants An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Furthermore, for all Category A and Category B Projects, the client will covenant the financial documentation: a) to comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and b) to provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and c) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan. Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, as considered appropriate.
Principle 9	Independent Monitoring and Reporting Project Finance To assess Project compliance with the Equator Principles and ensure on-going monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI. Project-Related Corporate Loans For Projects where an Independent Review is required under Principle 7, the EPFI will require the appointment of an Independent Environmental and Social Consultant after Financial Close, or require that the client retain qualified and experienced external experts to verify its monitoring information, which would be shared with the EPFI.
Principle 10	EPFIs Reporting Client Reporting Requirements The following client reporting requirements are in addition to the disclosure requirements in Principle 5. For all Category A and, as appropriate, Category B Projects: • The client will ensure that, at a minimum, a summary of the SESIA is accessible

	and available online. • The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually. Refer to Annex A for detailed requirements on GHG emissions reporting. EPFI Reporting Requirements The EPFI will report publicly, at least annually, on transactions that have reached Financial Close and on its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations. The EPFI will report according to the minimum reporting requirements detailed in Annex B.

1.4 Standards and Guidelines

1.4.1 Soil Quality

National Requirements

There are no specific Moroccan standards and guidelines for soil protection.

International Requirements

The IFC EHS regulations do not specify pollutant standards for soils. In light of this, sector-specific guidance documents on pollution prevention and good practices produced by the IFC (e.g. IFC 'Environmental Health and Safety Guidelines (EHS) Guidelines: Contaminated Land' (2007)) will be referred to in the assessment. Such guidance includes the following:

The General EHS guidelines detail that the '…Transfer of pollutants to another phase, such as air, soil, or the sub-surface, will be minimized through process and engineering controls.'

Section 1.8 of the IFC's General Guidelines details the specific requirements with regards to contaminated land. It notes that: "*Contamination of land will be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release will be identified and corrected to avoid further releases and associated adverse impacts*."

Internationally recognized assessment values for soil contamination set by the Dutch Ministry of Housing, Spatial Planning and Environment have been applied. The baseline results have been compared against standard values and guidelines.

In the Netherlands, environmental quality values have been established based on the philosophy of protecting ecosystems, environmental functions and ensuring the multi-functionality of soil and groundwater quality. These are discussed below:

- Target Value: average background concentration or detection limit; exceeding this value indicates a possible diminishing of the functional abilities of the soil for humans, plants or animals.

- Intervention Value: concentration level above, which there is a serious or threatening diminishing of the functional abilities of the soil for humans, plants or animals.

The following Table provides a list of the Dutch Soil and Groundwater standards that the proposed project will be required to comply with.

Table 2-1 Dutch Soil Standards

Contaminant	Dutch Soil mg/Kg dry weight	
	Target	Intervention
Beryllium	1.1	30
Cadmium	0.8	12
Chromium (total)	100	220
Cobalt	20	180
Copper	36	96
Lead	85	530
Nickel	35	100
Mercury	0.3	10
Molybdenum	3	190
Selenium	0.7	100
Thallium	1	15
Vanadium	42	250
Zinc	140	350
Benzene	0.05	2
Total PAH	1	40
The values listed above will be adapted to the soil type at the PL corridor. Constituent levels greater than the target value indicate that the soil has lost some of its multi-functional properties and can be considered as contaminated soil. If the contamination level is exceeding the intervention value, further investigation will be carried out. The soil intervention values indicate when the functional properties of the soil are seriously impaired or threatened.		

It will be noted that the target values are not specific clean up criteria. They represent targeted objectives. Also, in the latest (2009) version of the Dutch Standard, Target values for soils have been removed for all compounds except Metals.

1.4.2 Water and Wastewater

National Requirements

The Water Act, Law 10-95 on water and its implementing regulations, was promulgated on 16 August 1995. It aims to ensure the rational use of water and access to this resource throughout the Kingdom. The main decrees implementing this law published to date are:

- Decree No. 2-04-553 of 13 Hijja 1425 (24 January 2005) relating to spills and direct and indirect discharges into surface or groundwater (O.B. No. 5292 of 17 February 2005)
- Dahir 2-97-787 on the establishment of water quality standards

This decree regulates water discharges, including runoff and direct or indirect discharges to surface water or groundwater.

As a result of the implementation of this decree an authorization has to be requested for water discharges from the relevant authorities.

In addition, domestic discharge standards set by Order No. 1607-06 (July 25, 2006), are shown in table 2-5.

- Decree No. 2-05-1533 covers wastewater discharges from rural settlements.
- Decree No. 2-97-875 of 6 Shawwal 1418 (4 February 1998) on the use of wastewater (O.B. 5 February 1998). This Decree regulates the reutilization of wastewater. An authorization is required for wastewater reuse except for onsite reutilization.
- Decree No. 2-97-657 of 6 Shawwal 1418 (4 February 1998) on the delimitation of protected areas (B.O. February 5, 1998), which regulates zoning around public waters.
- Decree No. 2-97-787 of 6 Shawwal (4 February 1998) on water quality standards and water pollution inventories (O.B. No. 4558 of 5 February 1998). This Decree defines, inter alia, the necessary parameters for the assessment of water quality and the quality standards that water must meet depending on its use.

To date, the legislations enacted based on this decree are:

- Decree n ° 1277-1201 enacted on the 17th of October 2002 on quality standards for water used for the production of drinking water. These standards are specified in the table 2-3;
- Order 1276-01 enacted on the 17th of October 2002 on quality standards for irrigation water. These standards are specified in the table 2-2;
- Decree n ° 1275-1201 enacted on the 17th of October 2002 on quality of surface waters;

Decree No. 2028-03 enacted on the 10th of November 2003 on quality standards for fishing waters.

Table 2-2 Water Standards for irrigation

Parameters	Units	Value	Specifications
Biological Parameter			
Faecal Coliform	ml	1000/100	100ml for agricultural products eaten raw
Salmonella		Absence	in 5 litres
Vibrio cholera		Absence	in 450ml
Parasitological Parameter			
Pathogenic parasites		Absence	
Parasitecysts		Absence	
Larvae of Ankylostomides		Absence	
Fluococercaires of Schistosoma haemotobium		Absence	
Toxic Parameters			
Mercury	mg/l	0.001	
Cadmium	mg/l	0.01	
Arsenic	mg/l	0.1	
Total Chromium	mg/l	1	
Lead	mg/l	5	
Copper	mg/l	2	
Zinc	mg/l	2	
Selenium	mg/l	0.02	
Fluorine	mg/l	1	
Cyanides	mg/l	1	
Phenols	mg/l	3	
Aluminium	mg/l	5	
Beryllium	mg/l	0.1	
Cobalt	mg/l	0.5	
Iron	mg/l	5	
Lithium	mg/l	2.5	
Manganese	mg/l	0.2	
Molybdenum	mg/l	0.01	
Nickel	mg/l	2	
Vanadium	mg/l	0.1	
Physical and Chemical properties			
Salinity			
Total salinity	mg/l	7680	
Electrical conductivity	mS/cm	12	at 25°C
Infiltration			
- Sodium Absorption Ratio 0-3	EC	< 0.2	
- Sodium Absorption Ratio 3-6		< 0.3	
- Sodium Absorption Ratio 6-12		< 0.5	

- Sodium Absorption Ratio 12-20		< 1.3	
- Sodium Absorption Ratio 20-40		< 3	
Toxic Ions (affecting sensitive agricultural product receptors)			
Sodium			
- Surface Irrigation	mg/l	69	
- Overhead irrigation	mg/l	9	
Chloride			
- Surface Irrigation	mg/l	350	
- Overhead irrigation	mg/l	15	
Boron	mg/l	3	
Effect drivers (affecting sensitive agricultural product receptors)			
Temperature	°C	35	Temperature
pH		6.5 to 8.4	pH
Suspended solids			Suspended solids
- Gravitational Irrigation	mg/l	200	- Gravitational Irrigation
- Localised overhead irrigation	mg/l	100	- Localised overhead irrigation
Nitrate (N-NO3-)	mg/l	30	Nitrate (N-NO3-)
Bicarbonate (HCO3) [overhead irrigation]	mg/l	518	Bicarbonate (HCO3) [overhead irrigation]
Sulphates (SO42-)	mg/l	250	Sulphates (SO42-)

Table 2-3 Drinking Water Standards

Parameter	Units	A1-G	A1-I	A2-G	A2-I	A3-G	A3-I
Toxic Substances							
Arsenic	µ g/l	-	50	-	50	-	100
Cadmium	µ g/l	1	5	1	5	-	5
Chromium (total)	µ g/l	-	50	-	50	-	50
Cyanides	µ g/l	-	50	-	50	-	50
Lead	µ g/l	-	50	-	50	-	50
Mercury	µ g/l	-	1	-	1	-	1
Nickel	µ g/l	-	50	-	50	-	50
Selenium	µ g/l	-	10	-	10	-	10
Pesticides, per substance	µ g/l	-	0.1	-	0.1	-	0.1
Pesticides, total	µ g/l	-	0.5	-	0.5	-	0.5
HPA	µ g/l	-	0.2	-	0.2	-	0.2
Undesirable Substances							
Boron	mg/l	-	1	-	1	-	1
Ammonia	mg/l	0.05	0.5	1	1.5	2	4

TKN	mg/l	1	-	2	-	3	-
Nitrates	mg/l	-	5	-	50	-	50
Phosphorous	mg/l	0.4	-	0.7	-	0.7	-
Barium	mg/l	-	1	-	1	-	1
Copper	mg/l	-	1	-	2	-	2
Zinc	mg/l	-	50	-	5	-	5
Manganese	mg/l	-	0.1	0.1	0.1	1	-
Dissolved iron	mg/l	-	0.3	1	2	1	3
Fluorides	mg/l	0.7	1.5	0.7	1.5	0.7	1.5
Dissolved hydrocarbons	mg/l	-	0.05	-	0.2	0.5	1
Phenols	mg/l	-	0.01	-	0.05	-	0.1
Anionic detergents	mg/l	-	0.5	-	0.5	-	0.5
Physical-chemical Parameters							
Temperature	°C	20	30	20	30	20	30
pH		6.5-8.5	-	6.5-9.2	-	6.5-9.2	-
Conductivity at 20° C	μ S/cm	1300	2700	1300	2700	1300	2700
Chlorides	mg/l	300	750	300	750	300	750
Sulfates	mg/l	200	-	200	-	200	-
Suspended materials	mg/l	50	-	1000	-	2000	-
Dissolved Oxygen	mg/l	7 (90%)	-	5 (70%)	-	3 (50%)	-
BOD5	mg/l	3	-	7	-	10	-
COD	mg/l	-	-	25	-	40	-
Oxydability	mg/l	2	-	5	-	10	-

Category A1: Water requiring a simple physical treatment and disinfection, including filtration, to be drunk.

Category A2: Water requiring normal physical and chemical processing and disinfection, including pre-chlorination, coagulation, flocculation, sedimentation, filtration and disinfection (final chlorination), to be drunk.

Category A3: Waters requiring physical treatment, chemical pushed refining and including disinfection by chlorination, coagulation, flocculation, sedimentation, filtration, adsorption and disinfection (ozone, final chlorination), to be drunk.

Within each category, there are two columns:

Column G (guideline values): correspond to the recommended values that surface water to be used for the production of drinking water.

Column I (mandatory values): values that are shown are the requirements that any surface water used for the production drinking water must meet.

Table 2-4 Domestic Discharge Standards

Parameters	Units	Value
BOD5	O2/l	120
COD	O2/l	250

Suspended Materials	mg/l	150

Table 2-5 Sanitary wastewater treatment plan discharge limits (as per the Minimum Functional Specifications, MASEN, 23-Feb-2016)

Parameter	Recommended Limits
BOD5	25 mg/l
COD	125 mg/l
TSS	35 mg/l
Total Nitrogen Compounds (as N)	15 mg/l

International Requirements

Two sections of the IFC general HSE guidelines, namely section 1.3 'Wastewater and Ambient Water Quality' and section 1.4 'Water Conservation' have been considered for this project.

Table 2-6 Indicative Values for treated Sanitary Sewage Discharge

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPNb / 100 ml	400a
Notes: a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. b MPN = Most Probable Number		

1.4.3 Air Quality

National Requirements

Moroccan Law No. 13-03 establishes the regulations for prevention of air pollution. The law identifies and addresses the sources and types of air pollution, and stipulates that in the absence of any defined national regulations, the polluter is required to integrate and implement the latest technology available to reduce or prevent pollution to the air.

- Decrees No. 2-09-286 establishes the national ambient air quality standards and monitoring mechanisms. These are presented in Table 2-7.

- Decree No. 2-09-631 establishes point source and non-point source emission levels, and the mechanism to control these emissions. These are presented in Table 2-8.

International Requirements

The following IFC EHS guidelines have been considered for the air quality assessment:

- IFC Environmental, Health and Safety General Guidelines (2007) and specifically sections relating to Ambient Air quality.

The assessment of air quality primarily ensures compliance with Moroccan regulations and standards. Where national regulations differ from the guidelines and standards presented in the IFC/WB guidelines, the project will be required to achieve whichever is the more stringent. As per the IFC/WB EHS Guidelines, the WHO ambient air quality standards are applicable in the absence of any national ambient air quality standards.

The following tables present the air emission standards that must be achieved, including those described above, extracted from: Decree 286 and 631 and World Bank/IFC EHS Guidelines.

Table 2-7 Ambient Air Quality Standards (µg/m³ unless otherwise specified)

Parameter	IFC EHS General GLs/WHO GLs		Moroccan		
	24 hour	Annual	1 hour	24 hour	Annual
PM10	150 (Interim target 1)	70 (Interim target 1)	-	90.4 50%centile	-
	100 (Interim target 2)	50 (Interim target 2)			
	75 (Interim target 3)	30 (Interim target 3)			
	50 (guideline)	20 (guideline)			
PM2.5	75 (Interim target 1)	35 (Interim target 1)	-	-	-
	50 (Interim target 2)	25 (Interim target 2)			
	37.5 (Interim target 3)	15 (Interim target 3)			
	25 (guideline)	10 (guideline)			
Nitrogen Dioxide	200 (1 hour)	40	98 200%centile	-	50 health 30 vegetation
Sulphur Dioxide	125 (Interim target 1)	500 (10 minute guideline)	-	99.2 125%centile	20 (ecosystem)
	50 (Interim target 2)				
	20 (guideline)				
	150 (Interim target 1)				

Ozone	100 (8 hour daily maximum guideline)	-	110 for 8hr	65 vegetation	-
Carbon Monoxide	-	-	10mg/m^3 for 8hr	-	-
Cadmium	-	-	-	-	5ng/m^3 Health
Benzene (C6H6)	-	-	-	-	10 Health
Pb	-	-	-	-	1 Health

1.4.4 Noise and Vibration

National requirements

Currently no noise regulations or standards have been enacted within the Moroccan environmental regulatory system.

MFS Requirements

The MFS dated on the 23rd of February 2016 included the maximum noise levels applicable to the project boundary during the construction and operational phases of the project.

Table 2-8 Permissible Noise Levels as per the MFS

Location	Maximum Noise Level dB(A) – 1 hour
At one (1) meter outside the Plant fence/boundary during night time (22:00 – 7:00)	45
At one (1) meter outside the Plant fence/boundary when all equipment is running (7:00 – 22:00)	50
Within the central control room	45

The MFS also requires compliance with the guidelines values established by the World Health Organization (WHO) in 1999. However, there are no specific limits for the setting that represents the project area. Nonetheless, the noise levels established above and below are more stringent than those established by the WHO and therefore, will be used as the permissible noise limit.

International Requirements

Noise

The proposed plant will be required to comply with the noise limits as specified by the IFC EHS General Guidelines (2007).

These guidelines represent maximum noise values that must be achieved at surrounding/nearby receptors. It is stated within the IFC EHS Noise Level Guidelines that noise impacts will not exceed the levels which are presented in Table 2-9, or result in a maximum increase in background levels of 3dB at the nearest off-site point of reception.

Table 2-9 IFC EHS General Noise Guidelines at off-site receptor

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 – 22:00	Night time 22:00 – 07:00
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

Vibration

None of the above standards set out specific standards in relation to vibration impacts at either the construction or operation phase. The IFC's General EHS Guidelines (2007) do however reference potential impacts from vibrations due to the use of hand held power tools and other equipment, as below:

"Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, will be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values, (i.e. the level of exposure at which remediation will be initiated) are provided by the ACGIH66. Exposure levels will be checked on the basis of daily exposure time and data provided by equipment.

2.1.1 Electric and Magnetic Field

The following table includes the reference levels for exposure to the public against the developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) – and included in the IFC EHS Guidelines for electric Power Transmission and Distribution.

Table 10 ICNIRP exposure limits for general public to electric and magnetic

Frequency	Magnetic Field (μT)	Electric Field (KV/m)
50 Hz	100	5
60 Hz	83	4

Table 11 ICNIRP occupational exposure limits to electric and magnetic

Frequency	Magnetic Field (μT)	Electric Field (KV/m)
50 Hz	10,000	0.50
60 Hz	8300	0.41
Minimum Working and Clear Hot Stick Distance ~ 0.51m for a voltage range of 15.1 to 35 kV		

3 PROJECT DESCRIPTION

3.1 Project Location and Conditions

The power line will connect the planned NOOR Boujdour PV[1], located in the rural community of Lamsid, to an existing 60/22 kV ONEE-owned substation (the Interconnection Point) located in the municipality of Boujdour.

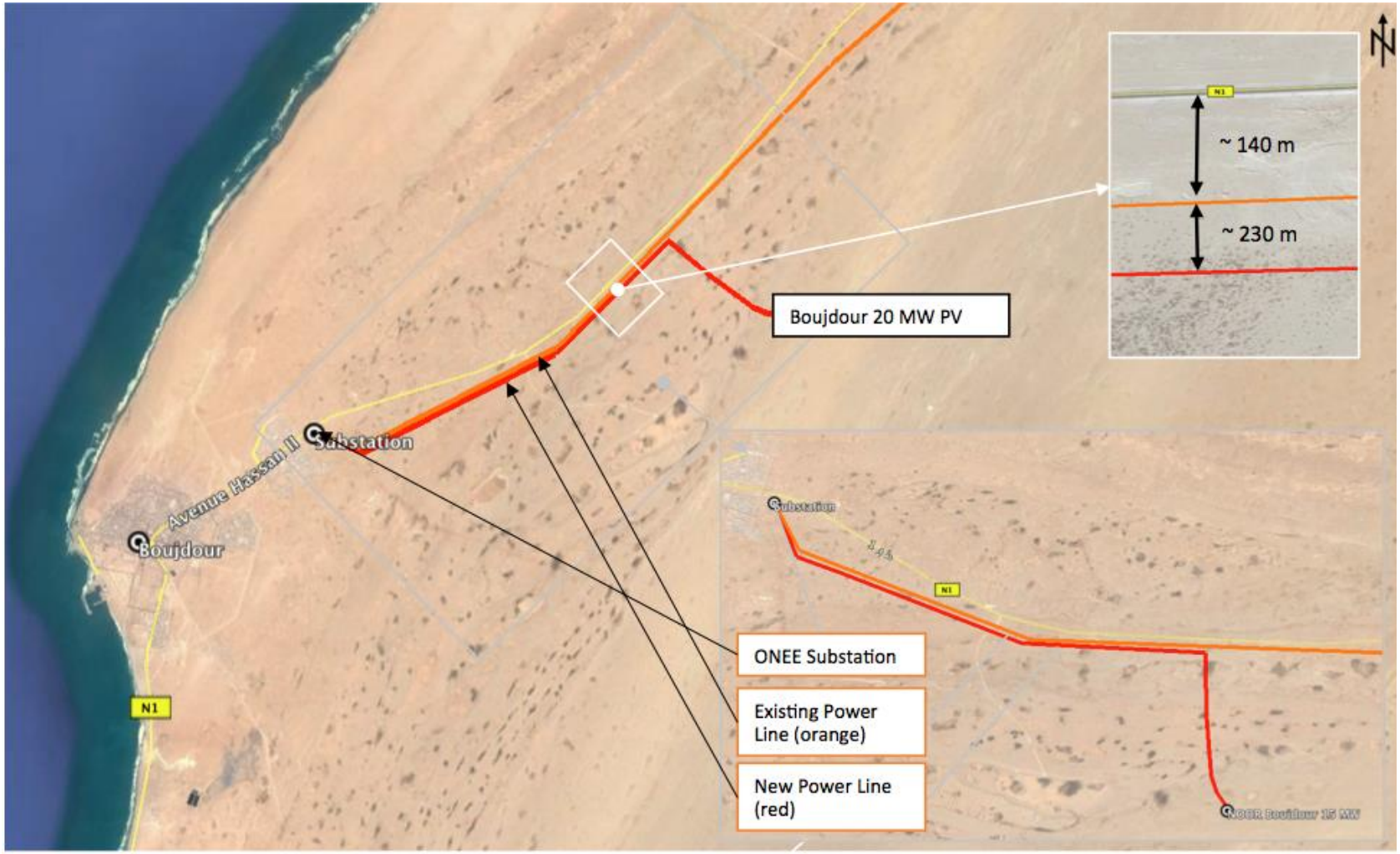
As illustrated in the figure below, the PL corridor is located approximately ~13 km northeast from the city of Boujdour and ~3 km southeast of the N1 road. The Interconnection Point is located on the northeast boundary of the municipality of Boujdour, and is ~9.5 Km (straight line) to the PV corridor. The length of the power line will be ~11 Km.

The PL will be co-located adjacent to an existing power line[2] in an existing corridor that is parallel to the N1 road. The PL is approximately 370 m and 230 m to the N1 road and existing power line, respectively. The PL will also be co-located in parallel to the access road that will connect the N1 road to the PV corridor. This will minimize impact on natural resources such as ecology and, local communities, reduce visual impact and ensure accessibility with no further intervention.

[1] The E&S impacts associated with the PV are covered in a dedicated SESIA report, as per MASEN's request. It should be noted that the PV and the PL are part of the same Project. Both the PV and PL will share the Laydown and Parking areas to minimise the footprint of the Project. Shared areas will be located within the PV construction PL corridor. The mitigation measures for these shared areas are the same in both SESIA reports.

[2] Redundant power line paths are often provided so that power can be routed from a variety of routes and allow access to the power line in case of planned maintenance or system failure of the existing line.

Figure 3-1 Location of 22 kV Power Line, PV and Interconnection Point



3.2 Potential Sensitive Receptors

Socio-economic sensitive receptors could include the nearest city, residential communities, villages, arable lands and other privately or communal land uses that may be positively or negatively affected by the project development.

The proposed power line does not cross residential communities, isolated houses, industrial or commercial areas.

The only potential identified sensitive receptors are the users of the N1 road and the residents of the dwellings located 500 m from the proposed corridor (figure below).

Figure 3-2 Closest Residential Area

There are no sites of biological or archaeological importance within or in close proximity to the PL alignment. Ecological sensitivities could include the physical, biological and ecological aspects of the corridor and surroundings that may be positively or negatively affected by the development of the project. These sensitivities will be identified and discussed in detail within the specific sub chapters of this SESIA.

3.3 Project Design

The table below includes the main design features of the power line.

Table 3-1 PL Design

Design Elements		Description
General	Distance	~ 11 km
	Type	Over ground
	Capacity	22 kV
Poles	Total number	76
	Types	11 Guyed Delta Transmission Towers 65 Suspension Transmission Towers
	Anti-corrosion protection	Hot Dip Galvanized
Wire Conductors	Number	2x3x181,6 mm²
	Material	Almelec
	Anti-corrosion protection	Hot Dip Galvanized

3.4 Resource Use and Waste Streams

3.4.1 Water Supply

The amount of water required during the construction phase of the Project (for both the power line and the PV plant) is estimated at 3,200 m³. No specific water requirement details were provided for the power line.

