



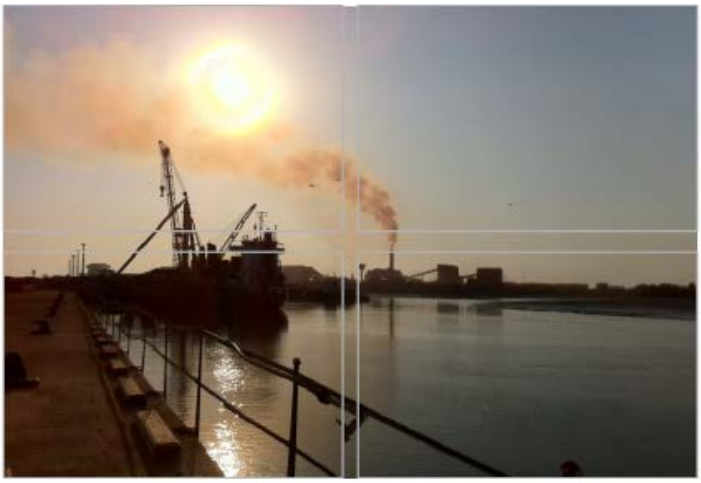


Environmental and Social Impact Assessment (ESIA) for a 50 MW Power Plant Project in Conakry Republic of Guinea

Version 3

July 2016

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FINAL REPORT

Environmental and Social Impact Assessment (ESIA) for 50 MW Power Plant Project –Commune de Matoto-Conakry-Republic of Guinea

Endeavor Energy

Version 3

July 2016

ERM Ref: 0342314

For ERM

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Tè Power Company (TPC), a subsidiary in Guinea of Endeavor Energy Power Holding II Limited (hereafter 'Endeavor' or 'the Client'), is developing a 50 MW thermal power station operating on HFO, and associated infrastructures in Conakry, Republic of Guinea (the 'Project').

The Project will deliver electricity to the national grid under a Power Purchase Agreement signed with the government of Guinea. Under the PPA, TPC is commissioned to Build, Own, and Operate (BOO) the power plant in Conakry for a duration of five years.

1.2 PRESENTATION OF THE PROJECT PROPONENT

TPC is a registered company in Guinea dedicated to the development of the 50 MW power plant in accordance with the "Power Purchase Agreement (PPA) for the supply of electricity of 50 MW to the transmission line of the Electricité De Guinée (EDG) in BOO (Build, Own, Operate)" and the "Investment Agreement for a 50 MW plant" signed between the Government of Guinea and Endeavor. Endeavor currently owns 100% of its subsidiary TPC.

Endeavor is a power project development company, whit the aim of developing, acquiring, financing, constructing, owning and operating thermal, hydroelectric, biomass, waste to energy and hybrid power generation plants in Africa. Endeavor is headquartered in Houston, USA, with offices in Guinea, Ivory Coast and the United Arab Emirates. Endeavor is currently involved in developing, financing, owning and operating over 10 billion USD and 4500 MW of power projects across Africa with key projects in Ghana, Ivory Coast and Guinea.

For the development of the TPC power plant, Endeavor is taking a lead supervisory role on the commercial development, and Engineering, Procurement and Construction (EPC) of the Project.

1.3 PROJECT JUSTIFICATION

Guinea's power market is characterized by a significant deficit of electricity. At around 12% electrification rate, electricity access is among one of the lowest in the World, and the vast majority of the country's population (which numbers over 10 million people) relies on biomass for fuel. Demand for power is expected to increase further over the next few years under the combined effect of rapid increase in demand and urbanization of the population (3.86%

growth rate). Though there have been increasing efforts in the country to develop and construct new power plants, the power market is expected to stay significantly undersupplied for the foreseeable future.

1.3.1 Electricity production at national level

At present, EDG has approximately 450 MW of installed capacity. This includes 350 MW hydropower (of which 220 MW is available) and approximately 87 MW from thermal power (HFO and other fuels) facilities. The country's heavy reliance on hydropower, which is seasonal and heavily dependent on rainfall, presents a major risk to the stability of the Guinean electricity sector. Guinea's power market is characterized by a significant power deficit, estimated at around 250 MW and is expected to widen under the combined effect of a rapid increase in demand (given mining developments) and urbanization. According to the Ministry of Energy, current demand is 600 MW and will grow to over 1,800 MW by 2025.

The deficit in the supply of electricity induces instability affecting living conditions and the development of economic activity. Development of this power plant is therefore essential to the development of Guinea.

1.3.2 Expected benefits

The Project will have benefits both for Endeavor and for Guinea:

- for Endeavor, the project is part of its strategy to develop energy generation assets in Sub-Saharan Africa;
- at national level, the construction of the TPC power plant will considerably increase Guinea's installed power production capacity and make energy supply more reliable in response to high demand;
- at local level, the Project will have direct benefits, with the creation of jobs during the construction phase and development of procurement;
- TPC will also assist in the post-Ebola economic recovery of the Country by providing much needed reliable power
- TPC should also set an example for resuming foreign investments in Guinea's infrastructure and invite additional investment in the Country's power and other critical infrastructure

1.4 PRESENTATION OF CONSULTANCIES CHARGED WITH UNDERTAKING THE ESIA

1.4.1 Environmental Resources Management (ERM)

Environmental Resources Management (ERM) is a leading global provider of environmental, health, safety, risk, social consulting services and sustainability related services. ERM has over 140 offices in 40 countries and territories employing more than 5,000 people. ERM is committed to providing

a service that is consistent, professional and of the highest quality to create value for its clients. ERM offers services across its clients' life cycle in the following broad practice areas related to environmental, health, safety, risk, sustainability, and social concerns.

ERM is accredited by BGEEE (Bureau Guinéen d'Etudes et d'Evaluation Environnementale) of the Ministry in charge of environment (Ministère de l'Environnement, Eaux et Forêts – "MEEF") for the development and submission of ESIAs in Guinea, under accreditation number: 0042/MEEF/BGEEE/2014.

For this study, ERM has provided overall contract execution, project management, team briefing and supervision, deliverables integration and development, quality assurance. ERM has acted as main interfacing entity with Endeavor. ERM also delivers in-house all environmental component of the scope of work, including air and noise modelling work, and hazard study, and provided supervisory and technical inputs in the social components. ERM has outstanding experience in the delivery of Environmental and Social Impact Assessments (ESIA) in Guinea and across the world.

1.4.2 INSUCO

INSUCO is a Guinea-registered consultancy, accredited by the Ministry of *Environnement, Eaux et Forêts* for the development of ESIAs. INSUCO provides specialized services covering all the social aspects of infrastructure, extractive and institutional projects in Africa. INSUCO has outstanding experience in social baseline studies, stakeholder engagement planning, and social management support in Guinea. This includes delivering qualitative and quantitative social and anthropological assessments.

For this study, INSUCO has provided social baseline study services, including demographic surveys of communities affected by the proposed development of the TPC power plant development, as well as expertise inputs into the social impact assessment and management plan.

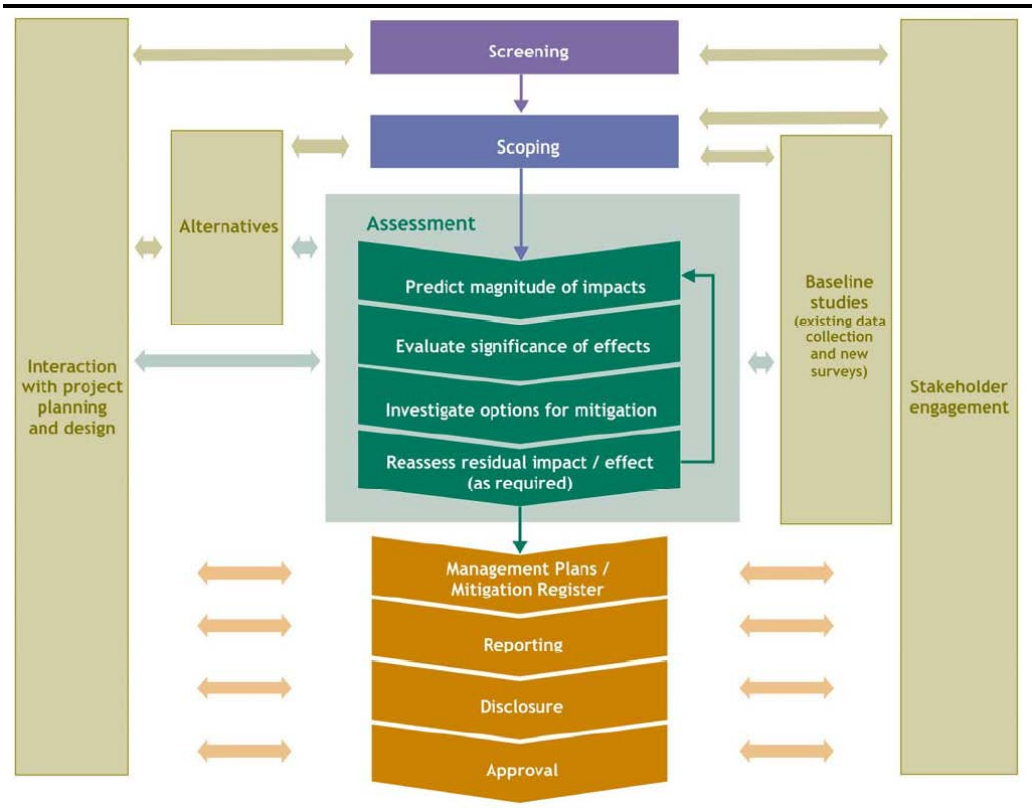
1.5 ESIA OBJECTIVES AND METHODOLOGY

1.5.1 Overall methodology framework

ESIA objectives

The purpose of the ESIA is to identify and evaluate the significance of potential impacts on identified receptors and resources; to develop and describe mitigation measures that will be taken to avoid or minimize any potential adverse effects and enhance potential benefits; and to report the significance of the residual impacts that remain following mitigation. The overall impact assessment (IA) approach is illustrated on *Figure 1.1*.

Figure 1.1 Overall IA approach



The screening and scoping phases allow for determining what environmental and social (E&S) standards are applicable to the Project, and what potential impacts related to the Project are likely to result in significant effects.

The impact assessment phase consists of an analysis of potential sources of impacts arising from the Project, together with an analysis of the sensitivity of the receiving natural and human environment. This draws from data captured through:

- baseline studies (to determine the sensitivity of the receiving environment); and
- interactions with the Project team, to develop a Project description, analyze how the Project may generate sources of E&S impacts, and (where relevant) analyze feasible alternatives to the Project.

Once impacts are analyzed and mitigation measures identified, those can be compiled under a management plan, which can be used as a framework for managing E&S impacts across Project life.