Water will be tankered from the ONEE local desalination plant Boujdour and stored in a water tank located at the PV laydown area with a minimum capacity of 50 m³.

Water will be used for domestic purposes, dust suppression measures and typical construction requirements (e.g. cement preparation). Drinking water will be taken in containers for the power line workers.

Construction water quality will be monitored on a regular basis to ensure that the following values are met, as suggested in the MFS:

Table 3-2 Permissible limits applicable for construction water

Organic content	200 mg/l
Inorganic content	3000 mg/l
Sulphates (SO4)	500 mg/l
Chlorides (Cl)	a) 1000 mg/l for RCC work b) 2000 mg/l for PCC work
Suspended solids	2000 mg/l
Alkalinity	Neutralize 200 ml of sample should not require more than 10 ml of 0.1 normal HCl using methyl orange as an indicator

pH	Neutralize 200 ml sample of water should not require more than 2 m of 0.1 normal NaOH (Caustic soda). The pH value of water shall generally be not less than 6

No water will be required during the operation and maintenance phase of the proposed PL.

3.4.2 Wastewater Management

During construction and operation, all wastewater generated (mostly domestic) will be stored in appropriate septic tanks in the shared Laydown Area and collected by licensed operators. The expected amount of domestic wastewater generated is 15 l per worker per day.

Contamination of storm water will be avoided by preventing rain from entering shared laydown area, material storage rooms, maintenance sheds, and other areas that contain hazardous materials.

3.4.3 Non-Hazardous Solid Waste

The main types of waste generated during the construction phase will be inert (sand, gravel, plastic, cables, metals, concrete, packaging materials, etc.) and domestic waste from workers. Waste handling will include storage in separate containers in a dedicated area within the shared Laydown Area.

Generation of solid waste as a result of the operation of the PL are not expected.

3.4.4 Hazardous Materials and Wastes

Materials

The construction of a PL does not require the storage of significant amounts of hazardous materials. The only hazardous material required will be fuel for vehicles and equipment during construction. Hazardous materials will be stored only in the shared Laydown Area.

No hazardous materials are required for the operational phase of the PL.

Waste

Other than sanitary wastewater, small amounts of hazardous waste (i.e. empty fuel drums) will be generated by the construction activities. Hazardous waste will be stored in adequate containers/facilities in the shared Laydown Area only and collected by an authorized hazardous waste management company.

No hazardous waste will be generated as a result of the operation of the PL.

3.5 Project Alternatives

Under Moroccan and international guidelines for environmental impact assessments, the evaluation of various project design and activity alternatives were considered, in order to ensure that the objectives of the proposed project have accounted for social, ecological, economic and technological options.

The following project alternatives are discussed in this chapter:

- No PL Project
- Alternative Alignment for the PL.

3.5.1 No Project Scenario

The PL is a necessary infrastructure to evacuate the power generated in the Boujdour PV, which will prevent the generation of up to 28,678.86 tonnes of CO_2 greenhouse gases per year. The PL is a required ancillary facility for the PV plant, and the PV plant is aligned with the objectives of sustainable development.

3.5.2 Alternative Alignment

The power line will be located next to the access road and adjacent to an existing power line, to minimize impacts on ecological aspects and landscape impacts. An alternative alignment would have higher ecological and landscape impacts.

3.6 Construction Schedule and Workforce

The construction of the PL will be undertaken in parallel with the construction of the PV. The construction phase for the entire Project is expected to last approximately nine months from

the Notice to Proceed (NTP), which is planned for the second quarter of 2017. A detailed construction schedule of the Project is included in the figure below.

Table 3-3 Construction & Commissioning Schedule

Task Name	Duration*	Tentative Start	Tentative Finish
Boujdour Project	223 days	April 2017	December 2017
Engineering	52 days	Sun 09-04-17	Wed 07-06-17
Procurement	157 days	Wed 26-04-17	Wed 25-10-17
Ordering	70 days	Wed 26-04-17	Sun 16-07-17
Manufacturing Clearance, Inspection and MDCC	95 days	Mon 22-05-17	Sat 09-09-17
Transportation	85 days	Wed 19-07-17	Wed 25-10-17
Construction	112 days	Sun 02-07-17	Wed 08-11-17
PV Plant Installations	58 days	Sun 03-09-17	Wed 08-11-17
Transmission Line Works	93 days	Sun 09-07-17	Wed 25-10-17
Commissioning & Testing	37 days	Sat 04-11-17	Sat 16-12-17
*Please note that several activities will be undertaken in parallel. The addition of the duration of all tasks does note equal the duration of the construction phase.			

The expected workforce for the power line will be of approximately 10 to 15 workers. The project will result in the creation of employment locally during construction and, subsequently, the dissemination of best practice construction skills into the local labour force. The local economy is likely to benefit from the use of local businesses and services. If workers from outside Boujdour are required, they will be housed in the city of Boujdour.

Laydown Area

During the construction phase, the laydown area will be shared with the PV and will be located strictly within the boundaries established for the PV site.

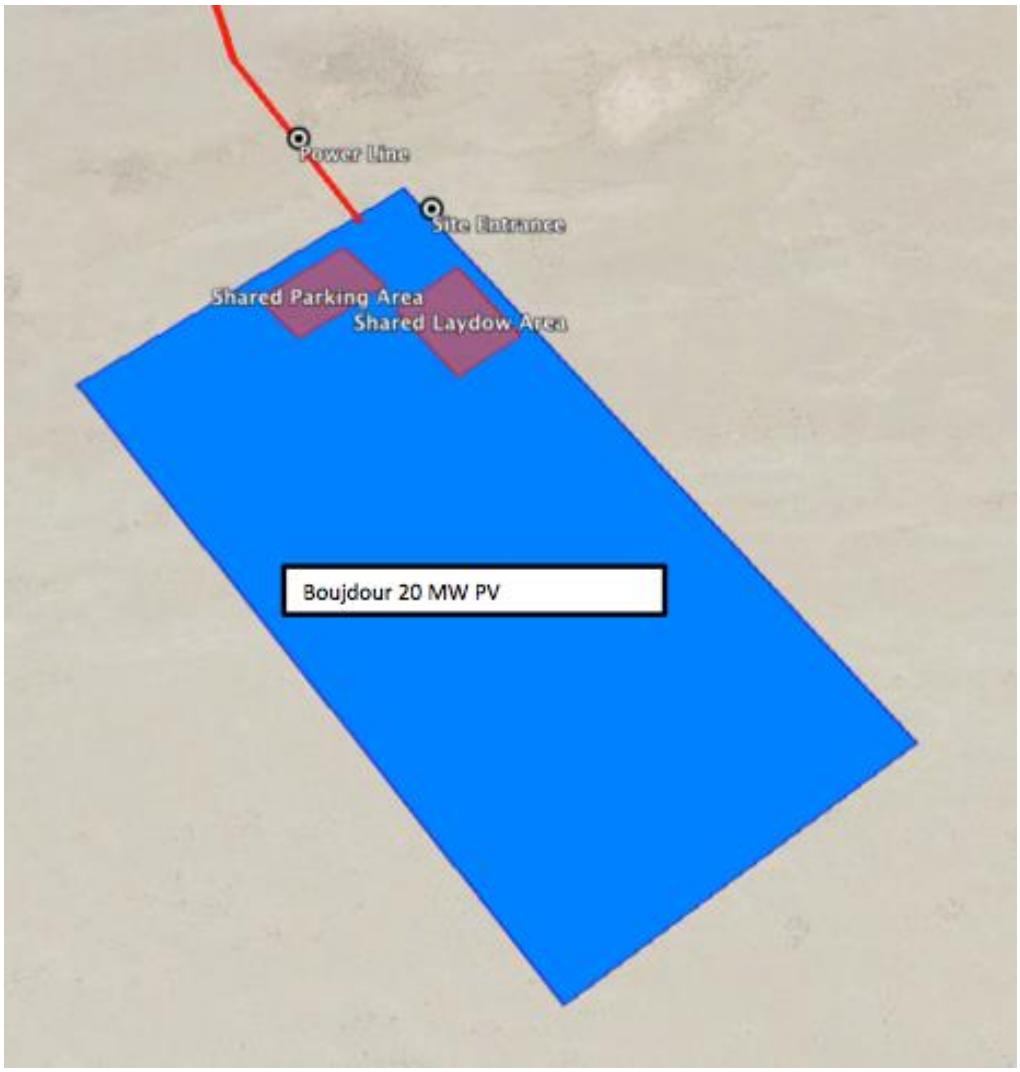
Table 3-4 Proposed PV site Coordinates

Boujdour PV	Easting	Northing
	UTM R28	
1	563604.45 m	2894102.11 m
2	564668.16 m	2894039.81 m

3	563559.22 m	2893540.65 m
4	564622.88 m	2893478.29

The figure below illustrated the approximate location of the shared laydown area within the PV site.

Figure 3-3 PV Site, shared laydown area and power line



All temporary equipment, materials and vehicles required during the construction phase of the power line will be parked / stored at the shared Laydown Area / shared Parking Area at the PV construction site.

It should be noted that the SESIA reports for the PV and the PL have been prepared in parallel and the mitigation measures for the shared Laydown Area are fully aligned. The construction of the PL and the PV will be handled by the same Project Company and responsibilities for the implementation of the mitigation measures will be coordinated from one single entity.

4 SESIA METHODOLOGY

4.1 Introduction

The SESIA methodology is specific to each of the technical subjects but includes, as a minimum, a desk study review of available information and standards, on-line information sources and existing data and laboratory analyses where available. Detailed surveys, monitoring and predictive modelling have been undertaken to determine the baseline situation and to predict impacts that are likely to occur during the construction, operational and decommissioning phases of the proposed project.

4.2 Baseline Conditions

Document Review

The following documents have been reviewed and provided key information for the SESIA:

- Framework Environmental Impact Assessment (FESIA) of the Boujdour PV, May 2016, prepared by NOVEC for MASEN. Original document in French.
- Revised (3rd amendment) Request for Proposals. April 2016, prepared by MASEN. The request for proposals includes the Minimum Functional Specifications (MFS) referred to throughout this document.

Baseline Surveys

Forming an integral part of the SESIA, the baseline surveys provide a benchmark of the existing conditions by which the potential impacts of the proposed Boujdour PV project can be assessed for construction and operational phases.

The environmental baseline surveys carried out as part of the SESIA have consisted of the following:

- Biodiversity baseline survey – November 2016;
- Air quality baseline survey – November 2016;
- Background noise monitoring – November 2016;
- Soil sampling survey – November 2016, and
- Social survey – November 2016.

These surveys are described further within the relevant chapters.

The analysis of the physical, natural and social environment has considered the immediate site as well as an appropriate buffer surrounding the corridor. The buffer width will vary in accordance with the environmental and social issues).

The identification of the buffer area of the Project follows international best practice procedures (Institute of Ecology and Environmental Management IEEM 2006) and has taken

into consideration the type of project, the construction methods, the operation activities, and the environmental and social setting of the area. Therefore, for each environmental and social issue the buffer width is based on the extent to which impacts from the construction and operation of the proposed Project would extend if no mitigation measures were implemented.

4.3 Impact Assessment Significance Criteria

In order to obtain a credible assessment of environmental impacts, the assignment of 'impact significance' for each identified impact needs to be a robust, consistent and transparent process. The methodology to assess 'impact significance' is outlined below and follows International Best Practice based on the assumption that the significance of an impact on resources or receptors is considered to result from an interaction between three factors:

- The nature and magnitude of the impact or change;
- The number of resources or receptors affected; and
- The environmental value (sensitivity) of those resources or receptors to the change.

A three-step approach has been used to determine the significance of environmental effects, as follows:

- Step 1 – evaluation of value / sensitivity of resource;
- Step 2 – assessing the magnitude of the impact on the resource; and
- Step 3 – determining the significance of effects.

The environmental value (or sensitivity) of the resource or receptor has been defined by using the criteria below in the table below.

Table 4-1 Environmental Value of Receptor or Resource

Value (sensitivity)	Description of Value
Very High	High importance and rarity on an international scale and limited or no potential for substitution. The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports. Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).
High	High importance and rarity on an national scale, and limited potential for substitution. The receptor is closed to reaching its carrying capacity, so a further impact may lead to a significant damage to the system that it supports. Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalized groups).
Medium	High or medium importance and rarity on a regional scale, limited potential for substitution. The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will get increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point. Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas).
Low (or Lower)	Low or medium importance and rarity on a local scale. The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system. Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g. industrial areas).
Very Low	Very low importance and rarity on a local scale. The receptor is not impacted and shows a very large spare carrying capacity. Impacts are very unlikely to generate any noticeable stress in the underlying system. Locations or groups that show a very low vulnerability to the environmental impact under consideration (e.g. industrial areas).

The existence of receptors that are legally protected (e.g. designated areas, protected habitats or species) will be taken into consideration for the assessment of the sensitivity of the receptors.

The magnitude of the impact is defined where possible in quantitative terms. The magnitude of an impact has a number of different components, for example: the extent of physical

change, the level of change in an environmental condition, its spatial footprint, its duration, its frequency and its likelihood of occurrence where the impact is not certain to occur.

The criterion that has been used for assessing the magnitude of impacts includes the geographical scale of the impact, the permanence of the impact and the reversibility of the impacted condition. A brief description of the magnitude of the impacts is provided in the table below.

Table 4-2 Criteria for Magnitude of Impact

Magnitude of Impact	Description of Magnitude
Major	Adverse: Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements. A major impact is usually large scale, permanent and irreversible. Beneficial: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse: Significant impact on the resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. Moderate impacts usually extend above the corridor boundary, and are usually permanent, irreversible or cumulative. Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse: Some measurable change in attributes quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Minor impacts usually are only noticeable within the corridor and are temporary and reversible. Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristic(s), features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements. Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

In addition to the factors outlined in the table above, the possibility of any standards being breached will be taken into consideration in the determination of the magnitude of the impact.

The significance of effects is a combination of the environmental value (or sensitivity) of a receptor or resource and the magnitude of the project impact value (change). The table below shows the criterion used for determining the significance of effects. Definitions of each significance category are provided for in the table further below.

Table 4-3 Criteria for Determining Significance of Effects

		Magnitude of impact (degree of change)				
		No Change	Negligible	Minor	Moderate	Major
Environmental value (sensitivity)	Very High	Neutral	Minor	Moderate to Major	Major	Major
	High	Neutral	Minor	Minor to Moderate	Moderate to Major	Major
	Medium	Neutral	Negligible to Minor	Minor	Moderate	Moderate to Major
	Low	Neutral	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate
	Very Low	Neutral	Negligible	Negligible to Minor	Minor	Minor

Table 4-4 Definition of Significance of Effects

Significance Category	Criteria
Very Large	Only adverse effects are assigned this level of importance as they represents key factors in the decision-making process. Effects are associated with sites and features of national or regional importance. Effects exceed statutory limits. Mitigation measures are unlikely to remove such effects.
Large	Important considerations at a local scale but, if adverse, are potential concerns to the project and may become key factors in the decision making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor	Local issue unlikely to be of importance in the decision-making process. Effects do not exceed statutory limits. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation

	measures.
Neutral or Negligible	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. No mitigation is required.

It should be noted that the decommissioning phase of the project has only been discussed in general terms since the proprietorship will change once the 25-year Power Purchase Agreement (PPA) ends. The Project will be handed over to MASEN at the end of the 25-year period and consequently the responsibilities for the decommissioning of the plant will fall under the responsibility of the future owner.

5 CONSULTATION PROCESS

The scale and nature of the proposed project and the emphasis that the IFC Performance Standards place upon community involvement or affected parties emphasise this important aspect of the environmental and social impact assessment process.

The SESIA has included a process by which the project stakeholders' input on matters affecting them is sought. The main goals of this procedure have been improving the efficiency, transparency and public involvement in the projects.

The project may have an impact on communities and consultation is key to understanding the existing social constraints, identifying any community grievances and identifying mitigation measures. Mitigation for the social or environmental concerns of these stakeholders has been considered at the early stage of the project development.

In Morocco, the public consultation process (enquête publique) is well defined under decree no. 2-04-564 and is a pre-requisite to carrying out the SESIA. The procedures and objectives are similar to those defined under the IFC Performance Standards 1, 4, 5, 7 and 8, which ensure that the development of the Project considers any impacts or practices which may affect local communities or other stakeholders.

5.1 Public Consultation Meeting

In addition to the national public enquiry, a public consultation was carried out on December 1st 2016. The detailed report of the community consultation meeting is provided in SESIA Vol. 4.

The public consultation meeting was advertised through the publication of an advert in French and Arabic national newspapers and by coordination with the Governor of Boujdour Province to send official invitations to provincial technical departments. The meeting was led by representatives Phenixa, ACWA Power and MASEN. Local Arabic was spoken during the meeting and 53 people attended.

A copy of the non-technical summary in French and Arabic was provided to all attendees and an initial presentation was undertaken to outline the main elements of the Boujdour PV project, to summarise the baseline conditions in the study area (physical, biological and socioeconomic), to outline the positive and negative impacts identified, explain the preliminary assessment undertaken and specify the mitigation measures that were being considered.

The stakeholders present at the meeting consisted of the following:

- Population
- Provincial technical departments

- Elected Communal councillors
- Non- Governmental Organisations

The meeting was considered to fulfill its aims, for the following reasons:

- It allowed for precise information to be provided about the main issues raised by the local population;
- It confirmed that the concerns raised by the population were in line with the mitigation measures being proposed.

The following is a summary of the perspectives and concerns of the stakeholders:

- Impacts on the livelihood of the herders
- Developing social programs to help sustain the herders
- Employment and training opportunities for the local population
- Environmental impacts in relation to source of water, soil quality, ecology, livestock, and health/security impacts; and
- Communications and grievance mechanisms

The following table summarises the most commonly raised questions and concerns raised, and the mechanism proposed/addressed in the design of the project:

Table 5-1 Summary of comments and question

Questions/Comments	Clarifications and Answers
The site is regularly used by herders for grazing and looking for water wells. It is requested that notice boards are placed to inform the herders of the sites boundaries and to guarantee their security.	It should be noted that there is no water wells within the project site, and that a fence will be constructed, avoiding any risks for the herds.
The residents of Lamsid commune are looking forward to the positive impacts from the implementation of the project, such as job creation and skills development.	Employment applications will be conducted through the ANAPEC, and the employment priority will be given to the local residents of the commune and province, according to available qualifications.
Which source of water will be used for the construction and operation of the project?	The supply of water for the need of the plant will be from the desalination plant at Boujdour in coordination with ONEE while obtaining necessary approvals.
The site has a couple of environmental considerations: The UAE has been introducing Houbara Bustards in the province (from historical data), and the IBA *Oufist* is located 55 km south of Boujdour, which is an important resting area for migratory birds. Therefore the mitigation measures should considered the potential impacts to	Ecological mitigation measures during construction and operation have considered the impacts to migratory birds and monitoring will be conducted to ensure that these measures are effective at preventing any losses. Specialist ornithological surveys have confirmed the absence of any Houbara Bustard in the project area.

Questions/Comments	Clarifications and Answers
these organisms.	

5.2 Stakeholder Engagement Plan

A Stakeholder Engagement Plan was prepared in order to guide the stakeholder identification, assessment, and plan stakeholder engagement actions for the SESIA and for the construction and operational phases. This SEP is a standalone Plan that will guide MASEN, the Project Company and the EPC.

The SEP covers both the PV plant and the PL.

A Grievance Mechanism will be implemented by MASEN, as the public company that leads the NOOR programme.

6 AIR QUALITY

6.1 Introduction

This chapter describes the existing air quality conditions in the area and the potential impacts that may occur as a result of the construction of the proposed PL. This chapter also identifies the measures that will be implemented in order to mitigate these impacts.

Impacts to air quality as a result of the operation of the PL are not expected and therefore the Operational Assessment has been scoped out.

6.2 Methodology

The construction of a power line typically results in increased dust levels, mainly resulting from corridor preparation activities and from vehicle movements. As such, only particulate matter has been considered for the air quality survey.

Ambient Air Quality Monitoring of PM_{10} and $PM_{2.5}$ was undertaken on November 13th for 24 hours at two locations using a continuous high volume mass sampler. Equipment to continuously monitor wind speed, wind direction, humidity, and temperature was also deployed for the monitoring period.

Monitoring was conducted at the PL corridor to provide representative results for the airshed's air quality.

Table 6-1 Air Sampling Coordinates

Monitoring Station	Lambert Coordinates		Description
	X	Y	
BS1	305 347.656	437 671.756	PV Site
BP1	295 635.981	436 261.152	Interconnection Point, close to the N1 road

Figure 6-1: Air Survey Locations

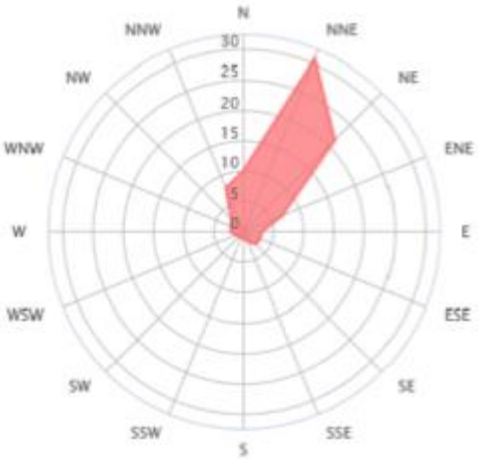
6.3 Baseline

The mean monthly air temperature was 17.3°C for the coldest month (January) and 24.8°C for the warmest (August) during the 2001-2014 period. During these years, the minimum and maximum average temperatures were, respectively, 12.5 °C (February) and 31.2°C (August)- data obtained from the Laayoune weather station.

The average annual precipitation in the project area is 40 mm, and rainfall occurs in short and intense events. The high relative humidity (inter-annual variation of 60 – 72%) reflects the proximity of the ocean.

The Saharan coastal region is exposed to high winds and the project area is exposed to aeolian transport, involving the movement and weathering of sand particles.

Figure 6-2 Prevailing Wind Pattern at the Project Area



6.3.1 Air quality Conditions

The proposed power line will be developed near the city of Boujdour and in parallel to the N1 road and the future access road. As a result, emissions from these sources can impact the airshed. No heavy industries are located in the area.

Analytical Results

Table 6-2 Air Monitoring Results, µg/m³

Parameter	IFC EHS General GLs/WHO GLs	Moroccan	Results (BS1)	Results (BP1)
PM_{10}	150 (Interim target 1)	90.4 (50%centile)	31.6	37.2
	100 (Interim target 2)			
	75 (Interim target 3)			
	50 (guideline)			
$PM_{2.5}$	75 (Interim target 1)	-	15.3	16.4
	50 (Interim target 2)			
	37.5 (Interim target 3)			
	25 (guideline)			

The monitoring values observed for coarse dust particles PM10 (2.5 to 10 micrometres ⌀) and fine dust particles PM2.5 (<2.5 micrometres ⌀) show that the ambient air quality conditions in the PL corridor are well within the national and international ambient air quality guidelines, and are considered good.

6.4 Sensitive Receptors

In accordance with good international practice, the assessment of sensitive receptors should consider up to 500 m from the PL for both human and ecological receptors (Holman et al, 2014), due to the typical distance of dust dispersion. The assessment of other pollutants (e.g. gaseous exhaust fumes) will require a smaller area of assessment (~ 200 m) as suggested by Bignal, K. et al, 2004, before emissions are indistinguishable from background concentrations.

Based on observations of the site visit and survey results, the following point receptors have been identified within the buffer area.

Table 6-3 Air Quality - Receptors sensitivity

Receptor	Sensitivity	Justification
Air Quality (Gaseous and Particulate)	Low	The existing air shed shows low pollution concentrations and its well within its carrying capacity.
N1 users	Very Low	Road users have a low sensitivity to impacts since they are in vehicles and their residence time in the area is low.
Residents (Boujdour)	Medium	The residential area located near (500 m) the Interconnection Point would be sensitive to increased dust conditions.
Residents – Transport Route	Medium	Construction vehicles will use the available route from the Casablanca/Agadir Port, which goes through several residential areas where there is no bypass road. Chronic human exposure to air pollutants along transport corridors can lead to health effects, principally in the respiratory system.
Construction employees	High	Workers will experience increased dust conditions during the construction of the PL. Human exposure to air pollutants can lead to health effects. Employees are considered medium sensitivity as they will work on a shift basis and exposure will be on a temporal basis.

6.5 Construction Assessment

6.5.1 Potential Impacts

During construction, the ambient air quality at the corridor may potentially be affected by increased dust and by gaseous exhaust fumes from construction equipment and vehicle movements to and from the PL corridor.

The main anthropogenic sources of dust and emissions at the PL corridor during construction will be:

- Vehicle movement over unpaved surfaces;
- Movement of vehicles to and from the PL corridor (e.g. for deliveries);
- Dust from uncovered stockpiled powdery materials or truckloads; and
- Emissions (e.g. NOx, SOx and CO) and particulates from vehicles and other mechanical equipment.

Dust due to movement of trucks and material transportation

Increased dust levels will occur due to the movement of trucks/vehicles used for material or personnel transportation, principally on unpaved surfaces, as the corridor where the PL will be located.

Most of the proposed alignment of the PL lies within corridor of the existing power line. This area has already been cleared, levelled and graded; so no additional earthworks will be required. In addition, existing drainage patterns will not be significantly disturbed.

Vehicular and Equipment Gaseous and Particulate Emissions

Vehicles and equipment that operate on liquid fuel (i.e. oil) will result in the emission of gases and particulates to air due to the combustion of fossil fuels. Such vehicle and equipment include, but are not be limited to the following:

- Excavators;
- Graders;
- Trucks;
- Small generators, and
- Hand held equipment operating on liquid fuel.

Air quality impacts relating to the use of the above are generally small.

Table 6-4 Air Quality – Magnitude of construction impacts

Impact	Magnitude	Justification
Dust from Transportation	Minor	Temporary and reversible impacts are anticipated, due to slow moving vehicles on the unpaved access roads. However, this impact will be temporary, reversible.
Gaseous and Particulate emissions from Transportation	Negligible	Typical air quality impacts from vehicle movements required for a power line of this size are considered small given the type and number of vehicles and trips required. This impact will be temporary and reversible.

Table 6-5 Air Quality - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Dust from Transportation	Minor	Air Quality (Gaseous and Particulate)	Low	Negligible to Minor
		N1 users	Very Low	Minor to Moderate
		Residents (Boujdour)	Medium	Minor
		Construction employees	High	Minor to Moderate
Gaseous and Particulate emissions from Transportation	Negligible	Air Quality (Gaseous and Particulate)	Low	Negligible to Minor
		N1 users	Very Low	Negligible
		Residents – Transport Route	Medium	Negligible to Minor
		Construction Employees	High	Minor
VOCs and other hazardous volatiles	Minor	Construction Employees	High	Minor to Moderate

6.5.2 Mitigation Measures

Table 6-6 Air Quality – Mitigation Measures – Construction Phase

Impact/Source	Mitigation Measure	Responsibility	Schedule
Dust from Transportation	Powdery materials (e.g. cements) will be transported in sealed containers	EPC Contractors	CESMP – Management and Monitoring
	The PL corridor will be sprayed with water to minimise the dust from vehicles movements if the dust levels (visual inspection) are considered high.	EPC Contractors	CESMP – Management and Monitoring
Gaseous and Particulate emissions from Transportation	Vehicles and machinery will be periodically inspected for their worthiness and where necessary will not be permitted to enter the PL corridor.	EPC Contractors	CESMP – Management and Monitoring
	Efficiently manage deliveries of equipment to reduce the number of trips.	EPC Contractors	CESMP – Management
	Designated tracks/roads will include signage for directions and speed limits.	EPC Contractors	CESMP – Management
	Vehicles will be turned off while waiting to minimise gas emissions.	EPC Contractors	CESMP – Management

6.5.3 Residual Impacts

Following the implementation of the mitigation measures outlined above, the overall residual effects are expected to be of temporary/short-term duration and of minor to negligible negative significance.

Table 6-7 Air Quality – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impact Significance
Dust from Transportation	Air Quality (Gaseous and Particulate)	Negligible to Minor	Yes	Negligible
	N1 users	Minor to Moderate	Yes	Minor
	Residents (Boujdour)	Minor	Yes	Negligible
	Construction employees	Minor to Moderate	Yes	Minor
Gaseous and Particulate emissions from Transportation	Air Quality (Gaseous and Particulate)	Negligible to Minor	Yes	Negligible
	N1 users	Negligible	Yes	Negligible
	Residents – Transport Route	Negligible to Minor	Yes	Negligible
	Construction Employees	Minor	Yes	Minor

6.6 Decommissioning Assessment

A detailed Decommissioning Environmental and Social Management Plan (DESMP) will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not realistic to outline mitigation measures for the decommissioning phase at this stage, since decommissioning techniques are likely to be updated. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

7 NOISE AND VIBRATION

7.1 Introduction

Noise and vibration are environmental impacts that will be generated mainly through the construction phase of the proposed PL. Noise and vibration impacts are not expected as a result of the operation of the PL (medium-voltage power lines do not generate noise) and therefore the Operational Assessment has been scoped out.

Noise is transmitted as a pressure wave and vibration is a repeated elastic oscillation. Both have the potential to act at distance upon other receptors (vibration to a lesser extent). Where optimal topographic and land use conditions for noise distribution prevail (e.g. flat land/water with open space and little vegetation), noise from a source can be received at great distances.

This section considers the potential effects associated with the generation of noise and vibration during the construction phase of the PL. The potential impacts are assessed, mitigation measures considered and the residual impacts reported.

7.2 Methodology

7.2.1 Noise

This study has been undertaken based on the following:

- Initial identification of the relevant standards and requirements relating to noise during the construction phase (included in the Legal and Administrative section of this SESIA);
- An assessment of the likely construction activities. The assessment has been made against the permitted national and IFC standards, and
- Determination of required mitigation measures, including noise abatement technologies that might be needed to comply with national and international noise limits. Mitigation measures have been recommended in light of the results of the assessment and the residual impacts on receptors outside the PL corridor and workers at the PL corridor have been predicted.

In order to establish a benchmark of the noise conditions at the PL corridor, an environmental noise survey was undertaken in the day and night time in November 2016.

During this survey, noise monitoring measurements were conducted at two locations to consider the ambient noise levels within the PL corridor and the influence of existing and surrounding noise sources. The table and figure below provide the location details.

The monitoring was undertaken using a pre-calibrated sound level meter, which was connected to a laptop for direct download of the data. A computer software specifically developed for the instrument, then interpolated the data and provided tables and graphs of the noise levels. Measurements were taken for a 15-minute period, in the day time and night

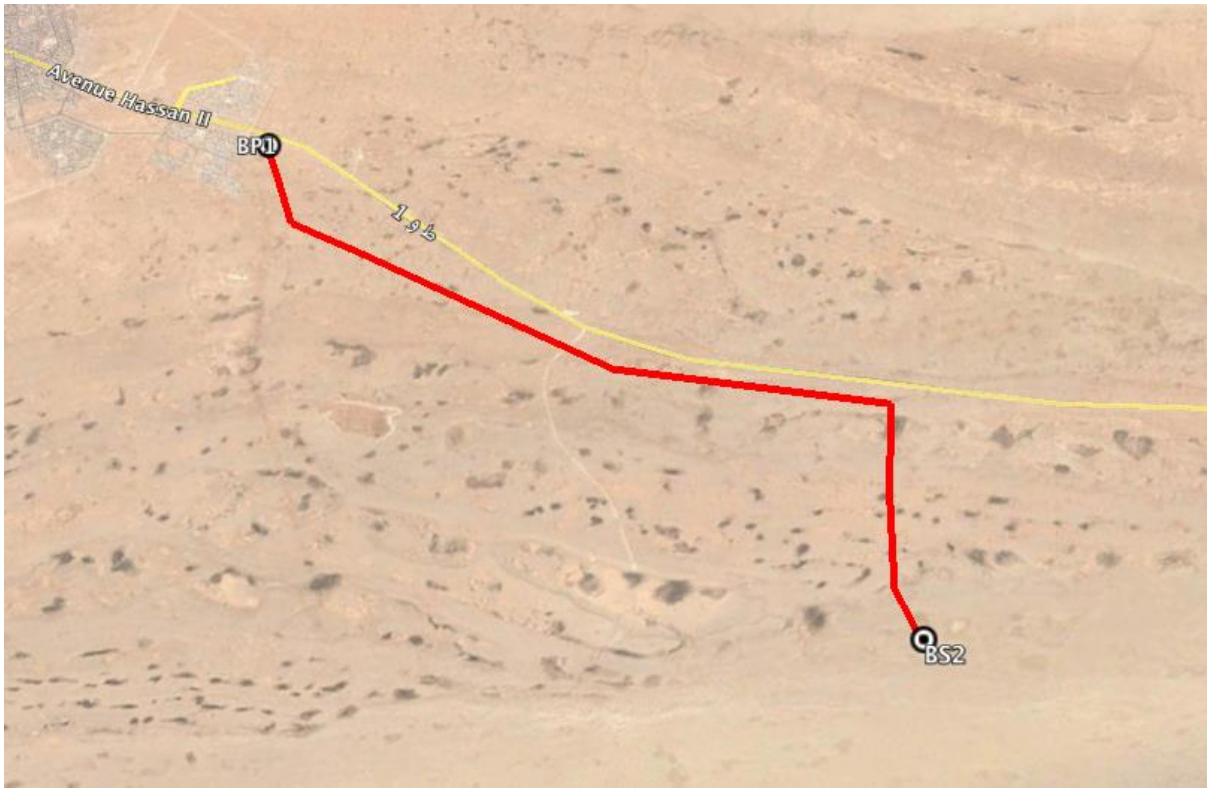
time, at each of the two locations using a broadband noise setting, within a measurement range of 20-100 dB.

The results of the noise monitoring survey will be used as a benchmark for the programmed noise monitoring activities, which will be implemented during the construction and operational phases.

Table 7-1 Noise Sampling Coordinates

Monitoring Station	Lambert Coordinates		Description
	X	Y	
BS2	304 845.134	437 845.895	PL corridor connection point
BP1	295 635.981	436 261.152	At the Interconnection Point, close to the N1 road

Figure 7-1 Noise Survey Locations



7.3 Baseline

7.3.1 Noise

The proposed power line will be built near the northern boundary of the city of Boujdour, parallel to the N1 road and the future access road. Therefore, existing sources of noise are attributable to traffic and routine activities in the area.

Noise Survey Analytical Results

The following tables provide the noise levels measures within the proposed PL corridor.

Table 7-2 Noise Monitoring Results, Day Time

Monitoring Station	Measured Noise Levels Day Time			IFC EHS Noise Limits (Daytime 07:00 – 22:00)	Description
	Leq, dB (A)	Lmax dB (A)	Lmin, dB (A)		
BS2	45.9	74.0	33.1	Industrial/commercial (70 dB) Residential (55 dB)	Average noise levels reflect a quiet environment, and are within the standards.
BP1	56.9	81.9	40.0		The average slightly exceeds the standard due to the proximity of the N1 road.

Table 7-3 Noise Monitoring Results, Night Time

Monitoring Station	Measured Noise Levels Day Time			IFC EHS Noise Limits (Daytime 07:00 – 22:00)	Description
	Leq, dB (A)	Lmax dB (A)	Lmin, dB (A)		
BS2	40.5	78.1	35.2	Industrial/commercial (70 dB) Residential (45 dB)	Average noise levels reflect a quiet environment, and are within the standards.
BP1	46.9	76.2	31.8		The average slightly exceeds the standard due to the proximity of the N1 road.

The wind speed, during the monitoring period was weak, with a minimum of 2.8 m/s and a maximum of 11.2 m/s. The predominant wind direction was NNE-SSW.

Both the day time and night time noise levels at the PV connection point reflect a quiet, undeveloped area. The levels do not change significantly between night and day and are below the maximum allowable noise limits for residential areas. The noise levels at the Interconnection Point (substation) do change between night and day, and this is reflection of the impact from road noise between day time and night time traffic. The average levels are slightly above the maximum allowable limits for residential receptors due to noise traffic.

7.3.2 Vibration

In terms of a baseline, no noticeable anthropogenic sources of vibration were encountered on the PL corridor during the site visits.

7.4 Sensitive Receptors

The table below outlines the identified receptors in relation to noise and vibration as well as the determined sensitivity of those receptors.

In accordance with Good International Industry Practice (GIIP), the identification of sensitive noise receptors has considered a 1km buffer from the PL, which considers the standard noise attenuation factors due to geometric divergence (i.e. 20 dB reduction for each tenfold increase of the distance of the noise wave to Murphy, E. et all, 2014).

Giving that the anticipated construction activities will not generate significant levels of vibration, only those sensitive receptors in close proximity to the source are considered.

Table 7-4 Noise/Vibration - Receptors sensitivity

Receptor	Sensitivity	Justification
Construction Workers	High	Constructions workers are sensitive receptors for noise/vibration as they are directly exposed to noise impacts. The sensitivity is considered high as human exposure to consistent elevated sound levels could cause hearing impairment, stress, hypertension, etc. Repeated exposure to high levels of vibration is known to cause direct injury to the fingers and hand, affecting feeling, dexterity, and grip, besides being a known contributing factor to carpal tunnel syndrome and other ergonomic-related injuries.
Residential Areas	High	The nearest residential areas is located approximately 500m to the east of the Interconnection Point. The sensitivity is considered high as human exposure to noise levels could cause annoyance, stress, sleep disturbance, etc.

7.5 Construction Assessment

7.5.1 Potential Impacts

Noise

Noise will be created during the installation of poles and the installation of wire conductors (i.e. stringing, tensioning, clipping, etc.).

With regards to the impacts upon ambient noise levels, a basic assessment of the likely construction noise levels to be experienced at the PL corridor has been undertaken taking into consideration the noisiest construction plant/machinery to be used at the PL corridor. This basic assessment is provided below, but it should be noted that the predicted noise levels are indicative and are subject to variables including location, topography, weather conditions, specifications of construction plant, and works phasing.

Noise data for the likely plant/equipment to be used at the PL corridor has been obtained from 'BS:5228, British Standards: Code of practice for noise and vibration on construction and open site's. Noise values for likely PL corridor plant/equipment have been set out in the following table. These noise levels represent the typical magnitudes observed at 10m from the construction activities.

Table 7-5 Noise Level of Anticipated PL corridor Equipment

Construction Equipment	BS:5228 Noise level at 10m (db(A))	BS:5228 Reference
Loader	82	C.6, 33
Truck crane	77	C.4, 53
Fork Lift	67	C.4, 57
Cumulative noise at 10m assuming 50% of the time	80	

For the assessment it is assumed that each item of plant/equipment is utilised at approximately half its operational capacity over a given period of time, rather than continuously at full power; as is typical with any construction process. A 50% on time factor has therefore been applied in the calculation.

As such, the accumulation of the noise levels from all the above equipment at a reception point 10m away will be approximately 80 dB(A). It will be noted that this basic assessment assumes that the noise is being received at a distance of 10m from the source and does not account for any other background noises.

It is known that noise levels dissipate with distance propagation and the following table sets out the anticipated noise levels at distances from the construction sources. The propagation due to distance has been calculated from the appropriate attenuation formula for distance, as set out in the BS:5228 British Standard.

Table 7-6 Construction noise levels in terms of distance from the source

Distance from Construction Works (m)	Noise Level dB (A)
10	80
20	73
50	66
100	58
200	53.6
300	48.1
500	40.6

The above table demonstrates that the attenuating effects of distance on a noise source is profound; reducing noise levels when at greater distances from the source. Given the

seclusion of the PL corridor, the construction activities are unlikely to affect ambient noise levels beyond the neighbouring area.

Prior to the implementation of mitigation measures, this impact can be assessed as being of minor negative significance. However, measures will be introduced to reduce noise levels when working in close proximity to the PL corridor, as they could exceed the required standards without mitigation. It is likely that at certain locations of the PL corridor, noise levels will be in excess of 85 dB(A), for which ear protection would be required for the personnel on PL corridor. Such areas will include those immediately next to plant or machinery. Prior to the mitigation measures, the impact to workers can be deemed to be of a minor to moderate negative impact.

With regards to the closest residential area, located 500 m from the Interconnection Point, the expected noise level 40.6 dB(A), is significantly lower than 55 dB(A) established by the IFC General EHS Guidelines.

Increases in vehicle movements during construction may also lead to increases in the noise level. However, typical noise impacts from vehicular movements required for a power line of this size are considered low given the type and number of vehicles and trips required. Additionally, noise impacts from construction vehicles will be temporary and reversible.

Vibration

Certain construction processes, particularly those involved with civil works, e.g. pilling, have the potential to create vibration within the vicinity of the works. Minor vibration will also occur sporadically around the PL corridor due to the movement of materials and equipment. However, it should be noted that vibrations dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source.

Table 7-7 Noise and Vibration - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Construction Noise (residential areas)	Negligible	Noise at the nearest residential areas (located 500m from Interconnection Point) is well below the night time standard for residential areas (for day time noise emissions), and will not be noticeable due to traffic noise.
Construction Noise (PL corridor)	Major	Construction employees could be exposed to > 85 dB(A)
Vehicle Noise	Negligible	Required traffic levels associated with the construction phase are unlikely to result in discernible noise impact. Noise levels from deliveries (goods and workers) or visitor traffic will be significantly lower than for the adjacent PV Project.
Construction Vibration (including vehicle vibration)	Negligible	Very minor vibration impacts may occur during construction activities, which will be limited to the PL corridor, or to immediately adjacent areas from vehicle

Impact	Magnitude	Justification
		routes.

Note: (LA) Noise and vibration impacts resulting from construction vehicles passing through the residential areas have been addressed in the Traffic and Road Safety section of this SESIA.

Table 7-8 Noise and Vibration - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Construction Noise (offsite)	Negligible	Residential Areas	High	Minor
Construction Noise (PL corridor)	Major	Construction Workers	High	Major
Vehicle Noise	Negligible	Construction Workers	High	Minor
		Residential Areas	High	Minor
Construction Vibration (including vehicle vibration)	Negligible	Construction Workers	High	Minor

7.5.2 Mitigation Measures

Mitigation measures for construction are outlined on the table below. Mitigation measures to reduce noise levels associated to construction vehicles are included in the Traffic and Road Safety Section of this SESIA, Chapter 14.

Table 7-9 Noise & Vibration – Mitigation Measures - Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Construction Noise/Vibration	All activities with highest noise emissions at the interconnection point (ONEE substation) will be undertaken during daytime in the working week and not on official holidays.	EPC	CESMP – planning
	Diesel compression equipment or generators will be equipped with effective silencers when necessary	EPC	CEMP – monitoring
	Electrically powered equipment will be preferred, where practical, to mechanically powered alternatives. All mechanically powered equipment will also be fitted with suitable silencers when necessary.	EPC	CEMP – planning
	Plant equipment on the PL corridor operating intermittently will be shut down in the intervening periods between uses.	EPC	CEMP – monitoring
	Construction employees will, at all times, carry out all work in such a manner as to keep any disturbance from noise and vibration to a minimum.	EPC	CEMP – start of monitoring
	Where noise levels exceed 85dB(A) for an 8-hour time-weighted average, hearing protection devices shall be provided to workers. No unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C)	EPC	CEMP – monitoring
Vehicle Noise	Vehicles will be equipped with effective silencers when necessary and switched off when are not in motion for more than 2 minutes	EPC Contractors	CESMP – planning
	All vehicles will be adequately maintained in order to minimise sound emissions.	EPC Contractors	CESMP – planning
	Speed limits are included in the Traffic and Road Safety Section of this SESIA. Besides road safety, these limits will contribute to reduce noise levels resulting from traffic movements particularly in residential areas without bypass road.	EPC Contractors	CESMP – planning

7.5.3 Residual Impacts

Table 7-10 Noise and Vibration – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impacts
Construction Noise (residential)	Residential Areas	Minor	Yes	Negligible
Construction Noise (PL corridor)	Construction Workers	Major	Yes	Minor
Vehicle Noise	Construction Workers	Minor	Yes	Negligible
	Residential Areas	Minor	Yes	Negligible
Construction Vibration (including vehicle vibration)	Construction Workers	Minor	No	Minor

7.6 Decommissioning Assessment

A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

8 SOIL AND GROUNDWATER

8.1 Introduction

This chapter assesses the potential impacts to soil and groundwater resulting from the construction activities of the proposed Boujdour PL.

Typical contamination risks are associated with the transport, handling and storage of hazardous materials, which could be released into the soil and reach the groundwater table. Other risks to soil quality are associated to soil compaction due to heavy vehicles.

Additionally, the stormwater runoff can wash areas containing hazardous materials and either infiltrate into the soil or carry them offsite, potentially contaminating other areas.

Although there will be very little or no interaction with hazardous materials or chemicals, the potential for uncontrolled releases of fuels and oils to soils during the any maintenance works is possible.

The EPC has considered local weathering conditions and the specification established in the MFS documentation prior the selection of the material for the poles and the wire conductors (hot-dip galvanized, Almelec, etc.). Impacts resulting from corrosion of metal structures are therefore unlikely. Other impacts to soil/groundwater quality as a result of the operation of the PL are not expected and therefore the Operational Assessment has been scoped out.

8.2 Methodology

The assessment of the potential impact of the power line is based on desktop research as well as soil information observed during the site visit, gathered from the baseline survey, sampling, testing and investigations undertaken for the project area.

5 Capitals has reviewed the following studies:

- Review of relevant guidelines identified within the IFC Performance Standards;
- Review of Dutch guidelines for assessing soil, and
- Consultant's research and desktop review.

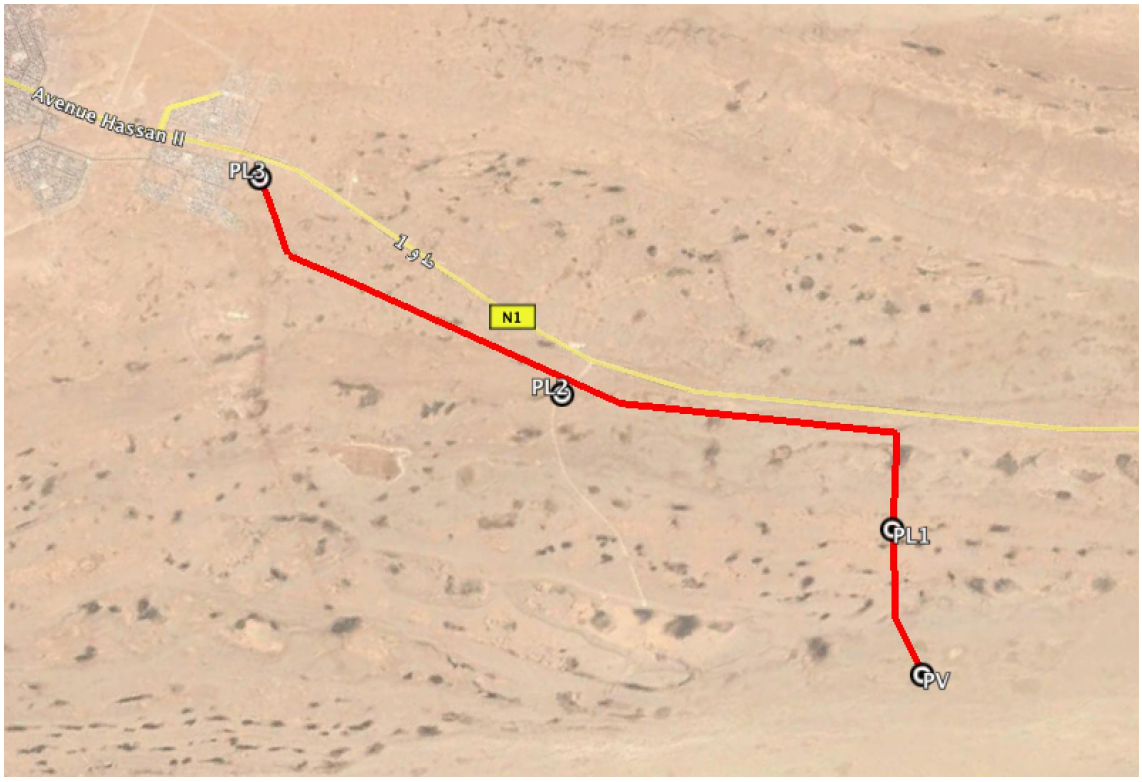
The desk study includes the assessment of the proposed design, and procedures for construction and operational issues that may impact on both the society and environment. Based on the findings of the assessment, measures have been identified to mitigate any negative effects and promote the positive effects associated with both construction and operational phases (including commissioning of the plant).