Note that stakeholder engagement is an important element of the ESIA process, from early screening / scoping to establishing and implementing management plans. This allows for:

- informing stakeholders on the Project;
- collecting appropriate information on the baseline environment;
- understanding the concerns and expectations of various stakeholders with regards to the Project, so that these can be accounted for in the ESIA, and addressed in the impact assessment and mitigation phase; and
- supporting the Project's public acceptance process by demonstrating an appropriate level of consideration of stakeholders' input in the Project's plan for managing environmental and social aspects.

Predicting the magnitude of impacts

The term 'magnitude' covers all the dimensions of the predicted impact to the natural and social environment including:

- the nature of the change (what resource or receptor is affected and how);
- the spatial extent of the area impacted or proportion of the population or community affected;
- its temporal extent (*i.e.* duration, frequency, reversibility); and
- where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

Table 1.1 provides definitions for the impact characteristics used in this assessment.

Table 1.1 Impact characteristic terminology

Impact Magnitude	
Type	**Direct –** impacts that result from a direct interaction between the project and resource/receptor. **Indirect –** impacts that follow on from direct interactions between the project and its environment as a result of subsequent interactions. **Induced –** impacts that result from other activities that happen as a consequence of the project.
Extent	**Local –** impacts that are limited to the Project area and the surrounding area. **Regional –** impacts that are experienced beyond the local areas to the wider region. **International –** impacts that are experienced at an international scale i.e. affecting another country.
Duration	**Temporary –** predicted to be short-lived, of the order of hours to weeks.

Impact Magnitude	
	Short-term - predicted to last only for the duration of the drilling or construction operations (i.e. up to approximately two years). **Medium-term** - predicted to last from two years to the end of the project life (i.e. 5 years). **Long-term** - predicted to continue beyond the project life but will cease in time. **Permanent** – impacts that cause a permanent change in the affected receptor or resource that endures substantially beyond the project lifetime.
Frequency	**Continuous** – impacts that occur continuously or frequently. **Intermittent** – impacts that are occasional or occur only under specific circumstances
Likelihood*	**Unlikely** – the event is unlikely but may occur during the project. **Possible** – the event is likely to occur at some point during the project. **Likely** – the event will occur during the project (i.e. it is inevitable).

* For unplanned events only.

Magnitude

Magnitude describes the actual change that is predicted to occur in the resource or receptor. An assessment of the overall magnitude of an impact therefore takes into account all the dimensions of the impact to determine whether an impact is of **negligible**, **low**, **medium** or **large** magnitude.

Sensitivity/Vulnerability/Importance of resources and receptors

The **significance** of the impacts resulting from an impact of a given **magnitude** will depend on the characteristics of the resources and receptors in terms of their **sensitivity**, **vulnerability** and **importance**.

The **quality** or **importance** of a resource will be judged taking into account, for example its national or international designation, its importance to the local or wider community, its ecosystem function or its economic value. The assessment of the **sensitivity** of human receptors, for example a fishing community or wider social group, will consider their likely response to the change and their ability to adapt to and manage the effects of the impact.

Sensitivity, vulnerability and importance of resources and receptors are assessed based on the baseline data. Where required, specific criteria for assessing sensitivity are presented under the relevant impact assessment sections.

Assessing significance

All human activity imposes some level of change to the natural and social environment, because of physical interactions with natural systems or other human activities. To provide information to decision makers and other stakeholders on the importance of different project impacts, the ESIA team makes an evaluation of the **significance** of each such change.

There is no statutory definition of **significance**. Therefore, in the ESIA, the evaluation of significance is based on the professional judgment of the ESIA team using objective criteria when available and informed by relevant legal standards, national and regional government policy, accepted industry good practice, and the views of relevant stakeholders. Where specific standards are either not available or provide insufficient information to allow grading of significance, evaluation of significance will take into account the magnitude of the impact and the quality, importance or sensitivity of the affected resource or receptor.

Magnitude and receptor **quality/importance/sensitivity** are assessed in combination to evaluate whether an impact is, or is not, significant and if so its degree of **significance** (defined in terms of *Minor, Moderate* or *Major).* Impacts ranked as *Negligible* include those that are slight or transitory, and those that are within the range of natural environmental and social change. This principle is illustrated schematically in *Table 1.2*.

Table 1.2 Impacts significance matrix

		Sensitivity / Vulnerability / Importance of Resource/ Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The specific criteria used to evaluate significance for each type of impact will be clearly defined in the impact assessment.

Box 1.1 Context of impact significance

- An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.
- An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently low to be well within applicable standards (meaning applicable regulations and guidelines) or in the absence of applicable standards, when the resource/receptor is of low sensitivity/ vulnerability/ importance.
- An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
- An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. One of the aim of the ESIA is to get to a position where the Project does not have any major residual impacts, or any impact that would endure into the long -term large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

Mitigation measures

Impact assessment is designed to ensure that decisions on Projects are made in full knowledge of their likely impacts on the environment and society, but as importantly to identify measures that can be taken to ensure impacts are as low as technically and financially feasible.

For impacts that are initially assessed during the ESIA process to be of *Major* significance, a change in design is usually required to avoid, reduce or minimize these, followed by a reassessment of significance. For impacts assessed during the ESIA process to be of *Moderate* significance, where appropriate the discussion explains the mitigation measures that have been considered, the one selected and the reasons (*e.g.* in terms of technical feasibility and cost-effectiveness) for that selection. Impacts assessed to be of *Minor* significance are usually managed through good industry practice, operational plans and procedures.

The ESIA is intended to help decisions on projects to be made in full knowledge of their likely impacts on the environment and society. As noted below, the residual impacts and their significance reported in this report are

based on the proposed Endeavor development as described, *i.e.* inclusive of all proposed mitigation.

Box 1.2 ***Ranking of mitigation measures***

Avoidance at source Develop the project such that the characteristic causing an impact is eliminated at the design stage (elimination of waste materials flow, for example).
Reducing at source Modify the design of the project or of operational procedures in order to reduce the impact. For example, measures used to process effluent and waste materials fall into this category.
Reducing at receptor level If an impact cannot be reduced on site, measures can be implemented off site (e.g. noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site).
Repairing or correcting Some impacts imply damage to a resource that is unavoidable (e.g. loss of agricultural land and forestry due to creating access, work camps or materials storage areas). Repair mainly involves restoration and re-establishment type measures.
Compensation in kind When other mitigation methods are either not possible or are not entirely efficient, compensation can be adapted, to a certain extent, to losses (e.g. planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

Reporting residual impacts significance

The degree of significance attributed to residual impacts indicates the level of importance that should be associated with each impact, in the decision-making process on the Project.

Box 1.3 ***Weight of residual impacts in the decision-making process***

Residual impacts of ***Major*** significance, whether positive or negative, are considered to warrant substantial weight, when compared with other environmental, social or economic costs and benefits; conditions will be expected to be imposed to control and, if necessary, monitor adverse impacts and deliver benefits.
Residual impacts of ***Moderate*** significance are considered to be of reducing importance to making decisions, but still warranting careful attention to conditions regarding mitigation and monitoring, to ensure the most appropriate (technically feasible and cost-effective) mitigation measures are used and to ensure benefits are delivered.
Residual impacts of ***Minor*** significance are brought to the attention of decision-makers but will be identified as warranting little if any weight in their decision; mitigation will be achieved using normal good practice and monitoring may be required to confirm that impacts are as predicted.

1.5.2 *Structure of impact assessment*

Technical work streams for environmental and social impact assessment

The impact assessment structure is organized in technical work streams, which are developed in associated chapters. Depending on the topic, the technical section can be qualitative, quantitative, or relying on expert judgement.

Impact assessment is an iterative process aiming to decrease the impact at an acceptable level or as low as possible. This is an iterative process that implies re-assessment of the impact magnitude if amendments are brought to project characteristics or mitigation measures.

Mitigation measures determination was discussed and coordinated with Endeavor and the wider Project team through iterations during the ESIA process. The objectives were to:

- ensure the efficiency of these measures;
- ensure that all mitigations measures are technically and financially feasible by Endeavor; and
- ensure that mitigations measures make the impact acceptable and as low as possible.

Assessment of residual impacts

Once all mitigation has been defined, a final reassessment of impacts is undertaken to determine the magnitude and significance of residual impacts, once relevant mitigation measures have been defined. Where impacts remain evaluated as having major significance after all mitigation measures have been applied, a compensation approach may need to be envisaged.

The residual impact assessment table is shown in *Table 1.3*.

Table 1.3 Example of residual impacts assessment table

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
	Major	•	Moderate
	Moderate	•	Minor
Operation phase			
	Minor	•	Negligible
	Negligible	•	Negligible

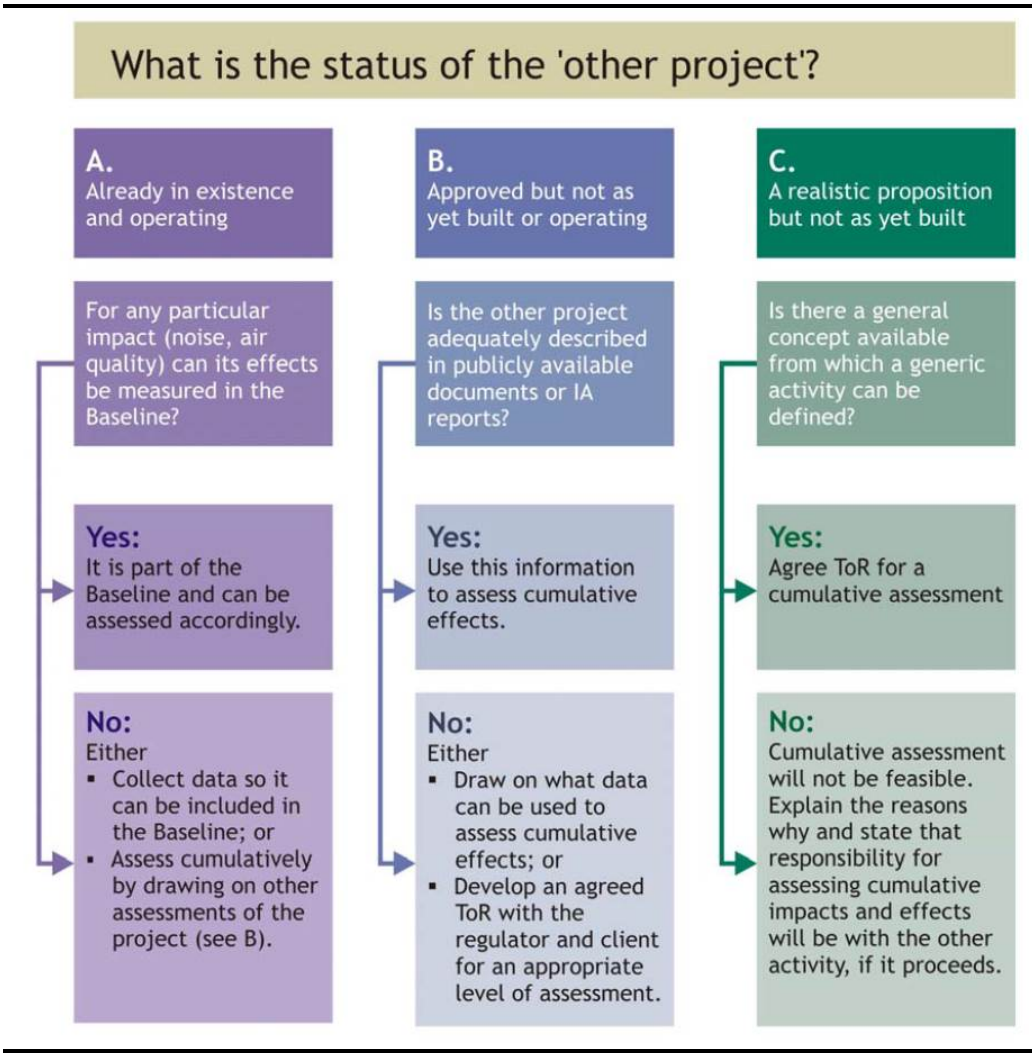
1.5.3 Cumulative impacts assessment

Introduction

Cumulative impact assessment (CIA) is an important component of any ESIA. The assessment considers the residual direct and indirect impacts reported for the Project and evaluates these alongside potential impacts from other projects/activities/natural events that may affect common resources and receptors. The ultimate goal of this analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. To encourage informed decision making we assess the relative contribution of the Project (and its alternatives when required) to the overall cumulative effects. The CIA report describes the additive or synergistic result of the proposed Project as they potentially interact with other actions and natural events external to the Project.