As part of the establishment of the baseline soil conditions along the PI alignment, 5 Capitals undertook soil sampling and analysis campaign. The sampling comprised of the collection of the top soil layer (at 0.1-0.2m depth) collected at four locations, which was then analysed for heavy metals, in accordance with Dutch standards.

Table 8-1 Soil Sampling Coordinates

Monitoring Station	Lambert Coordinates		Description
	X	Y	
PV	304997.0571	437866.5277	PL corridor connection point
PL2	303345.6482	438458.2101	PL alignment (close to future access road)
PL1	299429.8071	438458.2101	PL alignment (close to N1 road)
PL3	295717.6955	436092.8304	At the Interconnection Point (substation)

Figure 8-1 Soil Survey Locations



The purpose of the soil sampling activity was to establish a benchmark of the soil conditions at the PL corridor, which will be used for the long-term monitoring and environmental management of the PL corridor. Particularly if a spill or leak were to occur, the successful clean up procedure would include soil testing for any residual contaminants and the benchmark would be used in the assessment.

8.3 Baseline

The power line will be constructed adjacent to an existing power line and the N1 road. Therefore, surface soil contamination may exist from previous construction activities, litter from drivers using the N1 road, vehicle accidents/damage, deposition of vehicle exhaust gases, and oil leaks. Solid waste was found in the interconnection point during site visit.

8.3.1 Topography and Geology

The geological formations of the area are of tertiary and quaternary deposits.

A significant area of the proposed corridor for the new power line is within the right of way of an existing power line, parallel to the N1 road. The area has already been cleared, levelled and graded; and consequently no additional earthworks will be required. Similarly, existing drainage patterns will not be significantly disturbed.

8.3.2 Seismicity

According to the FESIA and available information on the region, seismic activity is not significant in the project area.

8.3.3 Hydrology

The project area is located in the Sahara basin, where surface flows are limited and deep groundwater is the only water source. There are no permanent fresh surface water bodies in the area.

Deep groundwater is the only natural source of freshwater in the Sahara basin, which is only rarely recharged, as a result of scarce precipitation. These deep reservoirs have been present for more than 5,000 years and are considered fossil water. At the regional scale, the shallow groundwater is approximately 90 m deep and the salinity is high.

8.3.4 Soil contamination

Analytical results

The following table provides the results for the soil sample collected alongside the PL corridor.

Table 8-2 Soil Quality Results and Applicable Standards

Parameter	Results (mg/kg MS)				Dutch Target	Dutch Action
	PV	PL1	PL2	PL3		
As	7.92	4.84	6.68	6.88	29	55
Cd	<0.40	0.71	<0.40	<0.40	0.8	12
Cr	28.4	22.9	19.6	17.5	100	380
Co	17.5	7.77	4.96	5.39	20	240
Cu	8.13	10.9	8.99	7.51	36	190
Pb	<5	7.48	<5.00	<5.00	85	530
Mo	<1.00	<1.00	<1.00	<1.00	3	10
Hg	<0.1	<0.10	<0.10	<0.10	0.3	200
Ni	7.78	13.5	9.82	8.59	35	210
Zn	15.8	34.4	25.9	21.5	140	720

The results reveal that heavy metal concentrations at the sample locations are within the Dutch Target values. Therefore, based on the analytical information and observations, it can

be concluded that the soils alongside the proposed alignment are not contaminated by heavy metals. No evidence of other types of contamination was identified during the site studies.

8.4 Sensitive Receptors

The table below outlines the identified receptors in relation to soils and geology, as well as the determined sensitivity of those receptors.

Table 8-3 Soils and Groundwater - Receptor Sensitivity

Receptor	Sensitivity	Justification
Soil/Ground water Quality	Low	No ground contamination was observed or detected. The groundwater is deep and the soils support little biodiversity and no agricultural uses.

8.5 Construction Assessment

8.5.1 Potential Impacts

There is a range of construction related activities that could pose a threat and lead to changes in the chemical properties of the soil, resulting in potential contamination. Impacts can occur as a result of the spillage of liquid materials used during construction and improper management of construction waste.

Hazardous Materials

A hazardous material is any substance or agent (biological, chemical, radiological, and/or physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials include chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapours, mists or smoke which may have any of the previously mentioned characteristics.

During the construction phase, the risk of accidental spillage and leakage of hazardous materials (e.g. fuels, cleaning agents, empty oil drums, etc.) is present. Impacts can take place at the storage area that is shared between the PV site and the PL as well as during the transport of such materials. Although hazardous materials for the construction of the PL will only be required in small quantities, improper methods of storing, transferring, and handling of these products can result in spillage to the ground and result in soil contamination.

In addition, the storm water runoff can wash areas containing hazardous materials and either infiltrate into the soil or carry them offsite, potentially contaminating other areas.

Mitigation measures to ensure safe transport, transfer, storage and handling of hazardous materials are provided below.

The health care facilities that will be deployed onsite to assist in accidents or emergencies will implement a system to manage the medical / pharmaceutical waste streams generated in line with Good International Industry Practice.

The table below includes the types of heath care waste streams that could be expected and the minimum requirement for storage, collection and transport/disposal. The system for the appropriate management of health care waste will be described in the Project Hazardous Materials Management Plan and Project Waste Management Plan, as appropriate, and will consider the scale and type of activities and identified hazards.

Table 8-4 Expected Health Care Waste Streams

Type	Description	Storage (onsite)	Management
Infectious waste	Waste suspected to contain pathogens in sufficient concentration or quantity to cause disease in susceptible hosts	Yellow or red bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved.	No management onsite. Only collection by licensed operators as per national requirements.
Sharps	Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc	Yellow or red code, marked "Sharps". Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labelled "infectious waste".	No management onsite. Only collection by licensed operators as per national requirements.
Pharmaceutical waste	Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, etc.	Brown bag / container. Leak-proof plastic bag or container.	No management onsite. Only collection by licensed operators as per national requirements.
Chemical waste	Waste generated through use of chemicals during diagnostic, cleaning, housekeeping, and disinfection.	Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects	No management onsite. Only collection by licensed operators as per national requirements.
Waste with high content of heavy metals	Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).	Waste containing heavy metals should be separated from general health care waste. Management procedures will follow those	No management onsite. Only collection by licensed operators as per national requirements and the

		indicated in the Hazardous Materials Waste Management Plan	Hazardous Materials Waste Management Plan.
Pressurized containers:	Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases	Pressurized containers should be separated from general health care waste	No management onsite. Only collection by licensed operators as per national requirements.
General waste	Paper, plastics, cardboard	Black bag / container or as indicated in the Project Waste Management Plan	As indicated in the Project Waste Management Plan for the different waste streams of general waste
Genotoxic / cytotoxic, radioactive waste streams are not expected.			

Erosion

The existing corridor where the power line will be constructed is uniform and no earthworks will be required.

The vegetation cover will be removed and soils disturbed at each pole position, thus potentially increasing erosion in the PL corridor. However, erosion generated in these areas are likely to be negligible, temporary short-term impact due to the very nature of the proposed PL and the flat topography of the area.

Table 8-5 Soils and Groundwater – Magnitude of Construction Impacts

Impact	Magnitude	Justification
Leaks and Spillage of Hazardous Materials	Moderate	The volumes and quantities of hazardous materials being transported and handled during the construction phase are small, however poor handling practices will increase the probability of spills. Furthermore, rainfall or runoff storm water entering areas where hazardous materials are stored could lead to distribute pollutants.
Erosion	Minor	Levelling is not required and only minor earthworks at the poles are expected. Therefore, magnitude is considered low.

Table 8-6 Soils and Groundwater – Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Leaks and Spillage of Hazardous Materials	Moderate	Soil/Groundwater Quality	Medium	Moderate
Erosion	Minor	Soil Quality	Medium	Minor

8.5.2 Mitigation Measures

Table 8-7 Soils and Groundwater – Mitigation Measures - Construction

Impact/Source	Mitigation Measures	Responsibility	Schedule
Leaks and Spillage of Hazardous Materials	Chemicals, fuels, lubricants and paints will be stored and transferred only in dedicated locations of the shared Laydown Area on impermeable surfaces to prevent leakage into the ground and contained inside a secondary bund (110% of largest container).	EPC	CESMP – Management
	Storage areas will be designed and located considering potential ground contamination risks. Runoff will be prevented from entering areas where hazardous materials are stored, handled or transferred. If runoff can enter potentially contaminated areas, a dedicated drainage system will direct the run off to dedicated tanks to avoid impacts to soils and groundwater. The fluids in these tanks will be collected by licensed operators and managed as Hazardous wastewater.	EPC	CESMP – Management
	Hazardous materials storage area will be positioned away from major transport corridors in the shared Laydown Area, in order to avoid potential collisions from vehicles or other machinery.	EPC	CESMP – Management
	No refuelling of vehicles or equipment will be undertaken outside the dedicated location of the shared Laydown Area.	EPC	CESMP – Management
	Health care waste will be separated following GIIP (at least, infectious waste, sharps, pharmaceutical and chemical wastes, and waste containing high levels of hazardous substance(s) or pressurised containers, if any)	EPC	CESMP – Management
	All chemicals will be handled in accordance with relevant instructions (MSDS)	EPC	CESMP – Management
	Reduce quantity of chemicals and fuels to minimum practicable levels	EPC	CESMP – Management
	Regularly inspect drip collectors and containers for spills and leaks.	EPC	CESMP – Management and Monitoring
	Provide spill kits at all areas where hazardous liquids are stored.	EPC	CESMP – Training and

Impact/Source	Mitigation Measures	Responsibility	Schedule
			Monitoring
	Develop and implement an Emergency preparedness and Response Plan, to immediately remediate the affected area in the event of a spill or leakage of chemicals, fuels, paints, and any hazardous material.	EPC	CESMP – Management, Planning, Training and Monitoring
	Washing of equipment, machinery, and vehicles will not permitted and will only be carried out in adequate offsite premises.	EPC	CESMP – Management
	Vehicle maintenance will not be undertaken in the PL corridor and will be carried out only in offsite permitted premises	EPC	CESMP – Management
	If vehicles and machinery are too large to be moved offsite, or if it is not practicable to move the machinery for maintenance during the construction phase, then measures to protect the soils from spills and leaks during the cleaning/maintenance activity must be implemented (impermeable hard standing area with dedicated drainage system located). Maintenance of these vehicles will only be undertaken in the shared Laydown Area.	EPC	CESMP – Management
Erosion / Soil Compaction	Minimise disturbed areas.	EPC	CESMP – Management
Cross-contamination of Soils	Excavated materials will be kept in the stockpile for as short a time as possible and, once an area is back-filled with soil material, compacted in a short time.	EPC	CESMP – Management
	Areas where vehicles are allowed to circulate will be minimized and located only inside the corridor.	EPC	CESMP – Management
	Implement good maintenance practices during construction activities, including the procedure and requirements for the proper handling, storage and transport of chemicals and hazardous waste	EPC	CESMP – Management

8.5.3 Residual Impacts

Table 8-8 Soils and Groundwater - Residual Impacts – Construction

Impact	Receptor	Impact Significance	Mitigation	Residual Impacts
Leaks and Spillage of Hazardous Materials	Soil/Groundwater Quality	Moderate	Yes	Negligible
Erosion	Soil Quality	Minor	Yes	Negligible

8.6 Decommissioning Assessment

A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

9 BIODIVERSITY

9.1 Introduction

This Chapter assesses the potential ecological impacts of the construction and operation of the 22kV overhead power line required for the NOOR Boujdour PV Plant including the anticipated impacts on habitats, species and ecosystems. The assessment considers the potential direct and indirect, temporary and permanent changes to the ecological environment. The laydown and parking areas to be used during construction of the Power Line are the same as those selected for the PV site and are assessed in the SESIA for Boujdour PV Plant.

Direct impacts on habitats expected during construction will generally be limited to the erection of 76 poles along the 11km route and the delivery of materials on existing tracks or temporary access roads. The potential fauna mortality (due to vehicle movements, electrocution and collision with the power lines) has been considered for both construction and operational phases.

The preparation of this Chapter has followed international best practice guidelines (CIEEM 2016)

9.2 Methodology

The terrestrial ecology of the power line corridor and the biodiversity of sensitive areas in the region have been assessed by a combination of desk studies and two field surveys undertaken in 2016.

NOVEC undertook a detailed ecological survey in May 2016, which was reported in the FESIA.

5 Capitals / Phenixa undertook additional ecological surveys in November 2016 to gather new and updated information on the proposed power line corridor. The biodiversity baseline study was undertaken by an experienced ecologist over 1.5 days (including nocturnal surveys) and covered the proposed footprint and a 500 buffer, adjacent to the power line route.

The following table summarises the surveys that have been conducted.

Table 9-1 Summary of Baseline Ecological Surveys

Report Name	Date	Survey Activities	Purpose
Projet de la réalisation d'une centrale solaire à Boujdour; FESIA by NOVEC	May 2016	Terrestrial flora and fauna in the project area	Gather information of the habitats, fauna and flora species
EIE Centrale Solaire de Boujdour et ligne électrique de	November, 2016	Terrestrial flora and fauna in the project	Gather updated information of the

Report Name	Date	Survey Activities	Purpose
raccordement Biodiversité		area and 500 buffer	habitats, fauna and flora species

9.2.1 Desk Studies – Information Sources

Desk studies were undertaken in 2016 for the area and these included reviewing ecological survey data from the previous field survey (FESIA) and literature review of habitats and fauna of the region, such as:

- Birdlife International (www.birdlife.org),
- Birdlife Conservation Series No. 11. Important Bird Areas en Africa et Iles associées. Lincoln D.C. Fishpool and Michael I. Evans. Sous-chapitre Maroc par Chris Magin.
- Important Bird and Biodiversity Areas (IBAs), un programme mis en œuvre par Birdlife International qui a pour objectif d'identifier, de suivre et de protéger un réseau global de IBAs (http://www.birdlife.org/datazone/geomap).
- IUCN Species Survival Commission, 2016. 2016 IUCN red list of threatened species. http://www.redlist.org.
- SEO Birdlife (*) (www.migraciondeaves.org), la représentation espagnole de Birdlife International qui suit plus de 23 espèces d'oiseaux migrateurs. Ce programme de suivi a démarré en 2011 et a collecté et cartographié des données migratoires de plus de 50 individus
- Thévenot M., R. Vernon & P. Bergier, 2003. The birds of Morocco. An annotated checklist. *BOU Checklist Series, n°20*. Tring, Herts (UK). 594 p.

(*) No information publically available from the Moroccan Birdlife partner (GREPOM).

GREPOM, the Moroccan partner of Birdlife International, has been consulted and their feedback incorporated into the assessment.

The Ecological Impact Assessment has also considered the IUCN Red list of any threatened species (critically endangered, endangered and vulnerable) that have been recorded in the region.

9.2.2 Habitats and Flora Survey Methods

During the habitat assessment undertaken in November 2016, habitats and flora species along the study area were assessed using an adaptation of the standardized Joint Nature Conservation Committee (JNCC) Phase 1 classification and mapping methodology (JNCC, 2010). The habitats at the site were surveyed using DAFOR scale and % of coverage.

9.2.3 Fauna Survey Methods

Transects were undertaken in the project site and buffer area and included the direct observation of fauna, with the use of binoculars and the identification of fauna species.

Bat surveys were undertaken for two consecutive nights using a bat detector and recorder (BatloggerM).

Camera trapping systems were used for two consecutive days (including night-time) in order to detect and identify mammal species.

The specialists involved in the ecological assessment conducted for the SESIA have experience in previous projects in Morocco (NOORo I, II and III) and in several ecological assessments on avifauna thought the Middle East and Europe. Additionally, Moroccan biodiversity experts have been involved in the assessment. The table below includes a brief description of the expertise on avifauna and other biodiversity studies of the specialists involved in the project:

Specialist	Company	Experience
Ken Wade	5 Capitals	Ken is an experienced ecologist with specialist interest in nature conservation, avian fauna and surveying of birds, including breeding bird surveys for the British Trust for Ornithology in the UK. He has undertaken bird surveys across the Middle East for the Emirates National Records and EIA project surveys in Africa. He also lead a team of ecologists preparing the 28 Conservation Management Plans for the Natura 2000 sites in Northern Ireland, including SPA (Special Protection Areas for Birds) and also the SAC (Special Area for Conservation). He has given expert evidence in Public Inquiries in the UK including ecology and water quality.
Sofia Morcelle – Biodiversity Expert	5 Capitals	Sofia is an ecologist, specialising in birds, with over eight years' experience in consultancy. Her ornithological experience has included a variety of surveys techniques such as vantage points, transects, nocturnal ornithological surveys, breeding bird surveys and wintering bird surveys. Her experience also includes monitoring for protected species in a number of countries. Sofia has experience undertaking a variety of breeding bird surveys using various techniques including Common Bird Census, Breeding Bird Survey methodologies as well as vantage point methodologies for breeding raptors and Collision Risk Modelling in the Middle East, Spain and the UK. She has worked on a wide range of projects including major infrastructure projects (wind farms, electric lines, and hydro-electric schemes) and small-scale developments (building projects and Solar PV arrays). Sofia has

		produced numerous reports to support both standard planning applications and EIA developments, supported by GIS mapping. She is familiar with the design and implementation of mitigation measures to benefit breeding birds on development sites.
Fabrice Cuzin	Phenixa	Fabrice Cuzin is an expert in flora and fauna with a strong experience in the field of biodiversity. He has participated in the preparation of several impact studies in Morocco and abroad. Mr Cuzin also participated in consultations and activities in the field of conservation of wildlife, environment and protected areas in Morocco in collaboration with the High Commission for Water and Forestry

9.3 Baseline

9.3.1 Designated Areas

The proposed PL alignment is not located within any national or international protected areas and no national or international designated areas were identified within 5km of the proposed project site.

The nearest international designated area, Pointe d'Awfist Important Bird Area (IBA) is located approximately 50km to the south of the proposed PL alignment. This designated area is an important wintering roost for the Audouin's Gull *Larus audouinii*. This species is listed as Least Concern (LC) according to the IUCN Red list of threatened species. This area is also listed as a national Site of Biological and Ecological interest (SIBE).

More than 5000 individuals of gulls and waders were counted in January 1993, including 1679 Audouin Gulls (which exceeds 1% of the worlds population), 15 individuals of Yellow-legged Gull *Larus michaelis*, 2763 individuals of Black-backed Gull *Larus marinus, approximately 500 Northern Gannet Morus bassanus individuals, minor numbers* of Great Cormorant *Phalacrocorax carbo and* Sandwich Tern *Thalasseus sandvicensis* and other 724 undetermined gull species.

Figure 9-1 Designated Areas

9.3.2 Study Area

Habitats

The proposed PL alignment runs over a flat plateau with sparse and relatively low vegetation, and including some other habitats although of minor extension. A total of four (4) habitats were identified within the study area and these included:

- Rocky/Steppe Plateau: also designated as desert pavement, is a desert surface covered by closely packed interlocking angular or rounded small rock fragments. This habitat also included sandy soils and a medium vegetation cover.
- Depressions: This habitat included small sand dunes. Vegetation coverage was the highest within this habitat.
- Graras are depressions located over silt substrate, which collect rainwater using an endorrhoeic hydrographic network. Graras comprise a medium vegetation cover and highest biodiversity within the study area. This habitat is located outside of the proposed footprint, to the northern and western areas of its boundary.
- Pre-littoral steppe: degraded habitats found to the north, south and west of the proposed footprint. This habitat is characterized by a low vegetation cover.

Figure 9-2 Habitats within the Study Area

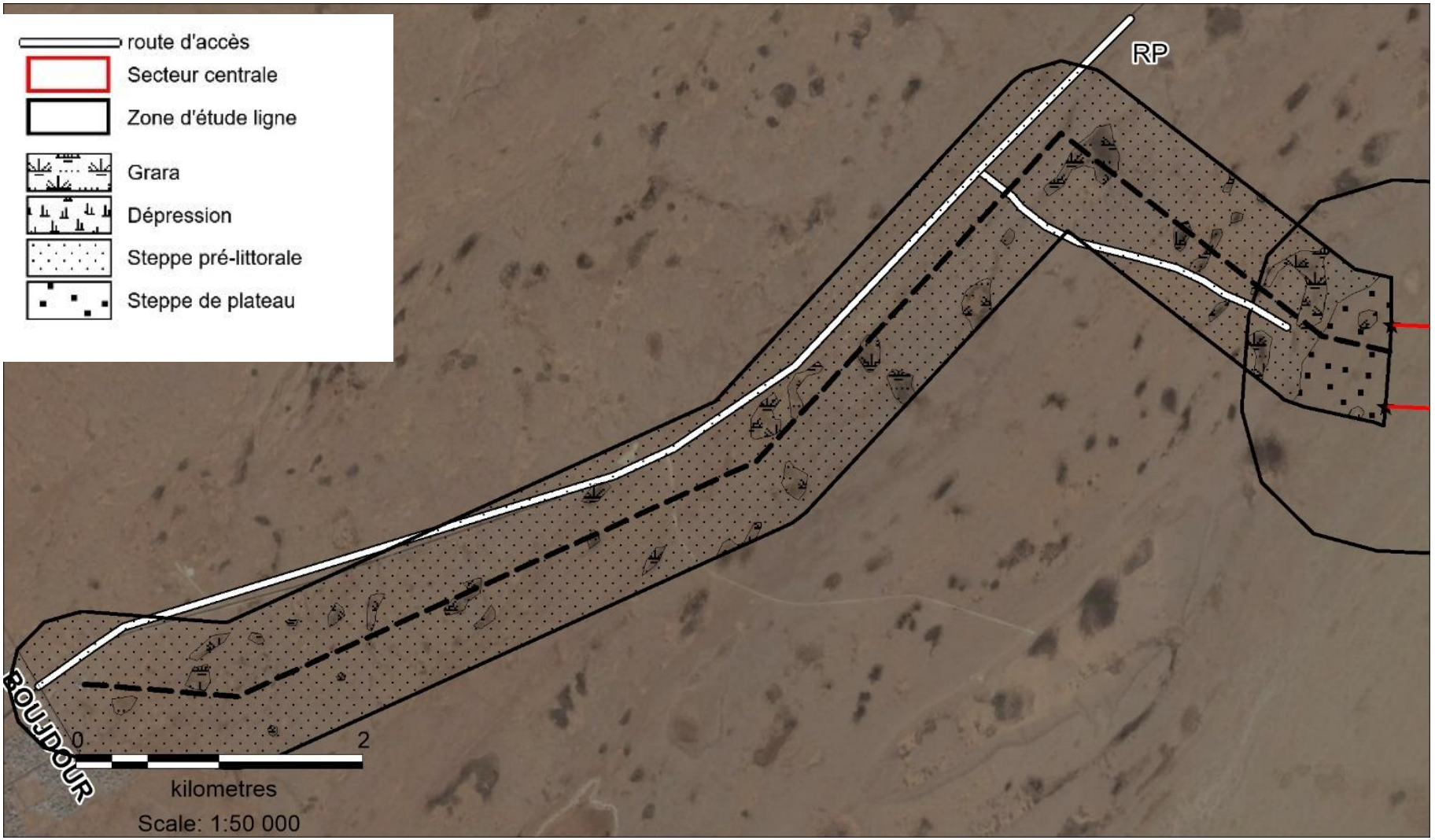
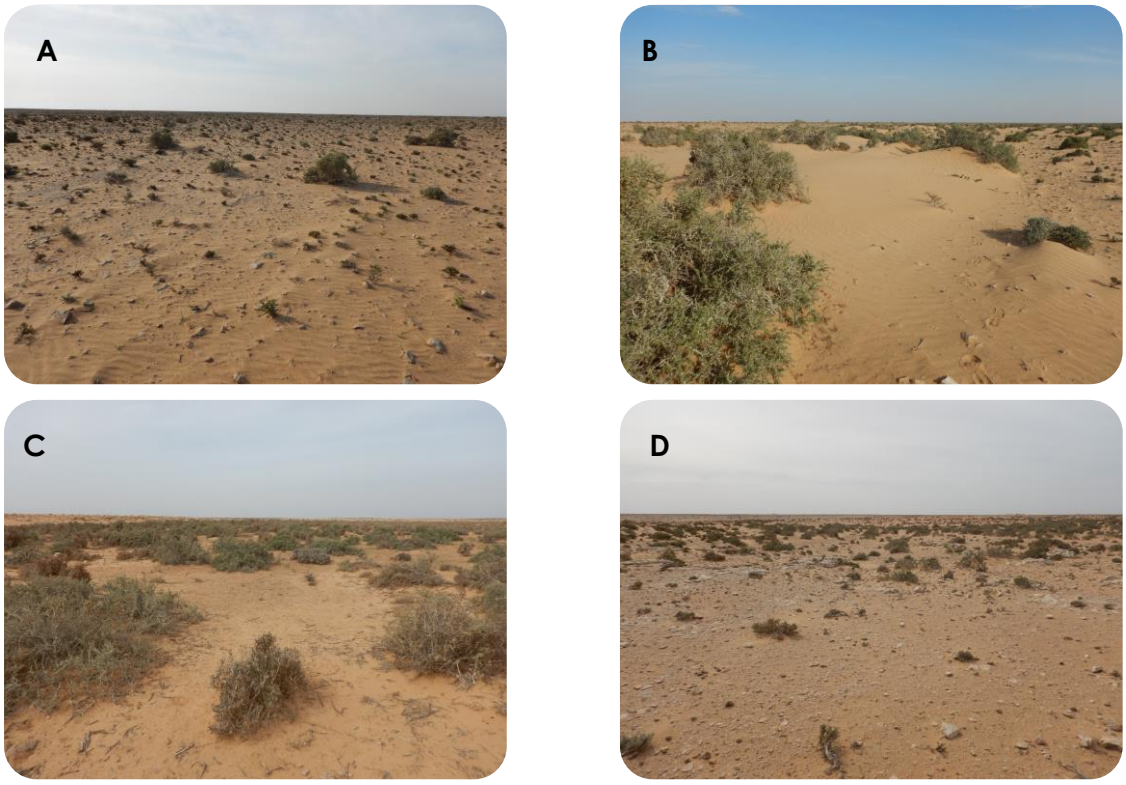

route d'accès
Secteur centrale
Zone d'étude ligne
Grara
Dépression
Steppe pré-littorale
Steppe de plateau
RP
BOUJDOUR
0
2
kilometres
Scale: 1:50 000

Plate 9-1 Habitats within the proposed Study Area



Above: (A) Rocky Plateau, (B) Depression, (C) Grara and (D) Pre-littoral Steppe.

Flora

A total of twenty-seven (27) species of flora were identified within the study area. From these nine (9) endemic, threatened and/or rare species in Morocco and Mauritania were identified within the study area. The following Tables present the endemic and rare species identified within the study area, and the habitats where these were identified. A table listing the total of flora species identified is provided in Appendix A. None of the observed species are listed of internationally conservation concern (IUCN Red list of threatened species, 2016).

Table 9-2 Nationally endemic rare and/or threatened species

Scientific Name	Endemic Species	Rocky Plateau	Depressions	Graras	Pre-litoral Reg
	Coverage	10-25%	20-40%	25-40%	2-10%
Euphorbia balsamifera	VU			x	
Ononis hesperia	Maroc	x	x	x	
Teucrium chardonianum	Maroc, Rare	x	x		
Zilla spinosa subs. pcotata	Rare			x	
Helianthemum canariense	Canaries, VU	x	x	x	
Pentzia hesperdium	Maroc, Rare	x	x		
Suaeda ifniensis	Maroc, Rare?			x	x
Suaeda monodiana	Maur, Rare?				x
Zygophyllum waterlottii	Maroc, Rare?	x	x		x

Fauna

The desk study identified a total of fourteen reptile species that could potentially be present in the habitats identified within the study area. A complete list of the species identified during the desk study is presented in Appendix 2.

Only two reptile species were identified during the site visit within the study area: *Acanthodactylus aureus* and Wedge-snouted Skink *Chalcides sphenopsiformis.* None of the species identified during the surveys is listed as nationally or internationally threatened.

Further details of the reptile species that could potentially be present in the habitats identified within the study area but were not identified during the site surveys are provided below:

- Helmethead Gecko *Tarentola chazaliae* is internationally listed as Vulnerable according to the IUCN Red List of Threatened Species.
- Two are Moroccan endemic species: *Saurodactylus brosseti* and Helmethead Gecko.
- A single species is endemic of Maghreb: *Tropiocolotes algericus.*
- A single endemic species from North Africa: Algerian Whip Snake *Hemorrhois algirus.*
- Three endemic species from Western Sahara: Duméril's Wedge-snouted Skink *Chalcides sphenopsiformis, Trapelus boehmei* and *Acanthodactylus aureus.*

Helmethead Guecko is found in succulent vegetation on sandy and stony soil in coastal areas, dunes where shelters are available, and rocky plateaus with refuges. Helmethead Gecko is threatened in Morocco by urbanization and fragmentation of its coastal habitats. The species is also hit by vehicles along the roads and is commonly traded in relatively large numbers (IUCN, 2016).

Saurodactylus brosseti is found in various stony or rocky areas, including degraded agricultural lands. Threats include habitat loss resulting from agricultural intensification and developments.

Duméril's Wedge-snouted Skink is generally restricted to coastal dunes and sand banks. The species is not thought to be facing any major threats, but people often persecute it.

Tropiocolotes algericus, Algerian Whip Snake, *Trapelus boehmei Trapelus boehmei,* and *Acanthodactylus aureus* occurs in Rocky plateau habitats. No threats are known for any of these species.

No amphibian species were identified and presence onsite is unlikely due to the lack of any wetlands in the nearby areas.

Birds

A total of nineteen bird species may potentially be present in the habitats identified in the study area, as per the desk studies undertaken for the FESIA and the SESIA.

A total of nine bird species were identified within the study area during the site visit: Cream-coloured Courser *Cursorius cursor,* Crested Lark *Galerida cristata,* Greater Hoopoe-lark *Alaemon alaudipes,* Great Grey Shrike *Lanius excubitor,* Sardinian Warbler *Sylvia melanocephala,* Spectacled Warbler *Sylvia conspicillata,* Streaked Scrub-warbler *Scotocerca inquieta,* Red-rumped Wheatear *Oenanthe moesta*, and Desert Wheatear *Oenanthe deserti.* All the species identified onsite are widespread and none of these species is listed as a national or international species of conservation concern.

Ten bird species not identified within the study area during the site visit are described in other studies as being present in the wider region. All these species are also widespread and none are listed as national or international species of conservation concern.

The African Houbara *Chlamydotis undulata* is an extinct species in Boujdour since the end of the 20th Century. A release of this species was made in 2013 under the initiative of Middle East for hunting proposes. The release was undertaken at the northern limit between the Provinces of Boujdour and Laayoune (Lemsid sector), about 70 km to the northeast of the Project. Since the release of individuals in 2013 was undertaken just for hunting purposes, and at a considerable distance from the project area, the species is currently considered extinct in the area.

No migratory species passing through the area were observed as surveys were undertaken out of the migratory periods. The proposed site is not located on a main flyway path; however, some migratory species such as Scopolis Shearwater *Calonectris diomedea*, Lesser Kestrel *Falco naumanni* and Bulwer's Petrel *Bulweria bulwerii* could occasionally use this area for migration (migration maps provided on the operational assessment below). None of these species is listed as a national or international species of conservation concern.

Mammals

A total of twenty mammal species may potentially be present in the habitats identified on the study area, as per the desk-based reviews undertaken for the FESIA and the SESIA. The list of species is included in Appendix 2.

A single species of mammal was identified within the study area during the field survey undertaken in November 2016. The Fat Sand Rat *Psammomys obesus* is widely distributed

within its range and the species is listed as an internationally "Least Concern" species (IUCN, 2016).

No bat species were detected during the bat surveys undertaken onsite.

From the desk study species list:

- A single species is endemic of Maghreb: Asian Garden Dormouse *Eliomys melanurus*
- A single species is endemic from North Africa: *Canis anthus*
- Three species is endemic from the Sahara: Saharan Shrew *Crocidura tarfayaensis,* Fat-tailed Gerbil *Pachyuromys duprasi* and the Libyan Striped Weasel *Ictonyx libyca.*

The Asian Garden Dormouse exists in a wide variety of habitats from steppes and semi-desert to high mountains in rocky areas, which are devoid of trees and bushes. Overgrazing is a minor threat for the species in some areas.

Canis anthus occur within rocky plateaus and steppe habitats. No major threats are known globally for this species.

The Saharan Shrew occurs within sand dune habitats along with dense shrubs and its therefore unlikely to occur within the proposed footprint. No major threats are known worldwide for the species.

The Fat-tailed Gerbil is found in deserts and semi-deserts with a solid, non-sandy substrate. No major threat is known globally for this species.

The Libyan Striped Weasel is only found on desert fringes with sparse vegetation. This species is protected in Morocco (K. de Smet pers. comm. 2007).

No species of international conservation concern were identified onsite or in the study area.

A number of mammal species including Dorcas Gazelle and Striped Hyena are extinct species within the region due to direct persecution, poaching, and trade activities.

9.4 Ecosystem Services

Ecosystem services onsite are limited due to the extreme environmental conditions, including lack of rain, salinity and extreme temperatures. The site is used as a grazing area; however, its productivity is very limed due to the arid conditions and low vegetation cover described above. "Graras" and "Depressions" are the most productive areas within the region.

9.5 Sensitive Receptors

For the Power line, the surrounding land use is generally homogenous and the topography is relatively flat, as such the buffer area extends 500m from the centreline of the PL alignment.

This buffer is deemed a sufficient distance for the extent to which impacts from the lifecycle of the Power Line would extend if no mitigation measures were implemented.

The table below identifies sensitive receptors likely to be present within the 1000km buffer. Migratory species wintering within the IBA and potentially passing over the PV are also considered sensitive receptors even though this designated area is located more that 1000m away.

Table 9-3 Ecology – Receptor Sensitivity

Receptor	Sensitivity	Justification
Local Flora & Fauna	**Medium**	The proposed PL alignment is located on a rocky plateau with some depressions, pre-littoral steppe, and graras and characterised by an arid climate. The biodiversity is rich in reptile species and flora but limited in terms of mammal and birds species.
Species of Conservation Concern	**High**	Some species of international conservation concern such as the Helmethead Gecko are vulnerable to direct mortality by vehicles and trade if mitigation measures are not implemented. Endemic reptile species and endemic flora may occur along the corridor as well as the wider region.
Migratory Birds	**Medium**	Migratory birds onsite, including gulls and waders migrating to/from the IBA, are especially vulnerable to collision and electrocution with the PL if mitigation measures are not implemented.

9.6 Construction Assessment

9.6.1 Initial Impacts

During the construction of the proposed project, the biodiversity on site and or nearby areas could potentially be affected by any removal of vegetation cover. However, habitat loss will be minimal and reduced solely to the construction corridor of the 76 pylons and the possible creation of new temporary tracks. Existing tracks will be used avoiding vegetation wherever possible.

Bird nests, if present on site, may be destroyed if construction starts during the breeding period, although, as highlighted before vegetation to be cleared will generally be limited to the base for each of the poles.

Furthermore, during the excavation works, direct mortality of small fauna could occur onsite, as some species such as reptiles or small mammals could fall into opened trenches and die. No trenches will be dug for the PL and vehicle movements will be on existing un-vegetated tracks where possible. The movement of vehicles and machinery could also pose a risk of direct mortality on small fauna due to run-over. Vehicles will use existing tracks where possible.

Illegal hunting by the workers could pose an ecological risk for some species of conservation concern identified onsite. However, impacts of this kind are expected to be minor or negligible as the nature and type of project activities makes hunting or poaching by project employees unlikely as they are fully briefed as part of induction training.

Finally, short term displacement of fauna could be generated during construction due to human disturbance from noise levels, lighting and vibration but this would be very short tem whilst erecting the poles and connecting the power lines.

Table 9-4 Ecology – Magnitude of Construction impacts

Impact	Magnitude	Justification
Habitat loss	**Minor Negative**	The habitat around each pole base will be cleared but this will be very limited. The creation of new temporary tracks may be required. Habitat loss could affect up to five endemic species in Morocco and Mauritania but none were recorded during the surveys in 2016. Considering that the actual distribution of the endemic species in the entire habitat area is not known, and that the vegetation clearance will be minimal, the magnitude is considered Minor.
Poaching/Hunting/Trade	**Minor Negative**	The nature and type of project activities makes hunting or poaching by project employees unlikely, since as they will be fully briefed as part of induction training
Direct mortality of fauna	**Minor Negative**	The increase of traffic levels and heavy machinery as well as the site works and excavation could potentially cause a direct mortality of fauna species such as reptiles, birds or small mammals. This impact could affect the identified Helmethead Gecko although it was not recorded in the surveys in 2016..
Displacement due to Human disturbance	**Minor Negative**	Temporary displacement due to human disturbance on fauna could be generated by human presence, noise levels, lighting and vibration.

Table 9-5 Ecology - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Habitat Loss	Minor Negative	Local Flora & Fauna	Medium	**Minor Negative**
		Species of Conservation Concern (endemic flora and reptiles)	High	**Minor to Moderate**
Poaching/Hunting/Trade	Minor Negative	Species of Conservation Concern (Helmethead Gecko)	High	**Minor to Moderate**
Direct mortality of fauna	Minor Negative	Species of Conservation Concern (Helmethead Gecko)	High	**Minor to Moderate**
Human disturbance	Minor Negative	Local fauna	Medium	**Minor**

9.6.2 Mitigation Measures

Table 9-6 Ecology – Mitigation Measures - Construction

Impact/Source	Mitigation Measures	Responsibility	Schedule
Habitat Loss	The following Moroccan endemic *species* were identified within the study area. *Euphorbia balsamifera, Ononis Hesperia, Teucrium chardonianum, Zilla spinosa subs. pcotata, Helianthemum canariense, Pentzia hesperdium, Suaeda ifniensis, Suaeda monodiana, and Zygophyllum waterlottii.* Avoidance of clearing any of these endemic species will be undertaken where possible. Appendix A includes a picture of each of these species. Adjustment of the proposed poles or tracks will be considered if any endemic species are to be affected by vegetation clearance.	EPC	CESMP – Design, Management
	These endemic species will be planted, where practical, at the landscaping areas (within the PV site) at the end of construction, to maintain populations locally. The Project Company can select the most suitable approach to comply with the measures outlined above. Seeds will be collected from local sources for sowing onto areas of land which are not a fire risk to the PV Plant and suitable for the site landscaping. If agreed by the stakeholders, the project company will support habitat restoration efforts in the region (project area or nearby protected areas).	EPC	CESMP – Design, Management
	Training in nest / burrow conservation awareness will be included during the construction period.	EPC	CESMP – Design, Management
	The contractor will ensure that no encroachment to the nearby, adjacent land will occur.	EPC	CESMP –Management and monitoring
	All construction vehicles will adhere to clearly defined transport routes identified during induction training. This will emphasise the need to adhere to the designated routes in order to protect the existing vegetation and fauna and reduce encroachment onto adjacent land, and reduce dust fall across the site.	EPC	CESMP –Management and monitoring
Poaching/Hunting/Trade	Hunting, falconry and trade will be strictly forbidden along the PL corridor and adjacent 500m buffer zone. Induction training and informative boards will raise	EPC	CESMP –Management and monitoring

Impact/Source	Mitigation Measures	Responsibility	Schedule
	awareness to all employees and subcontractors.		
Direct mortality of fauna	Speed limit will be imposed across the construction site in order to avoid direct mortality of fauna. Speed limits onsite are specified on Chapter 14 Traffic.	EPC	CESMP –Management and monitoring
	Transportation within and to and from the site will be minimised through efficient transport management in order to minimise the risk of running animals over.	EPC	CESMP –Planning
	Fires will be forbidden onsite or anywhere along the PL corridor.	EPC	CESMP –Management and monitoring
	Induction training for employees will include awareness of ecological management protocols including activities forbidden onsite, and protocols when fauna is encountered.	EPC	CESMP –Management and monitoring
	The pylons of the power line must be chosen in such a way that they do not cause the electrocution of the Raptors, which will not fail to land there. The Canadian type is recommended.	EPC	CESMP –Management and monitoring
	Schedule land clearing and excavation work outside the nesting period of the avifauna from June onwards. It is desirable that earthworks and clearing be completed by September in order to avoid any disturbance in the reproduction of birds that are likely to reproduce a second time if the rains occur in late summer	EPC	CESMP –Management and monitoring
	Workers will be trained and sensitized on site so as not to kill or harm birds or nests if they are on site. These birds or nests will be identified and reported to the HSE officer and will be moved out of the intervention corridor.	EPC	CESMP –Management and monitoring
Human disturbance	No glare or light spill from floodlights will be directed to the natural environment around the PL corridor or the 500m buffer.	EPC	CESMP –Management and monitoring

9.6.3 Residual Impacts

Table 9-7 Ecology - Significance of Residual Impacts

Impact	Receptor	Impact Significance	Mitigation	Significance Residual Impacts
Habitat Loss	Local Flora & Fauna	Minor	Yes	**Negligible**
	Species of Conservation Concern (endemic flora and reptiles)	Minor to Moderate	Yes	**Minor**
Poaching/ Hunting/ Trade	Species of Conservation Concern (Helmet head Gecko)	Minor to Moderate	Yes	**Minor**
Direct mortality of fauna	Species of Conservation Concern (Helmet head Gecko)	Minor to Moderate	Yes	**Minor**
Human disturbance	Local fauna	Minor	Yes	**Minor**

9.7 Operation Assessment

9.7.1 Initial Impacts

According to Hassen, D. *et al*, (2005) medium and low voltage power lines during operation may generate impacts on biodiversity in the form of direct mortality of avifauna by:

- Electrocution (due to birds making a connection between two live components); and
- Collision: due to the low visibility of conductor cables.

The electrocution risk is most commonly associated with poles and perching areas. Interactions and the impacts on birds and bird populations result from a complex mixture of biological, environmental and also engineering factors.

There are a number of factors related to the routing of power lines which increase the risks of collision:

- Areas in the surroundings with high bird populations and high percentages of migratory birds;
- Presence of wetlands, marshes, coastal areas and steppes, which may be important to bird species;
- Power lines crossing a flight path at right-angles;
- Poor visibility of the conductor cables, usually grey coloured.

Power pole design factors, which increase electrocution risk, include:

- Spacing between conductors being too narrow, enabling connection and causing a circuit to form;

- The use of upright insulators which are not insulated, which can cause a circuit to form;
- The spacing between lines being too narrow.

Physiological, behavioural and ecological features, which increase the vulnerability risk of certain species to collision and electrocution include:

- Large body, poor frontal vision, and a preference for nocturnal activity;
- Lack of flying experience in young birds which may increase vulnerability to collision;
- Preference for elevated places for roosting, perching or nesting;
- Preference for treeless open habitats and attraction to elevated poles;
- Flocking and gregarious behaviour which may impair visibility in large concentrations;
- Susceptibility to disturbance;
- Preference for low-altitude habitats, where there is likely to be a higher density of power lines;
- Low species density (with lower replacement potential);
- Low reproductive potential, meaning that an increase in adult mortality leads to an increased amount of time for a population to recover;
- Low fecundity, low natural mortality rates and long life expectancy;

Long-distance intercontinental migrants, can be affected by new and additional lines. However, the 11km power line form Boujdour PV will be located in parallel to an existing power line corridor and a main road. There is no information on any bird mortality caused by the existing power line and no dead birds were recorded during the survey for the new power line.

Poles can also provide additional perching areas for raptor species, which can lead to increased use of an area, which may have an impact on the local ecosystem.

The proposed PL corridor is in the general area of the Mediterranean/black sea flyway. The Mediterranean/Black Sea Flyway is one of three Palearctic-African flyways connecting Europe with Africa. The proposed site is not located on the main flyway path; however, some migratory species occasionally use this site for migration. The following Figures from BirdLife International Mediterranean/black sea flyway database (http://www.migraciondeaves.org) present some examples of the species identified using the proposed site or the nearby areas during migration.

Some migratory species such as Scopolis Shearwater *Calonectris diomedea*, Lesser Kestrel *Falco naumanni* and Bulwer's Petrel Bulweria bulwerii have been identified using the

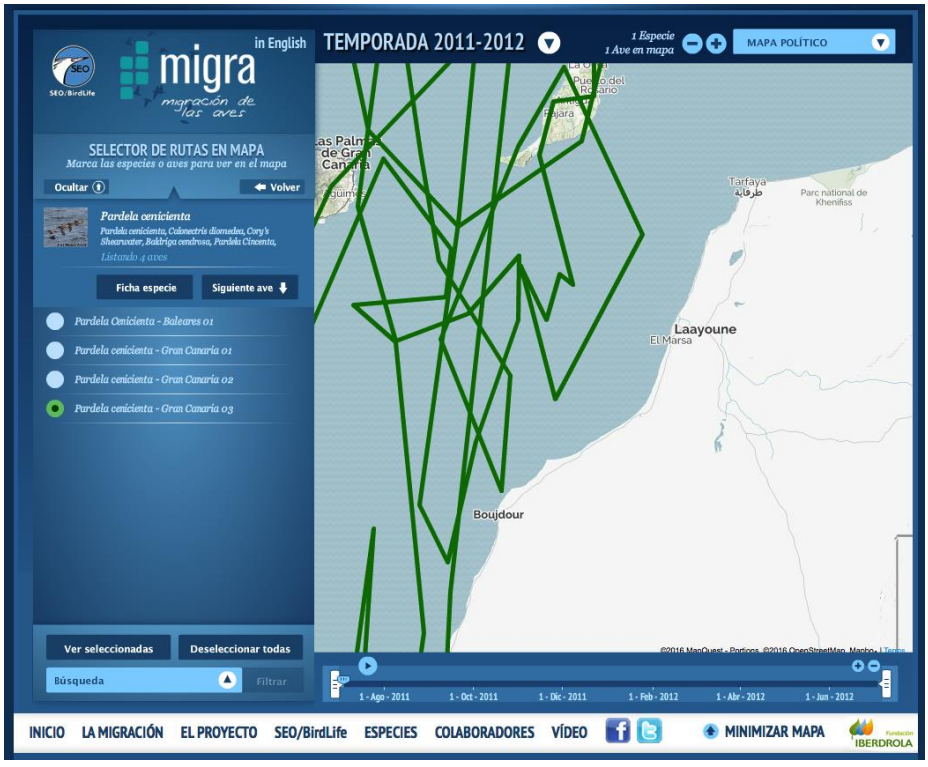
proposed area for the PL as a flyway (see Figures 10-2 to 10-4 below). None of these species are of international conservation concern (IUCN, 2016).