CIA is strongly influenced by the status of the other projects: already in existence or approved/planned or proposed and how much data is available to characterize the magnitude of their impacts. This is illustrated on *Figure 1.2.*

Figure 1.2 ***Assessing cumulative impacts***



CIA process

This section discusses the four key stages of the CIA Process. *Table 1.4* illustrates the CIA process.

Table 1.4 ***Key CIA phases and steps***

Phase	Key IA step feeding into the CIA
Scoping	• identify key issues associated with the project and resources / receptors that may be affected utilizing information from IA; • set temporal and geographical boundaries; • conduct stakeholder engagement; • define level of detail of assessment; • identify and screen 'other projects, activities or natural events' for potential interactions with proposed Project; and • confirm or establish significance criteria utilizing information from IA.
Baseline	• confirm the baseline (existing condition) of the Project receptors and resources utilizing information from IA.
Cumulative Impact	• determine the magnitude and significance of potential

Phase	Key IA step feeding into the CIA
Assessment	cumulative impacts considering the vulnerability of the resources and receptors and their limits of acceptable change.
Management & Monitoring Definition	• develop measures to avoid, minimize or mitigate significant 'Project-related' cumulative impacts; and • some measures already committed to in the IA may suffice to control potential cumulative impacts – so it is important to refer back to these and distinguish between those measures and any additional required.

The CIA should focus on meaningful cumulative impact issues, rather than on all conceivable impact relationships. This is especially important given the dynamic nature of natural ecosystems and the processes that go on within them and act upon them (e.g., coastal processes).

1.5.4 Environmental and social management plan

The environmental and social impacts expected from the Project, and the measures proposed to mitigate these impacts to an acceptable level, are discussed in *Chapters 5.*

This chapter describes the objectives of the Environmental and Social Management Plan (ESMP) for the Project which will be detailed in *Chapter 8*. The ESMP is intended to be used throughout the Project lifecycle as the basis for the detailed design and implementation of environmental mitigation measures to be established by Endeavor in coordination with its Contractors.

The ESMP should be viewed as a register of the mitigation measures proposed by Endeavor in the ESIA, to provide guidance for their implementation, as the Project progresses. It is intended as a "live" document, to be periodically reviewed as part of an ongoing improvement process, and adjusted as new circumstances arise during the course of the Project, such as a change in the Project design, the occurrence of unforeseen environmental conditions or any unplanned event.

Its objectives are as follows:

- to ensure compliance of the Project with Guinean legislation, international law and international standards, as well as with Endeavor relevant policies and good practices in the power generation industry;

- to help ensure that all the mitigation measures and all the commitments made by Endeavor and identified in the ESIA report are taken into account during the survey planning and performance phases; and

- to establish an environmental surveillance and monitoring program so that the ESMP can be updated and improved as the Project progresses.

1.5.5 Limitations/uncertainty

Even with a final Project description and an unchanging environment, predictions of impacts and their effects on resources and receptors can be uncertain. Predictions can be made using varying means ranging from qualitative assessment and expert judgment through to quantitative techniques (*e.g.* air emission modeling). The accuracy of predictions depends on the methods used and the quality of the input data for the Project and the environment.

Where uncertainty affects the assessment of impacts a conservative (*i.e.* reasonable worst case) approach to assessing the likely residual impacts is adopted and mitigation measures developed accordingly. To verify predictions and to address areas of uncertainty, monitoring plans are proposed.

1.6 STRUCTURE OF THE REPORT

This report is organised according to the following sections:

- *Chapter 1 Introduction*
- *Chapter 2 Institutional and regulatory context*
- *Chapter 3 Project description*
- *Chapter 4 Environmental and social baseline*
- *Chapter 5 Impact identification and assessment*
- *Chapter 6 Stakeholder Engagement*
- *Chapter 7 Hazard Study*
- *Chapter 8 Environmental and social management plan*

2 INSTITUTIONAL AND REGULATORY CONTEXT

2.1 GUINEAN INSTITUTIONAL CONTEXT

The power production industry activities in Guinea are regulated by the Ministry of Energy and Hydraulic (MEH) and its dedicated service, the national Energy Authority (*Direction Nationale de l'Energie*) as stated in the electricity law L/93/039 CTRN. The MEH's missions are:

- the supervision of the 1993 electricity law implementation;
- setting the government policy and prices for the electric energy sector;
- establishing the sector's regulations and oversee their implementation;
- signing concession agreements; and
- organising technical control of infrastructures.

The electricity law provides that a National Council for Electric Energy shall be summoned to discuss all electric energy policy issues. This council includes members from the following ministries:

- Ministry of Finance;
- Ministry of Urban Planning;
- Concessionary companies;
- Chamber of Commerce and Industry;
- Ministry of Industry; and
- Ministry of interior.

The roles and responsibilities, composition, organization and operation of these departments are determined by decree of the President of the Republic.

Environmental affairs are the responsibility of the Minister for the Environment, Water and Forests (*Ministre de l'Environnement, des Eaux et des Forêts*). Other relevant ministries of the current Government of Guinea are:

- Ministry for Town & Country Planning, (*Ministre de la ville et de l'aménagement du territoire*);
- Ministry for Youth and Youth Employment (*Ministre de la Jeunesse et de l'Emploi des Jeunes*);
- Ministry for Industry and Small and Medium Enterprises (*Ministre de l'Industrie et des Petites et Moyennes Entreprises*);

- Ministry for Technical Education, Professional Training, Employment and Work (*Ministre de l'Enseignement Technique, de la Formation Professionnelle, de l'Emploi et du Travail*);

- Ministry for Territorial Administration and De-centralisation (*Ministre de l'Administration du Territoire et de la Décentralisation*);

- Ministry for Culture, Arts and Cultural Heritage (*Ministre de la Culture, et du patrimoine historique*);

- Ministry for Health (*Ministre de la Santé*);

- Ministry for Spatial Planning (*Ministre du Plan*);

- Ministry for Social Affairs, Women's Promotion and Childhood (*Ministre de l'action sociale de la Promotion féminine et de l'Enfance*); and

- Ministry for Transport (*Ministre des Transports*).

Decree D/2001/098/PRG/SGG of 18 December 2001 created *Electricité de Guinée* (EDG), a Guinean public company responsible for providing power generation, transmission, and distribution services.

2.2 GUINEAN LEGISLATION RELEVANT TO THE PROJECT

2.2.1 The Environment Code

The Environment Code or the Code for the protection and development of the environment *(Ordinance No. 045/PRG/87 of 28 May 1987, as amended by Ordinance No. 022/PRG/89 of 10 March 1989 on the code of protection and enhancement of the environment)* establishes the administrative and legal framework enabling the Guinean State to deliver on its constitutional obligation to provide for a clean and healthy environment to every person in Guinea.

The Environment Code is the cornerstone of environmental protection and enhancement in Guinea. It sets out the fundamental legal principles to be complied with to ensure the protection of environmental resources and the human environment.

Article 73 of the Title IV of the code relates to the legal regime of classified installations for environmental protection and establishes the administrative and financial requirements applicable to classified facilities (see Section 2.2.2).

Article 82 of Title V of the code sets out that a project proponent must submit an environmental impact study to the relevant regulatory authority for

projects, structures or installations that may, by their size or the nature of their activities, have an impact on the environment.

Article 83 provides for a Decree to establish a list of activities that require an environmental impact study and the content, methodology and the procedure to follow in relation to the environmental impact study: Decree n°199/PRG/SGG/89 of 18 November 1989 (see Section 2.2.2).

2.2.2 Regulations on environmental and social impact assessment

Presidential Decree No.199/PRG/SGG/89 of 18 novembre 1989, made under Article 82 and 83 of the Environmental Code (*Code de l'Environnement)* (*Décret présidentiel 199/PRG/SGG/89 du 18 novembre 1989 portant Codification des études d'impact sur l'environnement, pris conformément à l'article 82 et 83 du Code de l'environnement*), sets out the projects requiring an environmental impact assessment (EIA) study. This decree lists the types of projects that require an EIA and the content of the EIA study.

Order No. 990/MRNE/SGG/90 of 31 April defines the content, methodology and procedure of the EIA study), establishes the content, methodology, and procedures to be complied with when carrying out an environmental impact assessment.

This content is also specified in the General Guide for Impact Studies (February 2013). Environmental impact studies must contain the following information:

- A brief description of the Project with its particular purpose(s); its geographical location; an estimate of its cost of implementation; the date on which the investment decision was taken and the timetable of the Project.

- A description of the environmental and social baseline situation of the site, on aspects likely to be affected by the Project such as sites, natural resources, landscape and socio-economic and cultural conditions. The aspects to be covered on the Project include geology and soils, hydrogeology, hydrology, fauna and flora, landscape and visual aspects, air pollution and noise, traffic and infrastructure, social and socioeconomic status.

- An analysis of the Project's impacts on the environment, particularly on the landscape and visual aspects; on the flora and fauna, natural habitats and biological balances and, where appropriate, the nuisances (noise, vibration, odor, etc.), hygiene and public health, and cultural heritage.