Most of the identified migratory marine species use the Canary Islands as a frequent migratory stopover and main path; therefore it is considered that the proposed alignment is outside the main Mediterranean/Black Sea flyway.

Figure 9-3 Shearwater Bulwer's Petrel individual migratory path (2010-2011)

Figure 9-4 Lesser Kestrel´s individual migratory path (2010-2011)

Figure 9-5 Scopolis Shearwater´s individual migratory path (2011-2012)



The following table based on Hassen, D. *et al*, (2005), presents information on the severity of the impact on populations from losses due to electrocution and/or collision for the families of bird species identified onsite. The following classification is used:

- 0: no causalities reported;
- I: causalities reported but no apparent threat to the bird population
- II: regional or locally high causalities; but not significant impact on the overall species population
- III: causalities are major mortality factor; threatening a species with extinction, regionally or on a large scale.

Table 9-8 Severity of impact on bird populations of mortality due to (A) electrocution and/or (B) collision with Power Lines for the identified families of birds.

Family	A (Electrocution)	B (Collision with PL)
Petrels (*Procellariidae*)*	0	I-II
Raptors (*Falconidae*)*	II-**III**	I-II
Gulls (*Laridae*)*	I	II
Waders (*Scolopacidae*)*	I	II-**III**
Rollers (*Coraciidae*)*	I	II

*Some of the species included in this family are migratory birds.

Raptors and Waders, families identified during the desktop study, are potentially the species with a major mortality factor due to electrocution and collision with power lines. As such specific measures have been included in the mitigation section in order to avoid or minimize potential negative impacts on these species.

Table 9-9 Terrestrial Ecology – Magnitude of Operational Impacts

Impact	Magnitude	Justification
Direct mortality of avifauna due to electrocution	**Minor Negative**	*Falconidae* species are likely to use the site occasionally as a migratory path. Electrocution causalities are major mortality factor for these species, but none recorded from existing power line during 2016 surveys.
Direct mortality of avifauna due to collision	**Minor Negative**	Wader species are likely to use the site occasionally as a migratory path. Collision causalities are major mortality factor for these species. However, the proposed alignment is outside the main Mediterranean/Black Sea flyway

Table 9-10 Terrestrial Ecology – Significance of Operational Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Direct mortality of avifauna due to electrocution	Minor Negative	Migratory Birds	Medium	**Minor**

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Direct mortality of avifauna due to collision	Minor Negative	Migratory Birds	Medium	**Minor**

9.7.2 Mitigation Measures

Table 1 Biodiversity – Mitigation Measures

Impact/Source	Mitigation Measures	Responsibility	Schedule
Direct mortality of avifauna due to electrocution	The EPC will prepare a technical assessment of the PL design, to show compliance with international good practice for bird mortality management in the design of the line, as specified in the EU "*Bern Convention Group of Experts on Conservation of Birds*" and Birdlife "*Birds and Power Lines within the Rift Valley/ Red Sea Flyway*". Aspects to be included in the assessment will include, but not be limited to: • The installation of bird rejecters above non-suspended insulators; • Strain poles with power lines below the crossarm to have insulating chains of more than 60cm length • Avoidance of strain poles with one conductor above the crossarm • Avoidance of power poles with upright insulators • Conductors of suspended insulators will be placed at least 140cm apart. • Bird landing deterrent design of poles (e.g. Canadian shaped poles); • For poles with the middle suspended insulator in a triangle- or vault-shaped frame, the distance between the perching site and middle suspended insulator to be at least 200cm in order to avoid electrocution during perching. • Terminal Poles and Tower stations: over voltage reactors to be attached below the crossarm and all down leading wires will be insulated with tubing. • Switch towers to be designed to have their switches below the cross arm. For each of these design recommendations, the EPC will clearly state which have been incorporated into the design, and when any has not been incorporated, the technical reason why it is not applicable will be outlined. • The report will be submitted to the Project Company and reviewed by a qualified independent expert to ensure that the proposed detailed design is aligned with good international practice to minimise bird mortality.	EPC	Design
Direct mortality of avifauna	In order to determine if collision rates justify the installation of bird markers, an intensive monitoring will be undertaken for the first two years after the construction of the Power Line. If	EPC	Design

Impact/Source	Mitigation Measures	Responsibility	Schedule
due to collision	identified mortality during a single migratory season exceeds 3 carcasses of threatened species (VU, CR or EN as per IUCN) or 10 carcasses in total, bird markers will be installed. If there is a clear geographical pattern of bird mortality, the markers could be installed only in the areas with a significantly higher mortality rates. Examples of flight diverters/markers are shown in Figure 5. Such provision can reduce collision accidents by 50 to 85%.		

9.7.3 Residual Impacts

Table 9-11 Terrestrial Ecology – Residual Impact Significance

Impact	Receptor	Impact Significance	Mitigation	Residual Impact Significance
Direct mortality of avifauna due to electrocution	Species of Conservation Concern	Minor	Yes	**Negligible**
Direct mortality of avifauna due to collision	Migratory Birds	Minor	Yes	**Negligible**

9.8 Decommissioning Assessment

The decommissioning impacts are likely to be similar to those of the construction phase but of a lower magnitude. A detailed Decommissioning E&S Management Plan will be prepared to ensure that all impacts are identified, assessed and mitigated. The DESMP will use the construction impacts of this SESIA as a basis to develop the MP. It is expected that the National and IFC standards will be updated at the time of decommissioning, and the DESMP will be compliant with the applicable requirements at the time of preparation. Given the time lapse between the preparation of this SESIA and associated ESMP, it is not consider sensible to outline mitigation and monitoring measures at this stage.

10 NON-HAZARDOUS SOLID WASTE MANAGEMENT

10.1 Introduction

This chapter provides an assessment of the environmental impacts that may occur as a result of inadequate handling of non-hazardous waste (waste) generated during the construction phase of the PL.

Following an assessment of the proposed design and required procedures for the operational phase, no solid non-hazardous impacts will be generated as a result of the operation of the PL. Therefore the Operation Assessment has been scoped out.

Non-hazardous solid waste has the potential to contribute to a number of environmental problems if not properly stored and/or managed. With proper management, a large amount of discarded materials can be reduced, reused, or recycled and can be adequately contained and managed reducing the risk of environmental and public health impacts.

The construction phase of the proposed project will necessitate the proper management of non-hazardous waste. Specific mitigation measures are recommended to address the identified potential impacts.

10.2 Methodology

The main objective of this chapter is to assess the impacts associated with the generation, handling, storage and transportation of waste during the construction phase of the project. This assessment has been informed through a desktop study, site visit, and an overall understanding of associated issues gained from assessing the environmental impacts of other PL facilities. The following specific information has been reviewed as part of the desk study:

- Assessment of applicable national and international standards and guidelines identified within the IFC Performance Standards;
- Assessment of available site specific information relating to waste generation;
- Assessment of the proposed design, construction procedures and project features that may impact on both the society and environment in terms of waste generation and hazardous materials, and
- Walkover survey; to identify sensitive receptors and determine the existing baseline conditions.

Based on the findings of the assessment, measures have been identified in order to mitigate any negative effects and promote positive effects associated with the construction activities. General waste management practices are evaluated with respect to legal requirements and where applicable, mitigation measures resulting in the improvement of waste management and minimisation, and storage, transport and handling of hazardous materials are recommended.

The main aims of the chapter are to identify the following:

- Waste generated onsite with the potential to pose substantial or potential threats to public health or the environment;
- Options for the reduction, re-use, recycling and recovery of all waste streams;
- Opportunities to minimise waste streams from project inception, thereby minimizing the amount of waste sent to landfill;
- Specify methods for the segregation of waste streams, and
- Detail methods for safe storage, transfer and disposal.

10.3 Baseline

Waste Characterisation

Waste can exhibit certain characteristics according to the process stream from which it is generated and any pre-treatment processes that are undertaken. Different types of waste require different management and disposal techniques according to the potential risk that the material poses to human health or the environment. In order to categorise the different risks to these receptors, it is often useful to demarcate the streams into 3 main categories that effectively equate to the level of the management and disposal which are required for each:

- Hazardous waste which pose a potential hazard to the environment or health of employees or the general public[3];
- Non-hazardous wastes - solid materials which are not hazardous and degrade, chemically or biologically in the environment; and
- Non-water soluble wastes - materials that do not breakdown in the environment, and are otherwise inert.

It is considered likely that the proposed project will potentially generate waste in all of the categories listed above.

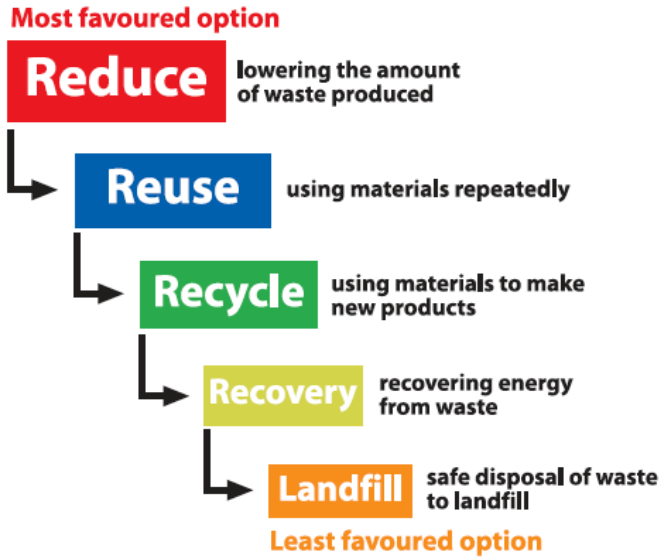
Waste Management Hierarchy

The waste management hierarchy is a key element of waste management. Minimising the amount of waste to be stored and disposed of not only protects the environment but also has the potential to reduce costs that may be incurred by the main contractor or the proponent for handling and disposing of the waste.

[3] Mitigation measures to ensure safe storage, handling and transfer of all hazardous materials and potential threats related to polluted runoff are also included in the Soil and Groundwater Section.

In general, waste generation is evaluated according to the waste minimisation approach. This approach is common to various national and internal guidelines and principles and involves the following steps in decreasing order of importance. The waste hierarchy is illustrated in the following figure.

Figure 10-1 Waste Management Hierarchy



Initially, options to prevent or reduce the amount of waste generated should be considered. Where waste generation cannot be avoided or further reduced at source, opportunities for reuse of materials should be explored, either for use for the same or a different purpose. Disposal to landfill is the least favoured option in the waste hierarchy and is the last resort after all other options have been considered.

In terms of a baseline,, non-hazardous waste was found at the Interconnection Point (outside the ONEE substation), as shown in the plates below.

Plate 10-1 Waste at the interconnection point (outside the existing ONEE substation)

10.4 Sensitive Receptors

The table below outlines the identified receptors in relation to waste management, as well as the sensitivity of those receptors.

Table 10-1 Non-hazardous Solid Waste - Receptors sensitivity

Receptor	Sensitivity	Justification
Surrounding Environment	Low	As the PL is located parallel to a road and infrastructures, there are no specific outstanding features inherent to the surrounding environment.
Local Waste Infrastructure	Medium	The construction and operation phases will result in an additional input of waste materials into the regional waste management service/infrastructures.

10.5 Construction Assessment

10.5.1 Potential Impacts

Waste will be generated as a result of construction activities. The main types of waste generated are outlined below. Given the size of the facility, the amount of waste generated will not be significant but if not properly managed, the area will look unsightly, and may lead to contamination of the soils and groundwater.

During the construction phase, a number of activities will result in the generation of non-hazardous waste. The types of waste generated by these activities include:

- Sand;
- Gravel;
- Scrap steel;
- Plastics;
- Packaging materials;
- Wood;
- Cables, and
- Domestic waste from construction workers.

Most construction waste is often bulky and heavy and mostly unsuitable for disposal by incineration or composting. The expected construction waste is inert and does not pose a threat to human health or the environment and, given the size of the power line, the amount of waste generated will be low. However, proper management is required in order to reduce associated secondary impacts such as resource use, dust emissions, landscape disturbance, habitat destruction or traffic accidents. Increased pressure may be placed upon local facilities/services and result in a reduced capacity for handling waste from municipal sources.

Domestic Solid Waste

Domestic solid waste will be generated, particularly during the operation of the canteen facilities at the shared PV Plant / PV site offices at the PV site. Domestic solid waste can be classified as both recyclable and non-recyclable. Recyclable waste includes paper, tin cans, plastics, cartons, rubber, and glass, while non-recyclables will consist mainly of organic and other putrescible waste.

In general, proper collection and management of non-hazardous solid waste is required to reduce associated secondary impacts such as resource use, landscape disturbance or habitat destruction. Increased pressure may be placed upon local facilities/services and result in a reduced capacity for handling waste from municipal sources.

Other environmental and social impacts that might arise from the generation of non-hazardous solid waste from construction activities are disposal to unlicensed landfills or increased pressure upon local licensed landfills that result in a reduced capacity for handling waste from municipal sources.

Table 10-2 Non-hazardous Solid Waste - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Construction waste	Minor	Given the size of the power line and that major earthworks are not required, no considerable amounts of construction waste is expected.
Domestic Solid Waste	Minor	Only small amounts of solid waste will be generated given the workforce required for the construction of the PL

Table 10-3 Non-hazardous Solid Waste - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Construction waste	Minor	Local Waste Infrastructure	Medium	Minor
		Surrounding Environment	Low	Negligible to Minor
Domestic Solid Waste	Minor	Local Waste Infrastructure	Medium	Minor
		Surrounding Environment	Low	Negligible to Minor

10.5.2 Mitigation Measures

Table 10-4 Non-hazardous Solid Waste –Mitigation Measures for Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Solid waste volumes/quantities	100% waste metal will be recycled	EPC Contractors	CESMP – Management
	Ordering materials that have reusable packaging and/or in bulk can significantly reduce waste generated	EPC Contractors	CESMP – Management
	Request suppliers to use minimal packaging.	EPC Contractors	CESMP – Management
	Chemicals should be ordered in returnable drums.	EPC Contractors	CESMP – Management
	"Buy-back" arrangements should be made with key suppliers so that any surplus chemicals or materials can be returned	EPC Contractors	CESMP – Management
	Refillable containers will be used, where possible, for collection of solid and liquid wastes	EPC Contractors	CESMP – Management
Housekeeping	Separate waste streams to facilitate recycling. All storage areas must be well organised and waste appropriately managed through segregation by type (paper, plastic, metal, masonry) and whether the material is reusable onsite, recyclable or non-recyclable.	EPC Contractors	CESMP – Management Monitoring
	A waste log will be kept onsite and will contain, at least, information about quantities, management solution (according to the waste management hierarchy described in the baseline section) types, operator, final disposal/destination, etc.)	EPC Contractors	CESMP – Management Monitoring
	Install adequate containers for non-hazardous waste in designated areas to prevent waste from dispersing throughout the PL alignment. All containers will be collected, segregated and emptied on a regular basis in the storage facilities located in the shared Laydown Area.	EPC Contractors	CESMP – Management
	Include in the employees' inception training sections to increase their awareness of waste management protocols including proper handling and storage of waste, and emergency response and contingency plans.	EPC Contractors	CESMP – Management
	Separate waste streams to facilitate recycling. All storage areas must be well organised and waste appropriately managed through segregation	EPC Contractors	CESMP –- Training

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	of hazardous and non-hazardous waste. Waste within each category will be further segregated by type (paper, plastic, metal, masonry) and whether the material is recyclable or non-recyclable.		
Waste Storage	Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent vermin/pests gaining access	EPC Contractors	CESMP – Management
	Lightweight waste e.g. paper, cardboard, plastics: Must be stored within a skip sealed with a secured tarpaulin/netting sufficient to prevent any material being dispersed.	EPC Contractors	CESMP – Management
	Heavy waste must be contained within an open skip, providing that segregation occurs effectively enough to remove all lightweight material that could be blown away.	EPC Contractors	CESMP – Management
	For litter (food waste, domestic waste), bins for separate categories will be placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the laydown area. Portable separate bins will also be placed at areas where works will be undertaken (interconnection point, power line, access road, etc.)	EPC Contractors	CESMP – Management
	No underground waste containers will be deployed and will be located in a fenced dedicated area in the shared Laydown Area. This waste storage area will be located considering potential risks (e.g. traffic accident).	EPC Contractors	Design and CESMP – Management
	Waste containers will be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, and securely attached. Wherever possible, chemicals will be kept in their original container	EPC Contractors	CESMP – Management
	Waste generated during construction and stored in the shared Laydown Area will only be transported off-site for disposal by an appropriately licensed vendor. This service provider will follow the proper protocols to ensure that all waste handling and disposal from the site is carried out according to accepted national/regional environmental regulations. A record for all streams of generated and collected waste will be kept	EPC Contractors	CESMP – Management - Monitoring

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	onsite.		
	Regular training of personnel in proper waste management and chemical handling procedures will be conducted at regular intervals.	EPC Contractors	CESMP – Training
	Incineration/burning of wastes will not be allowed	EPC Contractors	CESMP – Management
	Only qualified personnel are authorized to handle hazardous materials.	EPC Contractors	CESMP- Training
	Waste and hazardous materials must be placed in leakproof containers with sufficient containment to prevent spillage. These categories include hazardous materials contained in mobile refueling tanks.	EPC Contractors	CESMP – Management
Waste Facilities	Only Waste management facilities approved by national/regional authorities shall be used for the disposal of non-hazardous and hazardous wastes, respectively.	EPC Contractors	CESMP – Management

10.5.3 Residual Impacts

Following the implementation of the mitigation measures detailed above and through effective implementation of the measures and protocols set out within the Waste Management Plan, the potential residual impacts of waste generated during the construction phase are likely to be negligible to minor in significance.

Table 10-5 Non-hazardous Solid Waste – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impacts Significance
Construction waste	Local Waste Infrastructure	Minor	Yes	Negligible
	Surrounding Environment	Negligible to Minor	Yes	Negligible
Domestic Solid Waste	Local Waste Infrastructure	Minor	Yes	Negligible
	Surrounding Environment	Negligible to Minor	Yes	Negligible

10.6 Decommissioning Assessment

High amounts of waste as a result of panels/structures dismantling and PL corridor restoration activities is expected during the decommissioning phase of NOOR Boujdour. A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed.

It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

11 WASTEWATER MANAGEMENT

11.1 Introduction

This chapter identifies the main issues associated with wastewater production and management. Only domestic wastewater from sanitary facilities and canteens will be generated during the construction phase of the proposed PL.

No wastewater streams will be generated as a result of the operation of the PL. Therefore, the Operation Assessment has been scoped out.

Environmental or social impacts from poor domestic wastewater management can be significant and can impact various environmental components including the degradation or contamination of surface waters, soils and groundwater, with secondary impacts upon ecology, living natural resources and communities (in terms of health and economics).

Impacts associated will storm water runoff from areas containing hazardous materials have been addressed in the Soil and Groundwater section of this SESIA.

11.2 Methodology

The assessment has been conducted by identifying the relevant local and international standards and best practice relating to wastewater streams. Estimates and figures relating to wastewater volumes and proposed treatment processes have been based on data provided by the EPC.

11.3 Baseline

There is no connection to the public sewerage system available through the PL corridor or at the shared Laydown Area.

Chemical toilets will be installed in the along the PL alignment and septic tanks to store all domestic wastewater streams from canteens and lavatories on the shared Laydown Area during the construction of the PL. Septic tanks and chemical toilets will be collected by licensed operators on a regular basis.

Mitigation measures to avoid accidental discharges or leaks from septic tanks and chemical toilets are provided in this chapter.

11.4 Sensitive Receptors

The table below outlines the identified receptors in relation to domestic wastewater and their sensitivity.

Table 11-1 Sensitive Receptors

Receptor	Sensitivity	Justification
Surrounding Environment	Low	There are no specific outstanding features inherent to the surrounding environment present to make the character of this area unique.

11.5 Construction Assessment

11.5.1 Potential Impacts

The main wastewater contamination risks arising during construction relate to sanitary waste generated from sanitary facilities and canteens.

Impacts from poor wastewater storage, transfer, handling or management could lead to significant impacts to the surrounding environment (visual effect, soil and groundwater contamination, pest, insects, etc.). This could be particularly pertinent if the contaminants include high concentrations of bacteria.

The quantities of sanitary wastewater will be very limited during construction and commissioning as 10-15 workers are expected onsite.

Table 11-2 Wastewater Management – Magnitude of Construction Impacts

Impact	Magnitude	Justification
Domestic Wastewater	Minor	Daily volumes generated will be minor but will contain bacteria, parasite, and nutrients

Table 11-3 Wastewater Management – Impact Significance – Construction Phase

Impact	Magnitude	Receptor	Sensibility	Impact Significance
Domestic Wastewater	Minor	Surrounding Environment	Low	Negligible to Minor

11.5.2 Mitigation measures

The EPC Contractor will be responsible for the preparation and implementation of a detailed Construction Environmental and Social Management Plan (CESMP), in accordance with the requirements included within the Environmental and Social Management and Monitoring section of this SESIA.

Table 11-4 Wastewater Management – Mitigation Measures - Construction

Impact/Source	Mitigation Measures	Responsibility	Schedule
Domestic Wastewater	Chemical toilets/ septic tanks will be available at appropriate locations in the PL corridor and in the shared Laydown Area in sufficient number to attend the number of employees expected.	EPC	CESMP – Planning

Impact/Source	Mitigation Measures	Responsibility	Schedule
	No domestic wastewater will be discharged outside the chemical toilets / septic tanks	EPC	CESMP – Monitoring
	Wastewater from chemical toilets/ septic tanks will be collected by licensed operators. Each chemical toilets/ septic tank will generally be collected and emptied before its contents reaches 80% of its capacity.	EPC	CESMP – Management
	Septic tanks must be completely emptied before demobilisation to avoid contamination to the ground. The demobilisation procedure will ensure that tanks are not destroyed or damaged during the removal process.	EPC	CESMP – Management

11.5.3 Residual Impacts

Table 11-5 Wastewater – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impact
Domestic Wastewater	Surrounding Environment	Negligible to Minor	Yes	Negligible

11.6 Decommissioning Assessment

A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

12 TRAFFIC AND TRANSPORTATION

12.1 Introduction

This chapter of the SESIA focuses on the transportation related impacts associated with the construction of the PL. No impacts on traffic and transportation are expected during the operational phase of the PL, so this aspect has been scoped out.

The transportation infrastructure within the region and particularly within the immediate vicinity of the project is described below. The impacts from the increased traffic generated during the construction phase of the project have been considered. Where necessary and possible, opportunities to pursue measures to minimise and / or mitigate any impacts have been developed and put forward.

12.2 Methodology

The baseline analysis of this chapter is principally desk based, drawing from the technical proposal for the project, secondary sources (transportation and local authorities) and the site visit. Once the baseline conditions are established, the impact of the development on the surrounding transport infrastructure is evaluated.

12.3 Baseline

The PL corridor will be accessed by road for transport of materials, equipment and machinery and by workers. Ports will be used to bring equipment into the Kingdom of Morocco. Migrant workers may use the airport of Laayoune to access the region.

Main Port Facilities

The Casablanca (1,275 km to the site) and Agadir (828 km to the site) ports are the two options to be utilised to transfer cargo.

Road Network

The closest main road to the project is the National Route 1 (N1). The N1 is a national highway that connects the south (Dakhlan) with the northwest (Tanger) of the Kingdom along the Atlantic coast.

The PL will be located near the road that will be built for the PV plant and parallel to an existing line that runs along the N1. No new road infrastructure will be required to access the PL corridor.