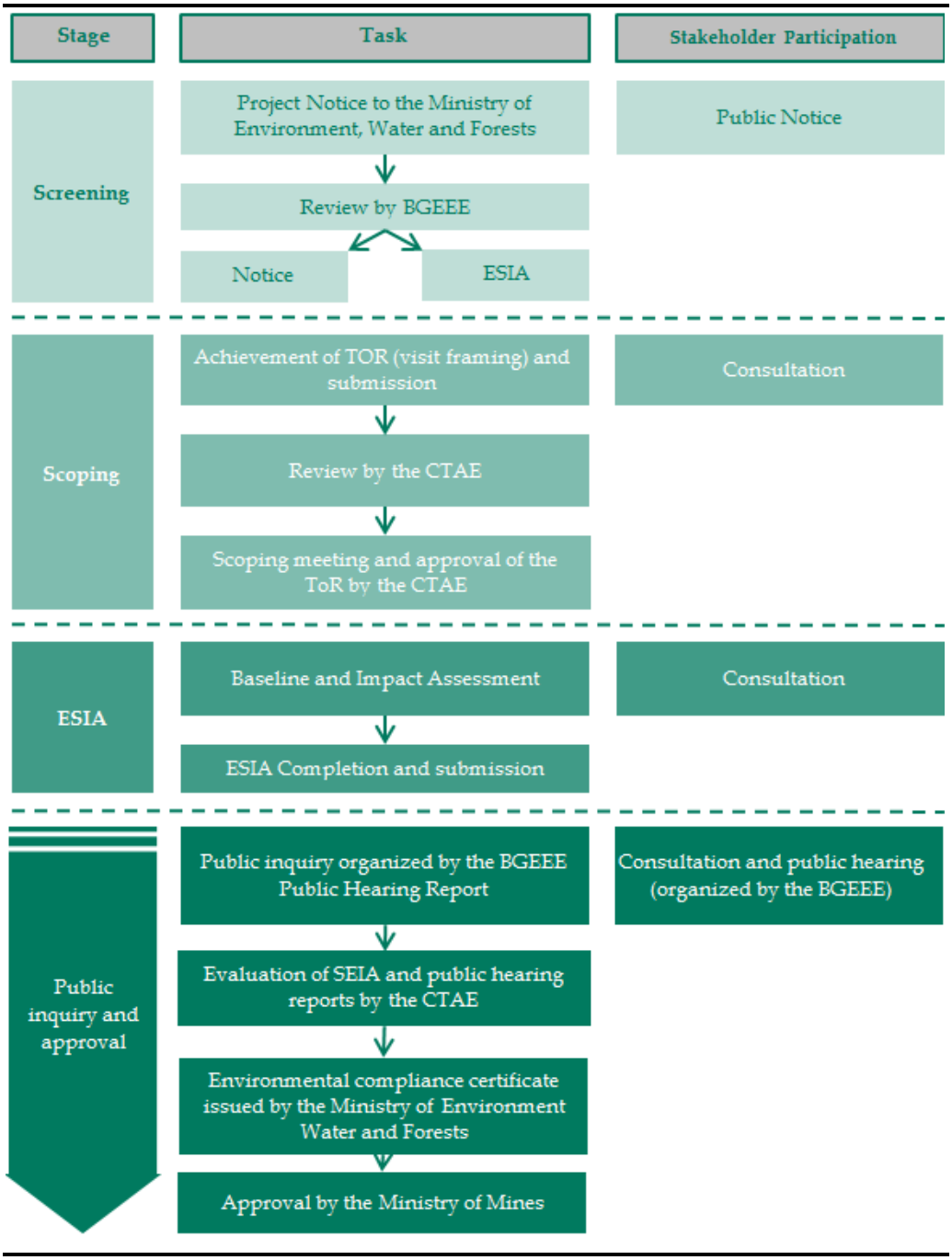
- A description of Project's alternatives and the rationale for choosing the proposed Project. This section shall in particular justify the choice of site and various production processes.

- A detailed description of the measures envisaged by the developer to eliminate, reduce or mitigate the adverse effects of the Project and the estimated expenditure for implementing such measures.

The General Guide for Impact Studies (February 2013) has also clarified the approval process of the ESIA. This procedure is shown in Figure 2.1. The entire submission and permitting procedure is managed by the *Bureau Guinéen des Etudes et Evaluations Environnementales* (BGEEE – the Guinean environmental directorate). Formal review of the permitting documentation is undertaken by the *Comité Technique d'Approbation Environnementale* (CTAE), an ad-hoc multi-disciplinary team composed of representatives of various ministries relevant to the Project. The final environmental compliance certificate is issued by the Ministry in charge of environment. Final approval is under the responsibility of the ministry in charge of the Project – in the case of Endeavor, the ministry of energy and hydraulic.

Obtaining the environmental compliance certificate is a prerequisite to applying for certain other operational permits required for the Project, such as building permits or import and storage of hydrocarbons permits.

Figure 2.1 Overview of ESIA development and approval process in Guinea



2.2.3 *The classified installations for environmental protection*

Presidential Decree n°200/PRG/SGG/89 of 8 November 1989 (promulgated under Article 73 of the Environmental Code) relating to the legal regime of classified installations for environmental protection establishes the administrative and financial regime applicable to classified facilities.

Classified facilities are facilities that, due to the nature of their activities or the actual volume of activities, require special authorization under Guinean law on the environment. Order n°93/800/PRG/SGG of 22 October 1993 lays down

the technical nomenclature of classified installations for environmental protection and list all industrial activities under the Presidential Decree 200/PRG/SGG/89 and for which an integrated permit is required. This order sets for each industrial activity thresholds that reflect the level of potential damage resulting from the activity and from which different requirements apply. Industrial sites are classified as sites of class I or class II according to the level of damage to the environment.

Article 2 of Presidential Decree n°200/PRG/SGG/89 requires the owner or operator of a classified installation to present its request for environmental authorization at the same time as the request for a building permit. In accordance with Article R221-1 of the Urban Code (Law L/98 No 17/98 of the 13 July 1998), a building permit must be obtained before construction of any building. However, this permission can only be obtained after obtaining environmental authorization for a classified facility.

2.2.4 Regulatory framework on land

In Guinea, the land law has several objectives:

- To exercise control over the development process using permissions development / building permit, which must be obtained from the local planning authorities before development can take place. In most cases, a building permit can only be achieved if the government made a favourable decision to the Project under the Environmental Impact Assessment process.

- To protect the environment through conditions, agreements, etc. related to environmental protection in a grant of development permission, via, for example, the need to obtain an environmental permit (also called authorization for classified installations) before production can begin.

Land and Estate Code (« Code Domanial et Foncier »)

Ordinance n°O/92/019 of 30 March 1992 establishes the Land and Domanial Code. The Land and Domanial Code deals primarily with property registered and details the registration process with titles, leases and deeds. It defines two procedures for land registration:

- Through the land plan: it is an administrative document, and not a title in itself, which is kept at the municipal level in the cities and in the community for rural development in rural areas.

- Through the registration of land ownership: this leads to the issuance of a freehold. The document will be kept in the service of conservation of landtitle.

In practice, these procedures of land registration have not been fully implemented in rural areas, where customary rights (« droits coutumiers ») predominate; in the absence of formal private property, the land is essentially a state property.

Urban Planning Code

Law L/98 n° 017/98 of 13 July 1998 adopting and promulgating the Law on Planning Code of the Republic of Guinea (also known as the Urban Planning Code) sets out the responsibilities of the Guinean State in the management and development of the country. This control is exercised by the Minister of Urban Planning who drafts the National Planning Scheme (*Schéma National d'Aménagement du Territoire* - SNAT), and the Regional Development Plans (*Plan de Développement et d'Aménagement Régional* - PDAR) that provide to different levels of government the tools to influence urban development.

In addition to the Urban Planning Code, the Government of Guinea issued the Declaration of Rural Land Policy (Decree D / 2001/037/PRG), which aims to promote rural economic and social development by guaranteeing property rights and rules favourable to agricultural development in rural areas, improving the sustainable management of resources and allowing the development of a market for transparent and fair land. This decree is the strategic framework for the management of rural land.

Local Government Code

At a local level, the Local Government Code ("*Code des Collectivités Locales*"), relating to the devolution of powers from central government, defines the powers, duties, and active fields as well as the limits of community action in local communities.

This Code sets out the roles and responsibilities of local communities in the management of land use. As such, the municipality must give an opinion before any project investment and before any occupation / land use. Local communities share responsibility for the management of land use with the state.

2.2.5 Specific environmental legislation

Biodiversity

Regulation on the protection of species is defined in the Code for the Protection of Wildlife and Hunting Regulations (Law L/97/038/AN of 9 December 1997 adopting and promulgating the Code of protection of wildlife and rules for hunting). This Code sets out the legal framework for the protection, conservation and management of wildlife and flora, and their habitats; and provides for the recognition of the right to hunt. It also describes certain rules concerning hunting and aims to promote the sustainable use of

species and ensure their sustainability for the satisfaction of human needs. This Code and its interaction with the ESIA legislation is currently the cornerstone of the protection and enhancement of biodiversity in Guinea.

The Code is supported by a National Policy on flora and fauna, setting conservation goals and an action plan for their conservation, rehabilitation and development. In addition, the Code states that certain species of flora and fauna are a national resource that must be protected. It lists species that must be fully protected or partially protected.

In addition, there are several policy actions in favor of biodiversity, including:

- National Action Plan for the Environment;
- National Forestry Action Plan;
- Mangrove Forest Management Plan;
- Scholarship Program in the energy sector; and
- National Program for Sustainable Human Development.

Air emissions

The following Guinean Standard defines the air emission limits: NG 09-01-011:2012 / CNQ: 2004 relating to new standards for air pollutant emissions (*Norme Guinéenne NG 09-01-011:2012 / CNQ: 2004 sur la Pollution Atmosphérique – Rejet*).

These texts are applicable to any new and existing fixed or mobile installation that emits atmospheric emissions (including vehicles).

The texts require that anyone that operates or intends to build a facility that emits air pollutants shall provide the competent authority with the following information:

- the nature and quantity of emissions;
- location and height of the point of discharge; and
- other characteristics of the discharge, needed to estimate emissions.

In addition, limit for air quality standards are set. These are summarized in Table 2.1. The Guinean texts also set guidelines for emissions from stationary combustion engines depending on the type of fuel used: heavy fuel or diesel, summarized in Table 2.2.

Table 2.1 Air quality standards: Guinean directives

Pollutants	Guinean Limits	Statistical definitions
SO_2	50 µg/m³ 125 µg/m³	Yearly average Daily average
NO_2	40 µg/m³ 200 µg/m³	Yearly average Hourly average
CO	30 µg/m³	Daily average
PM_{10}	80 µg/m³ 260 µg/m³	Yearly average Daily average
$PM_{2.5}$	65 µg/m³	Yearly average

Table 2.2 Emission limits for stationary combustion units: Guinean directives

	Guinean standards (draft)	
Pollutants	Heavy Fuel	Diesel (DO)
CO	650 mg/Nm³	450 mg/ Nm³
NO_x	300 mg/ Nm³	165 mg/Nm³
SO_2	2,000 mg/ Nm³	-
Dust / Particulate Matter (PM)	50 mg/ Nm³	50 mg/ Nm³

The authorities will control the enforcement of the limit values presented in this section.

Noise emissions

Guinea currently does not have any specific national standards and procedures for the regulation of noise. However, there is a Ministerial Order on noise regulation (*Arrêté Ministériel fixant la réglementation du bruit en République de Guinée*) currently under development. At this stage of the Project, only a draft of the national regulation on noise is available.

The Ministerial Order on noise regulation (*Arrêté Ministériel fixant la réglementation du bruit en République de Guinée*) defines different noise levels for specific period of the day and type of areas, as detailed in Table 2.3.

The Guinean regulation recalls the IFC noise limits for night time, 45 dB(A) for residential areas and 70 dB(A) for industrial areas. For day time, instead, it establishes a more stringent limit of 50 dB(A), and also defines an additional sensitive time period between 13:00 and 15:00, for which a 5 dB(A) lower threshold is recommended (45 dB(A)).

Table 2.3 Ambient noise levels: proposed Guinean standards

Period	Maximum Ambient Noise Level 1-hour Leq [dB(A)]		
	Guinean standards		
	Class 1 Residential area	Class 2 Commercial area	Class 3 Industrial area
6:00 – 13:00	50	55	70
13:00 – 15:00	45	50	
15:00 – 22:00	50	55	
22:00 - 6:00	45	50	

Water

The Water Code (*Code de l'Eau*) (Law L/94/005/CRTN of the 14 February 1994) establishes a system of water use rights and sets the overall framework for managing water resources. The Code states that a concession is granted by decree for permanent water uses, such as supplying potable water to towns and villages, hydropower, agricultural, industrial or other developments, requiring investments whose amortization period exceeds 10 years.

The Code states that any use of water resources must comply with the guidelines of the development plan of the watershed containing these resources. The Code also addresses the prevention of the harmful effects of waters and the protection of water quality.

The Code addresses groundwater issues, and more specifically the measures governing the exploration, exploitation and protection of groundwater sources. The arrangements for establishing protection perimeters, defining water resource safeguard areas and issuing drilling permits are determined by the National Directorate for Hydraulics (*Direction Nationale de l'Hydraulique*- DNH).

In addition, there are a Ministerial Order on wastewater discharges (*Projet d'arrêté Ministériel fixant les conditions de rejets des eaux usées*) and a Guinean Standards: NG 09-01-010:2012 / CNQ:2004 relating to new standards for waste water discharges (*Norme Guinéenne NG 09-01-010:2012 / CNQ:2004 Rejet des Eaux Usées*). The requirements are the following.

Some discharges such as liquid effluent causing stagnation, nuisances to the neighborhood, and pollution of surface water, groundwater or marine water are completely forbidden.

Treated effluent discharged into a receiving environment, must comply with the specified values.

An authorization order from the Minister for the Environment, Water and Forests (*Ministre de l'Environnement, des Eaux et Forêts*) and the Directorate responsible for Classified Installations will set the maximum daily discharge flow rate. When the authorized maximum daily rate exceeds 1 / 10th of the nominal flow of the river or if it is greater than 100 m^3/day, the authorization order will also set a limit on the monthly average daily flow and an instant limit.

The operators of classified installations, who are authorized to discharge substances mentioned above, must send annual reports to the Ministry for the Environment summarizing:

- discharge flow rates; and
- discharge concentrations.

This report must show the evolution of these discharges and measures taken to reduce these.

The wastewater discharged into the natural environment must comply with the limits described in Table 2.4, depending on the maximum daily flow allowed.

Table 2.4 Effluent quality parameters before discharge in the environment

Parameters	Guinean limits for wastewater discharge
pH	5.5-9
Temperature	<30°C
COD	<200 mg/L if the daily flow rate is ≤30 L/day <100 mg/L if the daily flow rate is >30 L/day
TSS	<15 mg/L (specific limit for the mining industry)
Biochemical Oxygen Demand $(BOD)_5$	<200 mg/L if the daily flow rate is ≤100 kg/day <100 mg/L if the daily flow rate is >100 kg/day
Total nitrogen	<30 mg/L as monthly average concentration if the daily

Parameters	Guinean limits for wastewater discharge
	flow rate is ≥50g/day A different value can be fixed by the operating permit
Total Phosphorus	<10 mg/L as monthly average concentration if the daily flow rate is ≥15kg/day A different value can be fixed by the operating permit
Total hydrocarbon	15 mg/L if the daily flow rate is ≥150g/day

Waste management

General requirements for waste management are set by the *Guinean Code de l'Environnement* (Art 58 to 67). Waste has to be treated adequately to avoid any risk for the environment or for human health. Disposal of waste to fresh water or marine water is forbidden without prior authorization by the environmental authorities.

The Bamako convention on the Ban of the Import into Africa and the Control of Transboundary Movements and Management of Hazardous Wastes within Africa is dated 30 January 1991. It is a treaty of African nations prohibiting the import into Africa of any hazardous (including radioactive) waste. The convention came into force in 1998. Guinea, as Member of the African Union, has signed the Convention.

The convention constitutes an important stage of the construction is a treaty in terms of environmental protection. In line with the Basel Convention of the 22 March 1989, its principal objective is to limit the circulation of dangerous wastes on the African territory. The Bamako convention uses a format and language similar to that of the Basel convention, but it is much stronger in prohibiting all imports of hazardous waste and it does not make exceptions on certain hazardous wastes (like those for radioactive materials) made by the Basel convention.

To summarize, the convention has the following purposes:

- prohibit the import of all hazardous and radioactive wastes into the African continent for any reason;
- minimize and control transboundary movements of hazardous wastes within the African continent;
- prohibit all ocean and inland water dumping or incineration of hazardous wastes;
- ensure that disposal of wastes is conducted in an "environmentally sound manner"; and

- establish the precautionary principle.

2.2.6 Specific social legislations

Additional Guinean regulations exist regarding the issues of hiring and training workers, as well as health and safety at work:

- Law N°L/2014/072/CNT of 10 January 2014 repealing and replacing the Labor Code of 28 July of 1988 (*Ordonnance n° 003/prg/ sgg/ 88 du 28 janvier 1988 portant institution du code du travail*). Provisions of regulatory texts adopted in application of the 1988 ordinance that do not conflict with the new Labor Code are not repealed ;

- law of 14 February 1994 establishing a Code of Social Security Act; and

- the Public Health Code of 19 June 1997 and its application Decree.

The Labor Code

Law N°L/2014/072/CNT of 10 January 2014 is the main source of legislation governing employment practices and labor relations in Guinea. This Code applies to all private sector employees. It prohibits forced or compulsory labor. It establishes the rules of recruitment and termination of employment; the rules relating to working conditions, including wages, maximum hours worked and overtime; the employee benefits such as paid leave and retirement. The Code also defines the requirements for the employees' health and safety.

Workers health and safety

The primary document in Guinea that addresses protection of worker health and safety is the Law N°L/2014/072/CNT of 10 January 2014 repealing the Labor Code of 1988. The Code includes the following relevant articles:

- the employer must follow all useful measures to protect the health and safety of its employees;

- all heads of establishments must organize practical training in safety and hygiene;

- the Minister of Labor determines, via Orders, all work that must not be performed by women, apprentices and workers under 18 years of age (Order 1392);

- the Hygiene and Safety Plan must be communicated to the work inspector before work begins;

- all employment candidates must undergo a medical examination at the expense of the employer, who must also ensure an annual medical follow-up of all employees; and

- lists the medical facilities and services that must be provided by companies depending on the number of employees.

Social protection

Law L/94/006/CTRN of 14 February 1994 establishing a Code of Social Security Act is the main source of Guinean legislation governing the protection of workers and their families against economic or social poverty and against the difficulties arising from a significant loss of income. This text deals with the legal status and financial organization of the Social Security Fund, pensions for old-age, invalidity and survivors, occupational risk prevention, family benefits, sick leaves, health and social work, provisions relating to litigation and penalties.

It repeals the Social Security Code established by Law L/94/006/CTRN of 12 December 1960.

Public health

The Public Health Code (Act L/97/021/AN of 19 June 1997 on the Code of Public Health) ensures the protection and promotion of health, the rights and obligations of the individual, family and community throughout the territory of the Republic of Guinea.

Decree D/253/24/PRG on health at work creates a National Service of Occupational Medicine in the Department of Health and Public Hygiene, and defines the role and responsibilities of this department.

The Investment Code

The Investment Code, decreed by Order N° 001/PRG of the 3 January 1987 and modified by Law L/95/029 CMRN of 30 June 1995, establishes the guarantees afforded to investors and the advantages of different regimes and also defines their obligations. Investors are required to employ equally, as a priority, all Guinean nationals with equal qualifications and to organize training and the promotion of Guinean nationals within the company. A new Investment Code was adopted in May 2015 (Law /2015/n°008 of 25 May 2015).

2.3 CURRENT TRENDS / REGULATIONS PENDING ADOPTION

As mentioned, Guinea is currently elaborating Guinean Standards for environmental, health and safety management. These are likely to be adopted by decree and to become applicable to the Project:

- Guinean Standards: NG 09-01-010:2012 / CNQ:2004 relating to new standards for waste water discharges;
- Guinean Standards: NG 09-01-011:2012 / CNQ:2004 relating to new standards for air pollutant emissions;
- Guinean Standards: NG 09-01-012:2012 / CNQ:2004 relating to new standards on exposition to chemicals at work;
- Guinean Standards :NG 09-01-013:2012 / CNQ:2004 relating to new procedures for environmental inspection of industrial and commercial facilities; and
- Guinean Standards on noise emissions.

A comprehensive analysis of how these upcoming new regulations may affect the design of the Project and related environmental controls was developed in the appropriate *Section 2.2*Guinean legislation relevant to the Project.

It is important to note that these upcoming new regulations may or may not be applicable depending when the ESIA is submitted / approved and whether or not these new regulations are in force at that time.

2.4 THE IFC ENVIRONMENTAL AND SOCIAL PERFORMANCE STANDARDS (PS)

2.4.1 *The IFC performance standards*

Endeavor is expecting that the Project will be financed with the participation of international financial institutions (IFIs). It is likely that such IFIs will require the Project to comply with applicable international environmental and social sustainability standards. The most widely accepted international standards are the International Finance Corporation's Environmental and Social Performance Standards (2012) or IFC PS. The International Finance Corporation (IFC) is a subsidiary of the World Bank Group dedicated to supporting private sector growth in developing countries. The IFC's Sustainability Framework (updated 1 January 2012), is widely considered as one of the most complete sets of standards for environmental and social management.

The IFC Performance Standards are a central element of this framework. The set of eight thematic standards establishes the principles for integrating

environmental, health and safety considerations into projects. They were designed to assist project developers to avoid, mitigate and manage risks and impacts so that they develop their activities in a sustainable manner. The IFC PSs are outlined in Table 2.5.