12.4 Sensitive Receptors

Table 12-1 Traffic and Transport – Receptor Sensitivity

Receptor	Sensitivity	Justification
N1 (Casablanca - Agadir – Boujdour Route)	Very Low	The N1 is the only road connecting the various cities in south morocco. Currently, population density is low and congestion on the N1 road is low.
Residents	Medium	Residents are particularly vulnerable to increased traffic and number of heavy vehicles as these might lead to accidents, particularly those in areas with no bypass road.
Workers	High	Workers are particularly vulnerable to traffic and movements of heavy vehicles and machinery in the PL project.

12.5 Construction Assessment

12.5.1 Potential Impacts

Two aspects of transport during construction can potentially generate impacts: The transport of the workforce and the transport of equipment to the PL corridor.

The major components for the construction of the plant are equipment that will be assembled in-situ and no special platforms will be required.

The Casablanca (1,275 km to PL corridor) and Agadir (828 km to PL corridor) ports are the two options to be utilised to transfer cargo since they are well connected to the proposed PL corridor. The vast majority of the plant's equipment and supplies will go via the N1 route that connects the region north to south. Vehicles using the N1 road will need to go through several municipalities with no bypass road available.

Figure 12-1 Main Connection Route from Boujdour to Transfer Ports

Workers are likely to be accommodated in Boujdour. Transport services will therefore need to be included as part of the daily construction activities.

In summary, there will be a noticeable increase in Heavy Goods Vehicles (HGV) and vehicle movements for the transport of workers during construction activities. The severity of the impact will vary significantly depending on the stage of construction (frequency of deliveries and volumes of workers required).

Table 12-2 Traffic and Transport – Magnitude of Construction Impacts

Impact	Magnitude	Justification
Increased congestion on N1 road	Negligible	Temporary impact on local roads generating direct impacts (e.g. congestion). The magnitude is considered minor as the N1 road has the capacity to absorb the increased traffic expected for the construction of the PL.
Movement of vehicles on residential areas	Minor	Noticeable temporary impacts (e.g. noise, air quality, etc.) caused by the movement of vehicles in residential areas and other impacts.
Movement of vehicles on the PL corridor	Minor	Noticeable temporary impacts (e.g. noise, air quality, etc.) caused by the movement of vehicles and machinery along the PL corridor (or other areas where works will be done) and other impacts.

Table 12-3 Traffic and Transport – Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Increased congestion on N1 roads	Negligible	N1 (Casablanca -Agadir – Boujdour Route)	Very Low	Negligible
Movement of vehicles on residential areas	Minor	Residents	Medium	Minor
Movement of vehicles on the PL corridor	Minor	Workers	High	Minor to Moderate

12.5.2 Mitigation Measures

The mitigation measures provided refer to traffic and transportation. The EPC will be required to prepare a Traffic and Road Safety Management Plan in accordance with national and IFC requirements and aligned with GIIP.

These documents will incorporate, as a minimum, the mitigation measures included in the table below.

Table 12-4 Traffic and Transport – Mitigation Measures - Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Increased traffic load along National Highway and other on Residential Areas	Determine the designated access routes for delivery of equipment, road capacity, entrance/exit points, etc.	EPC	CESMP – Planning and Management
	Determine requirements for regular maintenance of vehicles (currently implemented) and use of manufacturer approved parts	EPC	CESMP – Planning and Management
	Identify areas/spots sensitive to road safety issues and implement the necessary road safety measures, including residential areas where construction-related vehicles will pass through and at the interconnection point of the access road with the N1 road. Sensitive area will be communicated in advance to all drivers who will be provided with maps to ensure awareness. Special measures will need to be implemented if deemed necessary and appropriately communicated to drivers (e.g. lowers speed at a specific vulnerable spot in the route).	EPC	CESMP – Planning and Management
	Manage delivery times of construction materials and equipment outside of peak hours.	EPC	CESMP – Planning and Management
	Stagger key deliveries or periods of high vehicle movements to the laydown area and reduce waiting times for drivers and over demand on receiving staff at the laydown area.	EPC	CESMP – Planning and Management
	Engines will be turned off while waiting in or outside the site.	EPC	CESMP – Planning and Management
	Staff will not be allowed to rest in vehicles to prevent excessive fuel wastage through the need to use air conditioning. Appropriate resting facilities will be provided at the landing for the drivers at the laydown area.	EPC	CESMP – Planning and Management
	Drivers should be fully competent and authorised to drive HGVs and should receive specific road safety training	EPC	CESMP – Planning and Management

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	All vehicles dedicated full time for the project and circulating on roads outside the site (owned or used by the Project Company, EPC or subcontractors) will have a clearly visible unique identification number and a sign with a telephone number for any road user that identifies reckless driving behaviour to be able to report it. Reports will be documented as grievances and investigated.	EPC	CESMP – Planning and Management
Movement of vehicles alongside the corridor	Temporary construction roads will be clearly signalled. Dust suppression measures will be conducted where and when required.	EPC	CESMP – Planning and Management
	Determine the designated access routes for delivery of equipment, corridor entrance points.	EPC	CESMP – Planning and Management
	A 30km/h speed limit will be imposed across the construction site in order to avoid direct mortality of fauna. Vehicle speeds will be restricted to 20Km/h on unpaved areas.	EPC	CESMP – Planning and Management
	Post designated routes and signs for directions and speed limits along the site.	EPC	CESMP – Planning and Management
	Specific waiting areas will be designated in suitable locations. No waiting areas will be designate in proximity to residential units or settlements.	EPC	CESMP – Planning and Management
General	Inspect daily N1 and remove building materials	EPC	CESMP – Planning and Management

12.5.3 Residual Impacts

Table 12-5 Traffic and Transport – Significance of Residual Impacts

Impact	Receptor	Impact Significance	Mitigation	Residual Impact
Increased congestion on N1 roads	N1 (Casablanca -Agadir – Boujdour Route)	Negligible	Yes	Negligible
Movement of vehicles on residential areas	Residents	Minor	Yes	Negligible
Movement of vehicles on the PL corridor	Workers	Minor to Moderate	Yes	Negligible

12.6 Decommissioning Phase

A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

13 ARCHAEOLOGY AND HERITAGE

13.1 Introduction

This chapter considers the potential cultural heritage and archaeology impacts which could potentially result during the construction phase of the proposed PL.

No potential risk of encountering or disturbing underground archaeological artefacts or remains of cultural conservation value is expected during the operation phase. Therefore, the Operation Assessment has been scoped out.

This cultural heritage and archaeological assessment takes into account that archaeological and cultural resources are finite and therefore consideration for their preservation has to be addressed.

For the purpose of this assessment, these resources may include, but not be limited to:

- Archaeological remains, buried and/or above ground;
- Historical structures and sites e.g. tombs or forts; and
- Any other structure of archaeological and/or cultural/historical significance.

Intangible cultural heritage has been considered in the socioeconomic section of this SESIA.

Where appropriate, mitigation measures to minimise or prevent potential risks to cultural heritage and archaeology have been provided.

This chapter provides an overview of existing information and guidelines for handling artefacts or sites of cultural and archaeological significance, which will be used in the event that such artefacts are discovered during the construction phase.

13.2 Methodology

The assessment in this chapter has been undertaken according to the relevant local and international law, regulations and standards as described earlier in this report. The assessment has included a desk-based study that included the review of the available information on the area and a site inspection.

Desk-Based Study

The purpose for conducting the desk-based assessment is to identify any relevant historic sites or the location of any artefacts on the PL corridor or the study area (including the presence or absence, character and extent, date, integrity, state of preservation and relative quality of the potential archaeological resource). The desk-based study consisted of the collation of existing written, graphic, photographic, electronic information and information from the FESIA in order to identify the likely character, extent, quality and worth of the known or

potential archaeological resource at the site in a local, regional, national and international context.

13.3 Baseline

The investigations from the FESIA concluded that sites of historical or cultural value where not found in close proximity to PL corridor and no artefacts or structures of cultural or archaeological significance were observed onsite. Equally, no archaeological sites within on nearby the project have been referenced in publicly held data.

However, the possibility of finding evidence of historical occupation, unknown belowground archaeological artefacts or remains of cultural conservation value (during site clearance and earthworks) cannot be ruled out.

13.4 Sensitive Receptors

The table below outlines the identified receptors in relation to cultural heritage and archaeology as well as the determined sensitivity of those receptors.

Table 13-1 Culture and Archaeology - Receptors sensitivity

Receptor	Sensitivity	Justification
Potentially unidentified archaeological artefacts	High	The sensitivity of tangible cultural artefacts is considered high as physical damaged could occur if archaeological discoveries are not handled properly.

13.5 Construction Assessment

13.5.1 Potential Impacts

For the reasons outlined in the baseline, it is considered unlikely that potential impacts of cultural or archaeological value will occur during the construction phase.

In the event that earthworks during the construction phase uncover unidentified sources of archaeological or cultural heritage, this will result in an impact of major negative significance prior to the implementation of mitigation measures.

Table 13-2 Cultural Heritage and Archaeology - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Destruction of unknown archaeological remains onsite	Negligible	Construction activities could cause the destruction of archaeological remains onnsite, resulting in permanent loses of the archaeological features. However the chance to find an artefact onsite is consider very low.

Table 13-3 Cultural Heritage and Archaeology - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Destruction of unknown archaeological remains onsite	Negligible	Potentially unidentified archaeological sites	High	Minor

13.5.2 Mitigation Measures

The EPC contractor will be required to prepare a CESMP before commencing construction works, which will consider the potential for unearthing historical sites or artefacts. The CESMP will include a Chance Find Procedure based on the Standards and Guidance for an Archaeological Watching Brief, Chattered Institute of Field Archaeologists, Version December 2014. The Archaeological Watching Brief is a formal programme of observations and investigations that are carried out for non-archaeological projects. It can be undertaken in any site where possibilities to find any archaeological deposits exist.

Training and awareness programmes will be provided to ensure that construction staff and labourers are aware of the procedures relating to the Archaeological Watching Brief will any artefacts or anthropogenic finds be uncovered. In the unlikely event of any artefacts being found/uncovered, the construction work would be ceased immediately and the Minister of Culture, via the "*Institut National des Sciences de L'Archéologie et du Patrimoine* (INSAP)" will be contacted by the EPC site Manager. The INSAP will take charge of any archaeological investigations.

13.5.3 Residual Impacts

Given that no evidence of sites of historical or archaeological value has been observed in the area, the risk of uncovering any archaeological resources is considered very low. Equally, the implementation of the above mitigation procedures will help minimise any impact that may occur to an acceptable level.

Table 13-4 Culture and Archaeology – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impact Significance
Destruction of unknown archaeological remains onsite	Potentially unidentified archaeological sites	Minor	Yes	Negligible

14 LANDSCAPE AND VISUAL IMPACT

14.1 Introduction

Landscape character could be defined as "*a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse*" (Natural England, 2014).

Impacts upon the landscape typically occur in situations where the visual horizon is disturbed by a development. Such impacts may include:

- The anthropogenic intrusion of the landscape by buildings or structures where no intrusion previously existed; or
- The change in the landscape character of an area, which could arise from new/out of place development or from changes in the land use.

Visual impacts may occur when the visual envelope or line of sight to and/or from a receptor (e.g. residential areas, area of natural beauty) is intersected or blocked by a development.

This chapter of the SESIA focuses upon the potential landscape and visual impacts, both direct and secondary, associated with the development of the PL.

14.2 Methodology

The assessment of the project upon the landscape and visual amenity of the surrounding area has been informed by the following:

- Desk-based assessment of existing information available, including maps, satellite images, area plans and viewpoint photographs taken at various locations, and
- Site visit undertaken to identify the existing landscape and visual character of the area

14.3 Baseline

The existing area reserved for the development of the power line is located in parallel to existing anthropogenic elements (e.g. ONEE substation, N1 road, existing power line, etc.). As such, the new power line will not change the landscape character of the area.

The N1 road is located ~370 m from the proposed PL and the existing power line ~230 m from the proposed PL through its alignment.

The plates below included below illustrates the exiting views of the corridor.

Plate 2 Existing Power Line – View from ONEE Substation (Interconnection Point)

Plate 3 Access Road/New Power Line Transect from the PV corridor

Note: The existing power line is noticeable from the proposed PV site, as illustrated in the picture above.

14.4 Sensitive Receptors

The table below outlines the identified receptors in relation to landscape and visual impacts as well as the determined sensitivity of those receptors.

Table 14-1 Landscape and Visual – Receptor Sensitivity

Receptor	Sensitivity	Justification
Landscape Character	Low	There are no specific landscape designations or other outstanding features present to make the landscape character of this area unique. The power line is located in an area with several anthropogenic infrastructures.
Visual Receptor – Boujdour residents	Low	The closest residents in Boujdour town are considered a group relatively vulnerable to the visual impact resulting from the development of an additional anthropogenic element. The area is already altered and therefore the sensitivity is considered low.

Visual Receptor – N1 road users	Low	The road users are considered a group relatively vulnerable to the visual impact resulting from the construction of the power line. The area is already altered and therefore the sensitivity is considered low.

14.5 Construction Assessment

14.5.1 Potential Impacts

During the construction of the PL a variety of construction vehicles will be travelling to and from the site, these will include trailers, trucks, and other heavy and light vehicles.

No Night-time works will take place and the corridor might require floodlighting for security.

Currently the topography of the PL corridor is very flat and the PL will not require any topographical changes.

Table 14-2 Landscape and Visual – Magnitude of Construction Impacts

Impact	Magnitude	Justification
Topographical impacts to landscape	No Change	Currently the topography of the site is very flat and the PL will not require any changes on the topography of the existing area
New features impacting views	Minor	New features will partially impact views from receptors, however they will not result in total losses of key views from receptors and the construction will be a temporary phase. All the temporary facilities will be removed once the construction phase is completed.
Light Pollution	Moderate	Flood lights will increase glare effect in the N1 road

Table 14-3 Landscape and Visual - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Topographical impacts to landscape	No Change	Visual Receptor – Boujdour residents	Low	Neutral
		Visual Receptor – N1 road users		
New features in the landscape Impacting views	Minor	Visual Receptor – Boujdour residents	Low	Negligible to Minor
		Visual Receptor – N1 road users		
Light Pollution	Moderate	Visual Receptor – N1 road users	Low	Minor

14.5.2 Mitigation Measures

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Light Pollution	Any flood lights required during night time construction activities will be directed onto the PL corridor, with a maximum position angle of 30° from vertical, therefore minimising any potential light leakage and impacts at night.	EPC	CESMP – Planning and Management

Table 4 Residual Impacts

Impact	Receptor	Impact Significance	Mitigation	Residual Impact Significance
Topographical impacts to landscape	Visual Receptor – Boujdour residents	Neutral	No	Neutral
	Visual Receptor – N1 road users		No	Neutral
New features in the landscape Impacting views	Visual Receptor – Boujdour residents	Negligible to Minor	No	Negligible to Minor
	Visual Receptor – N1 road users		No	Negligible to Minor
Light Pollution	Visual Receptor – N1 road users	Minor	Yes	Negligible to Minor

14.6 Operation Assessment

14.6.1 Potential Impacts

The power line will be located parallel to the N1 road, the access road and an existing power line to avoid disturbance to view sheds resources in pristine spaces in the project area. Therefore, the new power line will not change the landscape character of the area. Floodlighting is will not be required.

Table 14-5 Landscape and Visual – Magnitude of Operation Impacts

Impact	Magnitude	Justification
New features impacting views	Minor	The new PL will not contribute to changes in the landscape character as there are other anthropogenic elements (N1 road, access road, existing PL, etc.) through the corridor of the PL. The PL will only disturb view sheds resources in the corridor adjacent to the access road.

Table 14-6 Landscape and Visual - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
New features impacting views	Minor	Visual Receptors	Low	Negligible to Minor

No mitigation measures are deemed significant for the operation of the PL.

14.6.2 Residual Impacts

Table 14-7 Landscape) – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation Measures	Residual Impact
New features impacting views	Visual Receptors	Negligible to Minor	No	Negligible to Minor

14.7 Decommissioning Assessment

A detailed DESMP will be prepared to ensure that all impacts are identified, assessed and addressed. It is expected that Moroccan and IFC standards will be updated in the future, and the DESMP will be compliant with the applicable requirements at the time of preparation.

Given the time lapse between the preparation of this SESIA and associated ESMP, it is not considered realistic to outline mitigation measures for the decommissioning phase at this stage. However, the DESMP will consider the applicable mitigation measures included in the SESIA, CESMP and OESMP.

15 ELECTRIC AND MAGNETIC FIELDS

15.1 Introduction

Power lines generate electric and magnetic fields when electricity is being transmitted. The strength of the electromagnetic field (EMF) at ground level will vary in accordance with the capacity (voltage), configuration of the conductors, the terrain, shielding structures in the terrain (buildings and trees), and the distance of the transmission lines from the ground.

This chapter discusses the potential impacts from EMF on sensitive receptors at the operational phase of the project only, since EMF is not produced during the construction or decommissioning phases of the proposed PL.

The evaluation of the potential environmental and health impacts resulting from exposure to EMF is based on the guidelines and recommendations developed by the International Commission on Non- Ionization Radiation Protection (ICNIRP) Guidelines (in cooperation with the Environmental Health Division of the World Health Organization (WHO)) on the limitation of the exposure to electromagnetic field (0Hz to 300GHz) which applies to occupational and general public exposure.

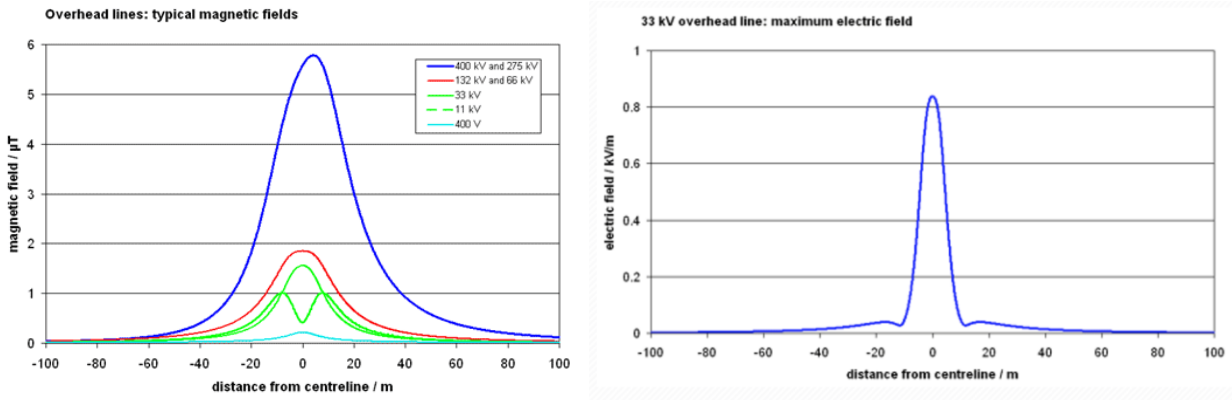
15.1.1 EMF Guidelines

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) issued guidelines on exposure to EMFs in 1998, which have since been reviewed in 2009 for different types of radiation. The Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (2010) states that even though epidemiological studies have shown that chronic low intensity power frequency magnetic field exposure is associated with an increased risk of child leukaemia, no casual relationship has been established, nor have any other long term effects been established.

Although there is public and scientific concern over the potential health effects associated with exposure to EMF, according to the IFC Environmental, Health, and Safety Guidelines on Electric Power Transmission and Distribution, there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines. However, while the evidence of adverse health risks is limited, it is still sufficient to license limited concern.

Electric fields are shielded by materials, such as trees and buildings, while magnetic fields pass through most materials and are difficult to shield. Power frequency EMF typically has a frequency in the range of 50 – 60 Hertz (Hz), and is considered Extremely Low Frequency (ELF). In addition to the fact that the strength of both electric and magnetic fields is a function of the capacity, distance from the wire conductors to the ground and the distance from the power line to the receptor; studies have also shown that radiation reduces with distance by a factor of $1/r^2$ to the source, as shown in the figure below.

Figure 15-1 Typical Magnetic (L – green line) Electric (R) Fields Dissipation for a 33 kV line (source: EMFs.info)



The following table includes the reference levels for exposure to the public against the developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Table 8 ICNIRP exposure limits for general public to electric and magnetic

Frequency	Magnetic Field (µT)	Electric Field (KV/m)
50 Hz	100	5
60 Hz	83	4

Table 9 ICNIRP occupational exposure limits to electric and magnetic

Frequency	Magnetic Field (µT)	Electric Field (KV/m)
50 Hz	10,000	0.50
60 Hz	8300	0.41
Minimum Working and Clear Hot Stick Distance ~ 0.51m for a voltage range of 15.1 to 35 kV		

15.2 Baseline

The proposed new 22 kV power line will be developed within an existing corridor parallel to an existing power line. The new power line and the existing power line are located 230 m away from each other.

The closest settlement is a residential area located 500 m from the ONEE substation (Interconnection Point), no residential communities, single dwellings or other rest areas are present adjacent to the PL corridor. As such, there are no permanent sensitive receptors identified in the impact corridor of the proposed power line as the road users of the N1 are considered a temporary and transient receptor.

15.3 Operation Assessment

15.3.1 Potential Impacts

Taking into consideration the low voltage transmitted by the 22kV PL, the low EMF field levels emitted by the 22kV power line, the dissipation of EMF over distance, and the absence of

any sensitive receptors within the potential impact corridor of EMF, the significance of negative impacts on roads users (a temporary and transient sensitive receptor) is considered negligible.

Table 15-10 EMF - Magnitude of Occupation Impacts

Impact	Magnitude	Justification
Exposure to EMF	Negligible	The risk of exposure decreases with distance and distance of the road from the edge of the corridor is outside the impact buffer zone.

15.3.2 Mitigation Measures

In order to help minimise the risks of exposure, the following measures are recommended:

- Ensure that the design height of the poles and cables maximizes the distance of the lines from the ground,
- Ensure that the configuring of the conductors minimises the EMF's strength,
- Prevent planting or establishment of any tall vegetation within the corridor, as these could damage the lines or cause a short circuit.
- Prevent any land use (residential, commercial, agriculture) within the PL corridor.

16 SOCIOECONOMIC

1.5 Introduction

This chapter of the SESIA Report focuses on the social and economic issues, both direct and indirect, associated with the construction of the power line. No impacts are anticipated during the operational phase of the power line.

Initially this chapter considers the existing socio-economic conditions within which the development will proceed, before examining the potential impacts of the development during the construction phase. Where necessary and possible, opportunities to pursue measures to avoid, minimise or mitigate any impacts have been developed and put forward.

1.6 Methodology

This chapter looks at key indicators relating to factors such as population, the economy, the labour market and social development at a regional and local level. Where relevant, professional judgement was drawn upon, including knowledge from site visits and information collected during consultation with interested parties to gather additional the secondary baseline data.

Once this baseline was established the report considered a more detailed assessment of the impacts of the development during construction.

In reflection to the requirements of the IFC Performance Standards, core components of this analysis include:

- A review of any local communities within the proposed development corridor and its immediate environs;
- An assessment of local labour market impacts;
- An outline assessment of any community health, safety and security implications of the facility;
- An assessment of impact upon local services; and
- The suitability of the proposed alignment in light of the social / development profile of the area.

1.7 Baseline

The power line will connect a 20 MW PV plant that will be located in the rural community of Lamsid with an existing ONNE-owned substation located in the municipality of Boujdour, both in the province of Boujdour.

The rural community of Lamsid is sparsely populated (0.0004 inhabitants per hectare). In 2014 the population was 572 inhabitants and over 240 households. The commune has shown a

population decrease of 52% between 2004 and 2014 due to migration to Boujdour, Laayoune, or other national or international cities.

In 2014 the municipality of Boujdour had a population of 42,651 and 9,511 households with 1.42 inhabitants per hectare. The population has increased 16% from 2004 to 2014.