Table 2.5 IFC performance standards (2012) considered in developing the Project

PS	Title	Scope
1	Assessment and Management of Environmental and Social Risks and Impacts	Defines requirements for ensuring appropriate E&S management, policy implementation and accountability, including through an Environmental and Social Impact Assessment for which the IFC PS 1 defines requirements.
2	Labor and Working Conditions	Requirements for ensuring fair labor management and safe and healthy work conditions.
3	Resource Efficiency and pollution Prevention	Defines requirements for ensuring an appropriate level of pollution prevention and abatement.
4	Community Health, Safety and Security	Defines requirements for ensuring that adverse impacts from the Project on the receiving community are managed and controlled.
5	Land Acquisition and Involuntary Resettlement	Defines requirements to minimize adverse social and economic impacts from involuntary resettlement, land acquisition, or restrictions on land use.
6	Biodiversity Conservation and Sustainable Management of Living Natural Resource	Defines requirements for ensuring that the Project's impacts on nature, ecosystems, habitats and biodiversity are appropriately managed.
7	Indigenous People (Not applicable to the Endeavor Project)	Defines requirements for the protection of Indigenous people (not deemed applicable to the Project, as there are no Indigenous people as defined by IFC PS7 in the Project area).
8	Cultural Heritage	Defines requirements to protect cultural heritage from the adverse impacts of Project activities, to support its preservation and to promote the equitable sharing of benefits from the use of cultural heritage.

2.4.2 The IFC EHS guidelines

The World Bank Group / IFC, Environmental, Health and Safety (EHS) General Guidelines of April 2007 superseded the World Bank Handbook issued in 1998.

In addition, the sector specific guidelines Environmental, Health, and Safety Guidelines for Thermal Power Plants (December 2008) will be taken into account where applicable. The updated EHS Guidelines serve as a technical

reference source to support the implementation of the IFC Performance Standards.

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

Air emissions

The IFC (International Finance Corporation) General EHS Guidelines (2007) set guidelines for ambient air quality. *Table 2.6* presents international air quality standards, for the following pollutants: NO_2, CO, PM_{10}, PM_{10} and SO_2. The international standards set by the IFC Environmental, Health, and Safety Guidelines for Air Emissions and Ambient Air Quality published on 2007 refers to the WHO Air Quality Guidelines.

The IFC Guidelines are intended to confer a maximum degree of protection of human health. However, these also include a degree of pragmatism in recognising that achievement of the guidelines may not be achievable in all circumstances; in these cases, for some pollutants interim targets are identified. These are designed to confer a degree of protection of human health, with the aim that regulators should work towards achievement of the Guideline.

Table 2.6 Air quality standards: Guinean and IFC General EHS directives

Pollutants	Guinean Limits	IFC limits (WHO AQ Guidelines)	Statistical definitions
SO_2	50 µg/m³	-	Yearly average
	125 µg/m³	125 µg/m³ (Interim target 1) 50 µg/m³ (Interim target 2) 20 µg/m³ (Guideline) µg/m³	Daily average
	-	500 µg/m³	10 min average
NO_2	40 µg/m³	40 µg/m³	Yearly average
	200 µg/m³	200 µg/m³	Hourly average
CO	30 µg/m³	-	Daily average

Pollutants	Guinean Limits	IFC limits (WHO AQ Guidelines)	Statistical definitions
PM_{10}	80 µg/m³	70 µg/m³ (Interim target 1) 50 µg/m³ (Interim target 2) 30 µg/m³ (Interim target 3) 20 µg/m³ (Guideline)	Yearly average
	260 µg/m³ (1)	150 µg/m³ (Interim target 1) 100 µg/m³ (Interim target 2) 75 µg/m³ (Interim target 3) 50 µg/m³ (Guideline)	Daily average
$PM_{2.5}$	65 µg/m³	35 µg/m³ (Interim target 1) 25 µg/m³ (Interim target 2) 15 µg/m³ (Interim target 3) 10 µg/m³ (Guideline)	Yearly average
	-	75 µg/m³ (Interim target 1) 50 µg/m³ (Interim target 2) 37.5 µg/m³ (Interim target 3) 25 µg/m³ (Guideline)	Daily average

1 24h average - cannot be exceeded more than once a year

Table 2.7 summarizes the emissions limits for small stationary combustion units and compares the Guinean and IFC general EHS directives for small reciprocating engines (50MWth – 300 MWth). Depending on the pollutants, the Guinean standards or the IFC guidelines are more stringent.

Table 2.7 Emission limits for stationary combustion units: Guinean and IFC general EHS directives

	Guinean standards		IFC standards (50MWth – 300 MWth)	
Pollutants	Heavy Fuel	Diesel (DO)	Liquid fuel	
			Non-degraded airshed	Degraded airshed
CO	650 mg/Nm³	450 mg/ Nm³	-	-
NO_x	300 mg/ Nm³	165 mg/Nm³	1,460 to 2,000 mg/Nm³	400
SO_2	2,000 mg/ Nm³	-	1,170 mg/ Nm³ or use of fuel less than 2% sulfur content	0.5% of sulfur content
Dust / Particulate Matter (PM)	50 mg/ Nm³	50 mg/ Nm³	50 mg/ Nm³	30 mg/ Nm³

Noise emissions

The IFC EHS General Guidelines (2007) implements the "Guidelines for Community Noise" established by the World Health Organization (WHO) in 1999.

Table 2.8 details the IFC EHS guidelines to community ambient noise levels, that prescribe an absolute level of 55 dB(A) during the daytime and 45 dB(A) during night time value in residential areas. These values make reference to noise from facilities and stationary noise sources, and are commonly applied as design standards for industrial facilities; IFC has indicated that these limits are not directly applicable to transport or mobile noise sources.

In environments where the ambient noise levels already exceed a level of 55 dB(A) daytime and/or 45 dB(A) night time the IFC includes a guideline stating that noise emissions should not cause the ambient noise level in a residential area to rise by 3 dB(A) or more, determined during the noisiest hour of a 24 hour period.

Referring to noise measurements, IFC gives several specifications on noise monitoring programs design, as follow:

- measurements are to be taken at noise receptors located outside the Project property boundary;
- typical monitoring periods should be sufficient for statistical analysis and cover an appropriate time period according to noise variation (24h, hourly or more frequently); and
- monitors should be located approximately 1.5 m above ground and no closed to reflecting surface.

Table 2.8 Ambient noise levels: proposed Guinean standards and IFC guidelines

Period	Maximum Ambient Noise Level 1-hour Leq [dB(A)]				
	Guinean standards			IFC Guidelines	
	Class 1 Residential area	Class 2 Commercial area	Class 3 Industrial area	Residential Institutional, Educational	Industrial, Commercial

Period	Maximum Ambient Noise Level 1-hour Leq [dB(A)]				
	Guinean standards			IFC Guidelines	
	Class 1 Residential area	Class 2 Commercial area	Class 3 Industrial area	Residential Institutional, Educational	Industrial, Commercial
6:00 – 13:00	50	55	70	55	70
13:00 – 15:00	45	50			
15:00 – 22:00	50	55			
22:00 - 6:00	45	50		45	

Water

The IFC recommends compliance with national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges.

Table 2.9 compares the effluent quality parameters before discharge in the environment of Guinean legislation and the IFC Guidelines. The IFC Guidelines are generally more stringent except for Total Suspended Solids (TSS) and Chemical Oxygen Demand (COD) depending on the flow rate of the discharge.

Table 2.9 Effluent quality parameters before discharge in the environment

Parameters	Guinean limits for wastewater discharge	IFC limits for treated sanitary water discharge
pH	5.5-9.5	6-9
Temperature	<30°C	<30°C
COD	<200 mg/L if the daily flow rate is ≤100 kg/day <100 mg/L if the daily flow rate is >100 kg/day	125 mg/L
TSS	<50 mg/L	50 mg/L
Biochemical Oxygen Demand $(BOD)_5$	<100 mg/L if the daily flow rate is ≤30 kg/day <30 mg/L if the daily flow rate is >100 kg/day	30 mg/L
Total nitrogen	<30 mg/L as monthly average concentration if the daily flow rate is ≥50g/day A different value can be fixed by the	10 mg/L

	operating permit	
Total Phosphorus	<30 mg/L as monthly average concentration if the daily flow rate is ≥50g/day A different value can be fixed by the operating permit	2 mg/L
Total hydrocarbon	15 mg/L if the daily flow rate is ≥150g/day	10 mg/L (oil and grease)

2.5 *INTERNATIONAL CONVENTIONS*

In addition to its national laws, Guinea is party to a number of international conventions and regional agreements on environmental and social issues (see Table 2.10). The signing of a convention is a first step. Ratification is the step where the country takes specific legal steps to implement the convention.

Table 2.10 International conventions and treaties

Convention	Date of Ratification/ Accession	Key Objectives
Convention on Climate Change	Guinea ratified the Convention in May 1993 and it entered into force in March 1994.	Since 1992, 192 countries around the world have joined an international treaty, the United Nations Framework Convention on Climate Change that sets general goals and rules for confronting climate change. The ultimate objective of the Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. The Convention provides that countries must meet the Convention objectives primarily through national measures.
Kyoto protocol to the United Nations Framework Convention on Climate Change	Guinea ratified the Kyoto protocol in September 2000. It entered into force in February 2005.	This Protocol was ratified by the Guinean Government in 2000 and it came into force in February 2005. Guinea is not an Annex I Party to the Protocol and therefore does not, currently, have to meet a specific greenhouse gas emission reduction target. There is currently no Guinean specific legislation implementing the Kyoto Protocol in Guinea.
Vienna Convention for the Protection of the Ozone Layer	Guinea ratified the Vienna Convention in June 1992 and the Convention came into force in September 1992.	Guinea ratified the Vienna Convention and the Montreal Protocol. The Convention provides for the international legal framework to protect the ozone layer. Guinea has not, to date, adopted specific legal instruments to implement the Convention in its legal system.
The Montreal Protocol on Substances that Deplete the Ozone Layer	Guinea ratified the Montreal Protocol in June 1992.	The Montreal Protocol on Substances That Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. The treaty was opened for signature on 16 September 1987, and entered into force on 1 January 1989. The Protocol provides for the international legal framework to protect the ozone layer by setting out phasing-out targets and schedules for named substances listed in the Protocol.

Convention	Date of Ratification/ Accession	Key Objectives
Convention on the Conservation of Migratory Species of Wild Animals	Guinea is a party to this Convention which came into force in August 1993.	The convention aims to ensure the conservation of Migratory Species and Natural Environment by an intergovernmental co-operation. The convention sets out to conserve wild flora and fauna and their natural habitats; promote co-operation between states; monitor and control endangered and vulnerable species; and to assist with the provision of assistance concerning legal and scientific issues. This convention was transposed into Guinean legislation via the Guinean Code of Protection of Wildlife and Rules of the Hunt.
Convention on Biological Diversity	Guinea ratified this Convention in May 1993.	The objective of this Convention is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development. The Convention has three main goals: conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources. This Convention has been transposed at a national level in Guinea with the Code of Protection of Wildlife and Rules of the Hunt.
African Convention for Nature Conservation and the Conservation of Natural Resources	Guinea signed this Convention in September 1968, but has yet to ratify it.	This Convention aims for the conservation and rational use of soil, water, flora and fauna resources. The objectives of this Convention are: to enhance environmental protection; to foster the conservation and sustainable use of natural resources; and to harmonize and coordinate policies in these fields with a view to achieving ecologically rational, economically sound and socially acceptable development policies and programs.
Convention concerning the Protection of the World Cultural and Natural Heritage	Guinea ratified this Convention in March 1979.	This Convention aims to protect the world cultural and natural heritage. This Convention provides for the creation of an intergovernmental committee for the protection of the world cultural and natural heritage and its associated fund.

Convention	Date of Ratification/ Accession	Key Objectives
Ramsar Convention on Wetlands of International Importance	Signed and ratified by Guinea	The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention uses a broad definition of the types of wetlands covered in its mission, including lakes and rivers, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near- shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans. Guinea has signed and ratified this Convention and it came into force in March 1993. Guinea has submitted national reports on the implementation of the RAMSAR Convention in Guinea which show that the Guinean government has taken some steps to implement the Convention.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Guinea has acceded to but not ratified the Convention in April 1995	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and / or composition and their characteristics, as well as two types of wastes defined as "other wastes" - household waste and incinerator ash.
Convention to Combat Desertification (A/AC.241/27)	Guinea ratified this Convention in June 1997.	The objective of this Convention, which came into force in December 1996, is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa. The Convention aims to achieve this through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas. Guinea has also produced a national action plan against desertification. The aims and objectives of the Convention have been incorporated into existing legislation such as the Environmental Code, the Mining Code *etc*.

Convention	Date of Ratification/ Accession	Key Objectives
World Heritage Convention (UNESCO)	The Convention came into force in 1975. Guinea ratified the Convention in March 1979.	The Convention aims to promote cooperation among nations to protect the world's natural heritage and cultural properties that is of such outstanding universal value that its conservation is important for current and future generations. It defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List; and sets out the duties of States Parties, of which Guinea is one of, in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage. The *Mount Nimba Strict Nature Reserve* was established by Decree in 1944 and declared as a biosphere reserve in 1980. Guinea has listed the *Mount Nimba Strict Nature Reserve* on the list of world heritage in danger in 1992. The Guinean government has also listed the cultural landscape of the *Mount Nimba* range on the tentative list of cultural sites to be protected under the Convention.
ILO Convention 87 on Freedom of Association and Collective Bargaining, Convention 1948	Guinea ratified Convention 87 in January 1959.	The Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87) establishes the right of all workers and employers to form and join organizations of their own choosing without prior authorization, and lays down a series of guarantees for the free functioning of organizations without interference by the public authorities.
ILO Convention 98 on Right to Organize and Collective Bargaining Convention 1949	Guinea ratified Convention 98 in March 1959.	The Right to Organize and Collective Bargaining Convention 1949 (98) provides for protection against anti-union discrimination, for protection of workers' and employers' organizations against acts of interference by each other, and for measures to promote and encourage collective bargaining.
ILO Convention 111 on Elimination of Discrimination in Respect of Employment and Occupation	Guinea ratified Convention 111 in September 1960.	The Convention on the Elimination of Discrimination in Respect of Employment and Occupation provides that member states pursue a national policy designed to promote, by methods appropriate to national conditions and practice, equality of opportunity and treatment in respect of employment and occupation, with a view to eliminating any discrimination in respect thereof.

Convention	Date of Ratification/ Accession	Key Objectives
ILO Convention 182 on Worst Forms of Child Labor 1999	Guinea ratified Convention 182 in June 2003.	The Worst Forms of Child Labor Convention 1999 provides that each member who ratifies the Convention must take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labor as a matter of urgency. This includes slavery, trafficking, prostitution and pornography, forced labor and recruitment into militia, as well as occupations that harm the child's safety, morals or health.
ILO Convention 138 on Minimum Age 1973	Guinea ratified Convention 138 in June 2003.	The ILO Minimum Age Convention, 1973 (No.138) sets the age below which children should not be in work at 15 (or 14 if a country's economic status requires that in the short term). Two years before they reach this minimum legal age, children can do 'light work' -- non-hazardous work for no more than 14 hours a week, and that does not interfere with schooling. Children under the minimum working age who are engaged in more than light work are in child labor. UNICEF additionally considers a child to be in child labor if they do domestic work for 28 hours or more a week.

2.6 *ENDEAVOR ENERGY HEALTH , SAFETY AND ENVIRONMENT POLICY*

Endeavor is committed to implement and maintain high Environmental, Health and Safety norms and standards. To achieve this purpose, Endeavor has developed a Health and Safety policy and an Environmental policy to formalise its commitment s in terms of EHS.

2.6.1 *Health and Safety policy*

The purpose of this policy is to develop a high standard of health and safety for the office-based operations of Endeavor Energy Holdings LLC and all its subsidiaries and affiliates ("Endeavor"), so that all operations will be in compliance with all applicable Occupational Safety and Health Administration ("OSHA") regulations, and international, national and local legislation.

It is a core principal of Endeavor that each employee has the right to derive personal satisfaction from his/her job and the prevention of occupational injury or illness is of such consequence to this belief that it will be given top priority at all times.

Endeavor will initiate and maintain a complete safety program, in compliance with all applicable regulations, including accident prevention and safety training for all Endeavor employees. All individuals are responsible for the safety and health of those persons in their charge and coworkers around them. By accepting mutual responsibility to operate safely, a commitment will exist throughout the Endeavor organization, which will contribute to the well-being of personnel.

2.6.2 Environmental policy

Endeavor's environmental mission includes conducting its business in compliance with environmental laws, regulations and permits. Endeavor believes it has an important duty to be a good steward of environmental resources in all its business operations and to provide the necessary organization, commitment and training to fulfil this obligation. Our policy is intended to help develop long-term benefits for all employees, our communities and the various stakeholders of our company. These goals will be achieved through:

- incorporating environmental responsibility into all business operations through the implementation of appropriate environmental protection measures;
- managing operations in an environmentally-sensitive manner, with an emphasis on conservation through improved energy efficiency, reduced consumption of natural resources, recycling, and the use of renewable resources; and
- maintaining an effective communication system for environmental matters through training and improved awareness.

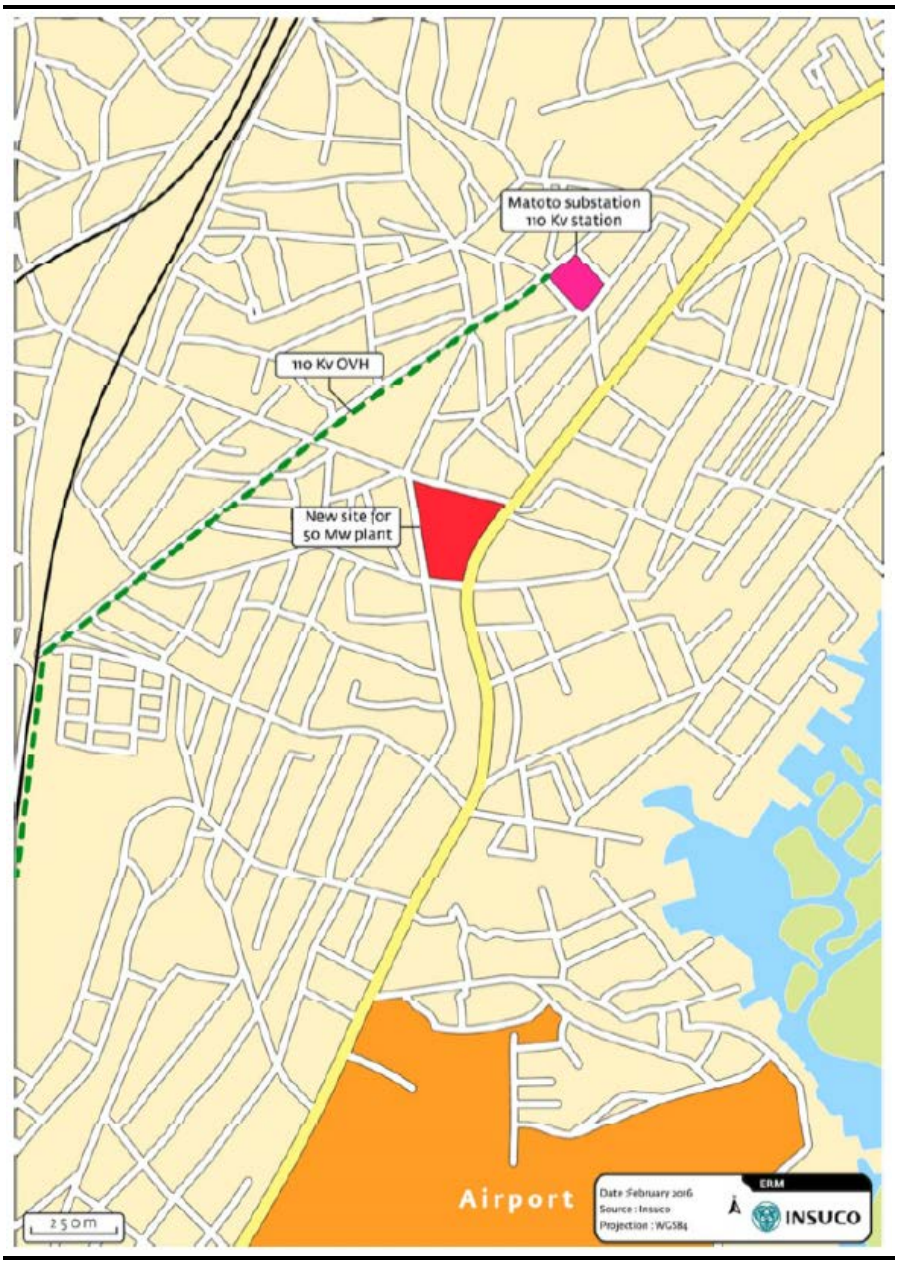
3 PROJECT DESCRIPTION

3.1 PROJECT LOCATION AND FOOTPRINT

The Project facilities will be located on the site of "La tannerie" in the commune of Matoto, one of the five communes of Conakry, in the sector of Simbaya école. The site of 26 500 m² is owned by the Ministry of Defence and allocated to the project by the Ministry of Electricity and Hydraulic. The site was previously used by Aggreko until 2015 for a containerized power plant of 50 MW installed capacity (fueled with diesel fuel oil, DFO).

The location of the Project is shown in *Figure 3.1*.

Figure 3.1 Project location in Conakry



In addition to the main power production facilities, an underground110kv power transmission line will link the Project facilities to the existing Electricité de Guinée (EDG) power transmission line north of the site.