The following tables include basic demographic and socioeconomic information on the village of Lamsid and the municipality of Boujdour:

Table 11 Demographic Data and Socioeconomic Information (Village of Lamsid)

Population			Male	Female	Total
			449	123	572
Age Distribution (%)					
<6 years			3.6	5.7	4.0
6 to 14 years			2.0	7.3	3.1
15 to 59 years			87.3	62.6	82.0
>60 years			7.1	24.4	10.8
Other Socioeconomic Data / Living Conditions					
Disability (rate)			1.3%	4.1%	1.9% (national 5.1%)
Illiteracy (rate)			33.3	54.9	37.8
Language (-read & written (% population)	Arab		49.7	63.8	51.7
	Arab and French		41.3	27.7	39.3
	Arab, French and English		7.0	8.5	7.2
	Local	Darija	66.7	5.7	53.6
		Tachelhit	30.4	2.5	24.4
		Tamazight	2.5	0.0	1.9
		Tarifit	0.4	0.0	0.4
		Hassania	30.6	94.3	44.3
School (enrolling rate from 7 to 12 years)			66.7	66.7	66.7
Employment	Active		415	62.0	477
	Inactive		34.0	61.0	95.0
	Unemployment rate		5.8	69.4	14.1
Infrastructure / Services	Public Health		2 pharmacies, no medical care facilities available		
	Education		2 Primary Schools		
	Electricity		20 % of the households have access to electricity		
	Drinking Water		Groundwater and water supply via tanker trucks to meet the needs of the population. Only 16.9% of the dwellings in the municipality have access to drinking water.		
	Wastewater		17% of dwellings connected to the sewerage system		
	Solid Waste		No collected		

Source: HCP, RGPH 2014

Table 12 Demographic Data and Socioeconomic Information (Municipality of Boujdour)

Population			Male	Female	Total
			449	123	572
Age Distribution (%)					
<6 years			12.9	13.4	13.1
6 to 14 years			18.2	19.3	18.7
15 to 59 years			64.2	63.5	63.8
>60 years			4.7	3.9	4.3
Other Socioeconomic Data / Living Conditions					
Disability (rate)			2.9	2.6	2.8 (national 5.1)
Illiteracy (rate)			21.5	35.5	28.2
Language (-read & written (% population)	Arab		37.0	33.4	35.5
	Arab and French		43.5	46.0	44.6
	Arab, French and English		16.8	19.2	17.8
	Local	Darija	87.7	85.9	86.9
		Tachelhit	15.4	12.9	14.2
		Tamazight	1.7	1.4	1.6
		Tarifit	0.2	0.2	0.2
		Hassania	24.7	27.5	26.0
School (enrolling rate 7 to 12 years)			98.2	98.6	98.4
Employment	Active		11 895	2 464	14 359
	Inactive		10 389	17 756	28 145
	Unemployment		12.6	50.8	19.1
Infrastructure / Services	Public Health		1 Hospital		
	Education		13 Primary schools, 5 secondary schools		
	Electricity		Data not available		
	Drinking Water		Supplied from desalination plant (flow of 45 l/s). New plant planned (additional 80 l/s)		
	Sewage		Municipal treatment plant (6,500 m3 /d capacity)		
	Solid Waste		Collection system available		

Source: HCP, RGPH 2014

The population in the region is structured in sedentary population (mostly in the municipality of Boujdour) and patoralistic (unevenly distributed in the rural commune). The number of pastoralists has decreased over the years (no official census available).

Figure 16-1 Example of Typical Shelter in the Area

The most relevant economic activity in the region is fishing activities. The fishing industry extracted 35,126 tonnes in 2014 and generated 323 million dirhams. The main capture is pelagic fish species (77% of the weight), cephalopods (45%) and white fish (29.8%). Associated industries (e.g. fish packing, drying or shipment, ice production, etc.) are also important in the area.

Livestock is also an important sector in the region, mostly goats and camels herded by pastoralist. The size of this sector in the areas has decreased in the last years due to acute droughts. The agricultural sector is small given the arid conditions of the area.

1.8 Construction Assessment

1.8.1 Potential Impacts

Typical positive social impacts resulting from the construction activities include local employment creation and a direct and secondary impacts on the local economy.

Conflicts could potentially arise between communities and the project workforce and the interaction between the workforce and the local population can result in the proliferation of diseases, with Sexually Transmitted Diseases (STDs).

The positive and negative impacts that typically result from the construction of small infrastructures that require a small workforce (25 to 30 workers) are considered negligible.

However, in order to help minimise the negative social risks and maximise opportunities to the local population when possible, the following section includes a number of measures which implementation is recommended.

1.8.2 Mitigation Measures

Table 16-13 Socioeconomic – Mitigation Measures - Construction Phase

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Employment and Accommodation	The project will seek to employ local workers where they are willing and available and have the skills required for the task. Non-specialist job opportunities will be offered to the local residents prior to hiring of employees from other areas when possible. The employment of women and vulnerable groups will be specifically targeted when possible.	EPC	CESMP – Planning
	Establish and implement a recruiting policy and ensure that the necessary measures to mitigate negative impacts associated with labour and working conditions are implemented (e.g. child and forced labour, exploitation, excessive overtime, insufficient wages, harassment, unsafe/unhygienic living and working conditions, etc.). Labour and working conditions will be aligned with IFC standards.	EPC	CESMP – Planning, Management
	Workers' accommodation (if required, as it is not envisaged at this stage) will comply with IFC standards.	EPC	CESMP – Planning
	Strict controls over the provision of housing shall prevent any unplanned settlements from developing.	EPC	CESMP – Monitoring
	A Retrenchment Plan will be prepared for moving from construction to operation.	EPC & Project Company	CESMP– Planning
Purchases	The EPC will only engage with reputable suppliers that do not use force or child labour and are capable to comply with the environmental and social standards established by the IFC for suppliers.	EPC	CESMP – Planning, Management
	Purchase of goods and services within the local/regional area will be prioritized.	EPC	CESMP – Planning, Management
E&S and Health and Safety Risks	If any activities that have not been assessed on the SESIA are proposed, potential E&S and HS risks to the communities will be assessed prior to their implementation or development.	EPC	CESMP – Planning, Management

Dissemination of Skills	Local employees will receive E&S and OHS training to enhance the development of skills. A certificate outlining the contents of the training and signed by the management of the project will be provided to employees upon finalisation of the employment contract.	EPC	CESMP – Planning, Training
Conflict – workforce	Training for foreign employees will include information on the cultural background of the local population.	EPC	CESMP – Training
Security Provisions	Develop and implement a Policy on Security and a Code of Conduct for Security Personnel.	EPC	CESMP – Planning, Management
	The security provider and personnel will adhere to international human right code of conduct. Only security personnel and companies with no human right violations will be employed.	EPC	CESMP – Planning, Management
	Security personnel will undergo a dedicated training program which will include, as a minimum, information on how to exercise practices following GIIP (UN Voluntary Principles on Security and Human Rights), cultural background of the area and the workforce (main groups), and the way they should interact with local communities and workers.	EPC	Construction
Spread of Diseases	Prevention of diseases (including STDs) will be included in the training programme through toolbox talks or separate training sessions.	EPC	CESMP – Training
Informal Settlements / Encroachment	Unplanned settlements will be monitored by Onsite security personnel and reported to the authorities.	EPC	CESMP – Planning, Management
	The local public security forces will be required to deal with encroachers as per national requirements.	EPC	CESMP – Planning, Management

1.8.3 Residual Impacts

Following the implementation of mitigation measure and promoting socio-economic activities, the positive significance of effects is expected to increase.

Table 16-14 Socio-economic – Residual Impacts – Construction Phase

Impact	Receptor	Impact Significance	Mitigation	Residual Impact
Local employment creation	Local Employment	Minor Positive	Yes	Moderate Positive
Dissemination of skills	Local Workforce	Minor Positive	Yes	Minor Positive
Purchase goods and materials from the local / regional economy	Local / Regional Economy	Minor Positive	Yes	Minor Positive
Conflict with security staff	Pastoralists	Minor Negative	Yes	Minor Negative
Conflict workforce – local population	Residents (Municipality of Boujdour)	Negligible to Minor Negative	Yes	Negligible to Minor Negative
Spread of STDs	Residents (Municipality of Boujdour)	Negligible to minor Negative	Yes	Negligible to minor Negative

17 FRAMEWORK MONITORING PLAN

The following table outlines the parameters that, as a minimum, need to be monitored for the project. It includes monitoring that is considered necessary as a result of the findings of this SESIA for the construction and operational phases of the project.

Additional frequency, parameters or locations might be monitored if new activities that were not covered in this SESIA are implemented onsite, or following emergency situations, incidents (e.g. spills) or requests from stakeholders.

Table 17-1 Framework Monitoring Plan

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Construction						
Air quality - Dust	Site boundary and at Sensitive Receptors	Visual Inspection of dust particles	Weekly during site preparation activities	Dust from vehicles and earthworks	To be determined by the EPC	EPC
Noise	Inside the Project Site and at Sensitive Receptors	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly during site preparation and construction of pylons. Monthly during the rest of construction.	Construction activities increase noise levels (nuisance, disturb fauna, work hazard)	To be covered by the EPC (indicative cost noise meter 2000-5000 MD)	EPC
Waste management -	Not applicable	Waste-log quantities and types of solid waste reuse, recycling and disposal. Include an indication if solid waste disposal has met intended construction phase recycling, recovery or reuse targets	Bi-weekly	Monitor compliance with waste management targets	Not applicable	EPC / subcontractors
Waste	Not applicable	Waste log- quantities and	Every time waste is	Monitor	Not applicable	EPC /

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
management		types of solid waste taken off site, the approved handler, and where the waste was disposed. Special attention will be given to hazardous waste.	taken offsite. Statistics compiled monthly.	compliance with off-site disposal by approved subcontractors		subcontractors
Wastewater management -	Not applicable	Waste log quantities and types septic tanks taken off site, the approved handler, and where the waste was disposed;	Every time sewage is taken offsite. Statistics compiled monthly.	Monitor compliance with off-site disposal by approved subcontractors	Not applicable	EPC / subcontractors
Waste Management -	Solid Waste Storage Areas	Visual inspection non-hazardous solid waste storage collection, storage and transfer areas or evidence of accidental releases and to verify that wastes are properly labelled and stored	Daily	Monitor compliance with waste storage targets	Not applicable	EPC
Hazardous Materials -	Hazardous Materials storage	Visual inspection	Daily	Monitor compliance with hazardous	Not applicable	EPC

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
	collection, storage and transfer areas			materials storage targets		
Soil Quality	Hazardous materials and liquid and solid waste storage areas as a minimum	Sampling methodology as described in SESIA – Soil Quality section	Soil samples will be analysed following the release of hazardous substances onto the soil and the required restoration	Monitor compliance with ground pollution targets	Quotations to be obtained by the EPC.	EPC
Ecological status – presence of fauna and bird nesting.	PL alignment and poles	Visual inspection of habitat around the boundary of the site and photograph of any changes. Document and monitor bird nests.	Monthly	To ensure that there is no loss of habitat or fauna outside of the plant boundary fence. Monitor any impacts on nests.	Not applicable	EPC
Traffic and Transportation	Within the site and in the access road	Speed meter device	Weekly	Monitor compliance with speed limits	Cost of speed meter	EPC
Housekeeping	Site and access roads	Visual Inspection and collection	Onsite: Daily Access roads: Weekly	Monitor good construction housekeeping	Not applicable	EPC

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
				practices onsite and at access roads		
Lighting	Boundaries of the site	Visual assessment of directional lighting	Quarterly	Minimise light spill glare and sky-glow.	Not applicable.	EPC
Recruitment policy	Not applicable	Ratio local, regional, national and international employees. Rations of women employees.	Monthly	Provide employment for local population, minimize impact immigrant labour	Not applicable	EPC
Complaints register	Point of contact to be posted at the site entrance	Register complaints and how they are addressed	Every time there is a complaint	Record, address and follow up complaints	Not applicable	EPC
Emergency monitoring	Not applicable	Register emergencies and follow-up-remediation	Every time there is an emergency	Register emergencies and follow-up-remediation	To be covered by the EPC.	EPC
Operation						
Ecological status –	PL alignment	Count of fauna species	Monthly	Monitor ecology	Not Applicable	O&M

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Presence of fauna. Specialist is not required.	and poles	and nests.		around the site		
Supervision (during the construction and operation phases)						
Independent Environmental Audits – Documentation	Not applicable	The auditors will review the environmental and social documentation kept at the facility, check the adequate implementation of the environmental procedures established in the ESMP (CESMP/OESMP) and documentary evidence of the application of the mitigation and monitoring measures stated in the SESIA, including the monitoring results	Quarterly (construction) Quarterly (operation – first two years) Yearly (remaining operational phase)	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP.	Project Company to hire independent external auditors.	Project Company The auditors will be required to have previous auditing experience in Morocco and in projects aligned with IFC requirements.

MONITORING PLAN						
What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)
Independent Environmental Audits — Site inspection	Not applicable	The auditors will visit the plant, to ensure that the environmental and social procedures are being adequately applied onsite.	Quarterly (construction) Every six months (operation –first two years) Yearly (remaining operational phase)	Independent environmental audits provide assurance of compliance with the measures included in the SESIA and the ESMP.	Project Company to hire independent external auditors.	Project Company The auditors will be required to have previous auditing experience in Morocco and in projects aligned with IFC requirements.

17.1 Bird Mortality Monitoring - Operation

A bird-monitoring program will be implemented to assess the effectiveness of the mitigation measures.

Bird-mortality monitoring for the Power Line will take place monthly during bird migration periods (end of August to November and March to mid May) for the first two years of operation of the power line. The recommendations of Birdlife International for bird mortality monitoring from Power Lines will be taken into consideration for the preparation of the bird-monitoring programme. Once a year during the first two years, carcass removal trials will be undertaken to monitor carcasses removed by scavengers and estimate the length of time that carcasses remain in the field for possible detection.

After each migratory season, the need to deploy measures to further reduce bird mortality will be assessed, as per the monitoring measures for biodiversity.

If less than four carcasses are identified per year, no further bird mortality monitoring will be undertaken after the 2nd year of operation of the Power Line.

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APPENDIX A – FLORA & FAUNA SPECIES LIST

Flora

Endemic species, rarity:

- Maroc endemic species in Morocco
- Maur, endemic species in Morocco and Mauritania
- Canary: endemic species in Morocco and the Canary Islands.
- Rare : rare species
- Rare ?: species likely to be rare onsite
- VU: Vulnerable species in Morocco.

Table 0-1 Flora species List

Scientific Name	Endemic Species	Rocky Plateau	Depressions	Graras	Pre-litoral Reg
	Coverage	10-25%	20-40%	25-40%	2-10%
Shrub 1-3m					
Euphorbia balsamifera	VU			x	
Shrub 0.5-1m					
Asparagus altissimus				x	
Antirrhinum ramosissimum				x	
Atriplex halimus				x	
Euphorbia officinarumsubspechinus				x	x
Launaea arborescens			x	x	
Lyciumin tricatum		x	x	x	x
Ononis hesperia	Maroc	x	x	x	
Rhus albida			x		

Scientific Name	Endemic Species	Rocky Plateau	Depressions	Graras	Pre-litoral Reg
	Coverage	10-25%	20-40%	25-40%	2-10%
Salsola gymnomaschala		x	x		x
Teucrium chardonianum	Maroc, Rare	x	x		
Zilla spinosa subs. pcotata	Rare			x	
Shrub <0.5m					
Asteriscus graveolens			x	x	
Deverra denudata		x	x	x	
Frankenia corymbosa		x	x	x	x
Gymnocar posdecander			x		
Helianthemum canariense	Canaries, VU	x	x	x	
Pentzia hesperdium	Maroc, Rare	x	x		
Salsola tetragona		x			x
Salsola tetrandra					x
Suaeda ifniensis	Maroc, Rare?				
Suaeda ifniensis				x	x
Suaeda monodiana	Maur, Rare?				x
Suaeda ifniensis	Maroc, Rare?				
Zygophyllum waterlottii	Maroc, Rare?	x	x		x
Grass species					
Heliotropium erosum		x	x		
Lotus sp			x		
Opophytum theurkauffii					x
Polycarpea nivea			x	x	
Total Number		**11**	**16**	**15**	**10**
Endemic species		**5**	**5**	**5**	**3**

The Following plates present each of the **Moroccan endemic, rare and threatened species** identified within the study area.

Plate 0-1 ***Euphorbia balsamifera*** ***Ononis hesperia***

Plate 0-2 ***Teucrium chardonianum*** ***Zilla spinosa subs. Pcotata***

Plate 0-3 ***Helianthemum canariense*** ***Pentzia hesperdium***

Plate 0-4

Suaeda ifniensis

Suaeda monodiana

Plate 0-5 *Zygophyllum waterlottii*

Fauna

Presence of species:

- FESIA: potentially present species according to the FESIA
- O: species observed or detected
- P: potentially present species
- E: extinct species in the region
- En: Endemic
- MAR: Morocco
- MAG: Maghreb
- AFN: North Africa (including the Sahara)
- SAH: Sahara (W Western part of the Sahara)

IUCN Status, 2016:

- CE Critically Endangered
- EN Endangered
- VU: Vulnerable
- NT Near Threatened
- LR Lower Risk / Minor Concern
- DD Data deficient / Insufficient data

IUCN status is assessed at the following levels: International (according to IUCN 2014): Globally, Mediterranean and National level.

The following legal information is provided:

- Protected species by the Hunting Act in Morocco.
- Species listed by Annexes I, II and III of CITES Convention (on trade of wildlife species) and CITES law in Morocco.
- Birds and mammals species listed on Annex I, II of CMS Convention (on migratory species).
- Species listed on Berne Convention (on European protected species)
- Bat species listed on EUROBAT Convention (on bat protection).

Table 0-2 Reptiles

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	UICN Morocco	Loi chasse	CITES Maroc AppIV
P	AGAMIDES	*Trapelus boehmei*	Agame de Boehm	SAH W	LC	LC	LC	x	
P		*Agama impalearis*	Agame de Bibron		LC	LC	LC	x	
P	GECKKONIDES	*Tropiocolotes algericus*	Tropiocolotès d'Algérie	MAG	LC	LC	LC	x	
P		*Saurodactylus brosseti*	Saurodactyle de Brosset	MAR	LC	LC	LC	x	
P		*Tarentola chazaliae*	Gécko casqué	MAR	VU	LC	LC	x	
O	LACERTIDES	*Acanthodactylus aureus*	Acanthodactyle doré	SAH W	LC	LC	LC	x	
P		*Acanthodactylus boskianus*	Acanthodactyle de Bosk		LC	LC	LC	x	
O	SCINCIDES	*Chalcides sphenopsiformis*	Seps occidental	SAH W	LC	LC	LC	x	x

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	UICN Morocco	Loi chasse	CITES Maroc AppIV
P/FESIA	COLUBRIDES	*Psammophis schokari*	Couleuvre de Schokar		LC	LC	LC	x	x
P		*Rhagerhis moilensis*	Couleuvre de Moïla		LC	LC	LC	x	x
P		*Malpolon monspessulanus*	Couleuvre de Montpellier occidentale		LC	LC	LC	x	x
P		*Lytorhynchus diadema*	Lytorhynque diadème		LC	LC	LC	x	x
P		*Hemorrhois algirus*	Couleuvre algire	AFN	LC	LC	LC	x	x
P	Viperidae	*Cerastes cerastes*	Vipère à cornes		LC		LC	x	x
FESIA		*Daboia mauritanica*	Moorish Viper		NT				

Table 0-3 Birds

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	Hunting Act	CITES Maroc AppIV	CITES App I	CMS App II	Berne App II
P	BURHINIDÉS	*Burhinus oedicnemus*	Oedicnème criard		LC					x	x
O/FESIA	GLAREOLIDÉS	*Cursorius cursor*	Courvite isabelle		LC		x	x			x
E	OTIDIDÉS	*Chlamydotis undulata*	Outarde houbara		VU	VU	x		x		x
P	ALAUDIDÉS	*Eremophila bilopha*	Alouette bilophe		LC						

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	Hunting Act	CITES Maroc AppIV	CITES App I	CMS App II	Berne App II
O		*Galerida cristata*	Cochevis huppé		LC						
P/FESIA		*Rhamphocoris clotbey*	Alouette de Clot-bey		LC						
O		*Alaemon alaudipes*	Sirli du désert		LC						
O	LANIIDÉS	*Lanius excubitor*	Pie-grièche grise		LC						x
O	SYLVIIDÉS	*Sylvia melanocephala*	Fauvette mélanocéphale		LC					x	x
FESIA		*Sylvia deserti*			NE						
O		*Sylvia conspicillata*	Fauvette à lunettes		LC					x	x
O/FESIA		*Scotocerca inquieta*	Dromoïque du désert		LC					x	
P/FESIA	TIMALIDÉS	*Turdoides fulva*	Cratérope fauve		LC						
FESIA	TURDIDÉS	*White-tailed Wheatear*	White-tailed Wheatear		LC						
O/FESIA		*Oenanthe moesta*	Traquet à tête grise		LC						
O/FESIA		*Oenanthe deserti*	Traquet du désert		LC						
P	FRINGILLIDÉS	*Rhodopechys githaginea*	Roselin githagine		LC			x			x

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	Hunting Act	CITES Maroc AppIV	CITES App I	CMS App II	Berne App II
FESIA	Passeriformes	*Ptyonoprogne obsoleta*	Pale crag martin		NE						
FESIA	Meropidae	*Merops persicus*	Blue-cheeked Bee-eater		LC						
FESIA	Corvidata	*Corvus ruficollis*	Brown-necked Raven		LC						

Table 0-4 Mammals

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	UICN Morocco	Hunting Act	CITES Maroc AppIV	CITES App II	CMS App I	Berne App II	Berne App III
P	INSECTIVORES	*Crocidura tarfayaensis*	Crocidure de Tarfaya	SAH	DD								
P		*Hemiechinus aethiopicus*	Hérisson du désert		LC	DD		x	x				
P	LEPORIDES	*Lepus microtis*	Lièvre de savanne		LC								
P		*Lepus capensis*	Lièvre commun		LC	LC	LC						x
P	RONGEURS	*Jaculus jaculus*	Petite Gerboise		LC	LC							
P		*Gerbillus*	Gerbille		LC	LC							

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	UICN Morocco	Hunting Act	CITES Maroc AppIV	CITES App II	CMS App I	Berne App II	Berne App III
		henleyi	pygmée										
P		*Gerbillus tarabuli*	Gerbille de Libye		LC	LC							
P		*Pachyuromys duprasi*	Rat à queue en massue	SAH	LC	LC							
P		*Meriones crassus*	Mérione du désert		LC	LC							
P		*Eliomys melanurus*	Lérot de Berbérie	MAG	LC	LC			x				
O		*Psammomys obesus*	Rat de sable diurne		LC	LC							
P	CARNIVORES	*Canis anthus*	Loup doré d'Afrique	AFR	LC								
P		*Felis silvestris ssp libyca*	Chat ganté		LC	LC	NT	x		x			
E		*Hyaena hyaena*	Hyène rayée		NT	VU	EN	x	x				
P		*Ictonyx libyca*	Zorille de Libye	SAH	LC	LC		x	x				
P		*Vulpes rueppellii*	Renard famélique		LC	LC			x				
E	ARTIODACTYLES	*Gazella dorcas*	Dorcas Gazele	AFN	VU	EN	EN	x			x	x	
FESIA	Vespertilionidae	*Pipistrellus rueppellii*	Rüppel's Pipistrelle		LC	LC							

Presence	Group	Scientific Name	Common Name	Endemic Species	Global UICN	UICN Mediterranean	UICN Morocco	Hunting Act	CITES Maroc AppIV	CITES App II	CMS App I	Berne App II	Berne App III
FESIA	Vespertilionidae	*Eptesicus serotinus*	Serotine		LC	LC							
FESIA	Erinaceidae	*Paraechinus aethiopicus*	Desert Hedgehog		LC	LC							