Two routes are considered so far, the first along an unpaved road north of the site over a distance of 700m, the second option along a paved road north west of the Project site over a distance of 300 m. Both options are shown in *Figure 3.2*.

Figure 3.2 Power transmission line proposed location

Source: CdF Ingénierie

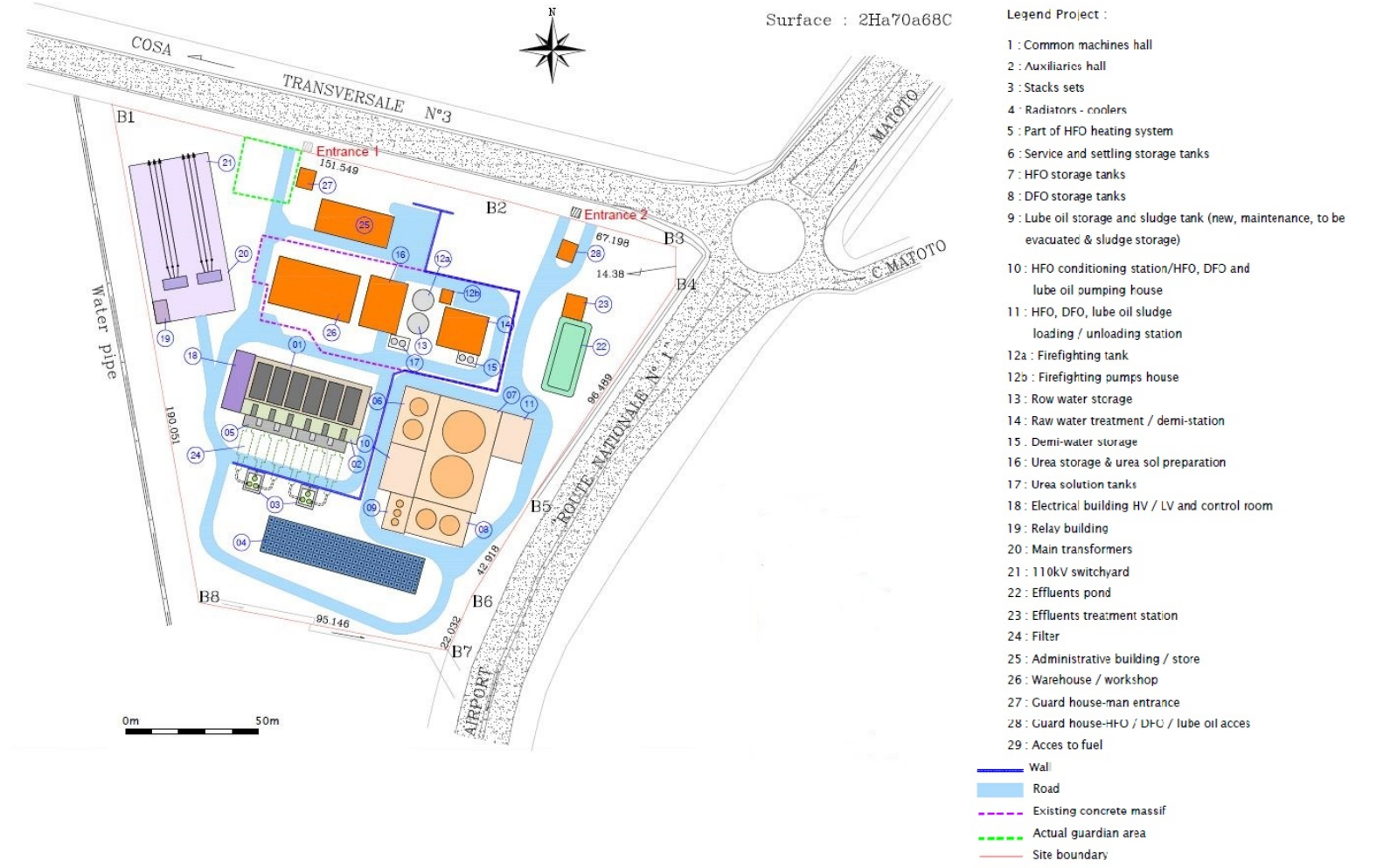
The two potential routes run along built area. Illustrations of the two proposed routes are presented in Box 3.1 for the northern route and Box 3.2for the north western route.

Box 3.1 ***Northern power transmission line route***

Box 3.2 ***North western power transmission line route***

A detailed layout of the Project site is presented in *Figure 3.3*.

Figure 3.3 Draft proposed Project site layout



Source : CdF Ingénierie

3.2 CONSTRUCTION PHASE

The detailed planning and configuration of construction works for the Project were not yet defined at the time of production of this report. The generic description presented hereafter is therefore based on similar projects.

Summary

Based on ERM experience of similar projects, typical construction works for a 50 MW (net output) HFO Project include:

- remaining vegetation clearance, removal of the existing infrastructures (concrete foundations, shelters,…), surface stripping and topsoil stockpiling;
- ground surface grading, rolling and resurfacing to create a flat area (sourcing of fill material and aggregates will be provided by local existing sources);
- installation of site drainage;
- establishment of hard standing for laydown areas, roads, paths; and
- laying of concrete;

The power transmission line will be installed along the existing public road from the power plant to the existing Matoto substation. It is anticipated that the line will be underground, within the existing right-of-way of the road. The construction of the line will involve trenching, cable laying, backfilling and road resurfacing works within the right-of-way. Once construction works are over, the buried line will not generate any further intrusion within the right-of-way and roadsides. Whilst the construction phase will involve works along the road for excavation and line installation, which may generate temporary traffic interferences, in the operational phase, the line will not involve any third party displacement. Construction-related nuisance such as noise and dust will be very limited given the temporary nature of the works. Excavation and other heavy machinery use will only occur during daytime.

Origin of raw materials and equipment

Technical equipment such as the engines will be delivered via the port of Conakry by international suppliers.

Most of the raw materials (steel, cement) and other materials will be brought to the site by trucks.

Engines will likely be delivered at night to avoid traffic by means of exceptional convoy.

Hazardous materials

The main hazardous materials required during the construction phase will be the following:

- inflammable paints, solvents and dilutants;
- pressurised gases;
- fuels containing oil derivatives and lubricating oils;
- chemicals used to clean pipes; and
- other materials according to the waste products classification contained in current regulations.

The list of hazardous materials used at the site and the relevant Material Safety Datasheets (MSDS) will be available to employees at all times. The use of hazardous materials will be restricted to authorised staff who will have received the necessary training and protective equipment.

Hazardous materials will be stored in the areas designated for this purpose and will be handled in compliance with the MSDS.

Land take

The construction of the Project is not expected to lead to land take beyond the proposed land plot allocated to the Project. At the time of the site visits undertaken in developing this ESIA (May 2016), the Project location was empty.

Military were also present to guard the site.

Construction storage and lay down areas will be comprised within the proposed boundaries of plot of land allocated to the Project. A temporary area will be laid out during the construction phase in order to store the various materials and equipment necessary, as well as for the concrete plant.

Traffic

Access to the site is currently operated via two entrance located on the northern side.

Deliveries of raw materials and equipment, as well as staff movements from and to the site will account for up to 30 vehicles per day during peak activity times.

Deliveries of equipment and materials will not take place during the night and will be planned as far as possible outside the times of day when traffic is at its highest level (between 7:00am and 10am and between 4pm and 7pm).

Water supply and consumption

During the construction phase water will be mainly used for:

- domestic and sanitation use;
- concrete unit; and
- sprinkling on the ground to avoid dust clouds from the construction work and when vehicles travel past.

The water will be supplied by the Conakry water mains.

As the construction activities have not been fully designed yet, the expected water consumption from the project cannot precisely be estimated, but it is anticipated to be modest (less than 100m^3 per day).

Liquid effluents

In the construction phase, effluents will mostly result from the cement production unit on site, domestic wastewater from construction workforce.

All sanitary effluents will be collected and treated in a state-of-the-art wastewater treatment plant and the treated water will be used for watering green spaces, or discharged into the nearby sewage canal (subject to confirmation of acceptability in the ESIA and approval by the authorities).

There may also be some construction-site runoff, during the rainy season, which will be handled as a normal part of good practice construction site management (with site drainage including sediments traps to reduce the turbidity of site run-off effluent).

Atmospheric emissions

Given the modest scale of the Project and limited duration of the construction phase, atmospheric emissions from vehicles and equipment during the construction phase are expected to be very limited.
Dust arising from traffic on unpaved areas and sand / backfill piles will be controlled by water spraying.

Noise

Noise emissions linked to the construction activities will issue mainly from site preparation works (land clearance, soil preparation and excavation), structural works and equipment installation.

Table 3.1below shows noise levels for typical site equipment according to British standards (BS, *British Standard*) "*Noise and vibration control on construction and open sites, BS 5228* [(1)]".

Table 3.1 Acoustic performance of equipment – construction phase

Equipment	Level of acoustic pressure at 10m [dB(A)]
Site preparation	
Chain excavator	79
Bulldozer	81
Wheel loader	68
Roller	76
Steam roller (*road planer*)	82
Asphalt surfacer	84
Dump truck	87
Civil engineering and installation works	
Concrete mixer truck	80
Concrete pump	77
Tower crane	77
Mobile crane	82
Fork lift truck	67
Motorised compressor	75
Generator	74
Worksite truck	87

Source: ERM based on standard BS 5228 *Code of good practice for basic information and procedures to control noise and vibration*.

More details on the estimated levels of noise generated during the project construction phase are provided in section *5.5*(Noise modelling).

Waste products

The main waste materials generated during the construction phase will be as follows:

(1) British standard BS 5228: *Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1: Noise. BSi, 2009*).

- excavated soils and materials excavated corresponding to the foundations of the main buildings;
- domestic waste;
- packaging of construction materials and raw materials (cement bags, wooden packaging, etc.);
- materials resulting from structural works (excess concrete, …); and
- greasy waste, batteries, empty drums and other specific waste materials.

Waste materials will be sorted according to their origin and treatment methods, this will avoid contact between incompatible waste materials and will permit inspections for the detection of leaks and spillages. The waste materials storage area will be waterproofed and covered to avoid the waste materials coming into contact with rain water. In addition, the area used for the storage of hazardous materials will be fenced and signs will be displayed to prevent access by unauthorized people and thus minimise any risk of accident.

According to feedback from similar projects, volumes of special / dangerous materials produced during the construction phase should be low, and most of the waste materials produced can be easily reprocessed via existing facilities. No more than 200 m^3 of ordinary waste materials, (i.e. ten truck loads) will be generated every month.

Collection of waste materials generated during the power plant construction phase will be managed by an approved service provider and will comply with current regulations. Special / hazardous waste materials will be evacuated to specialised facilities.

3.3 OPERATIONAL PHASE

Summary

Activities during operational phase will mainly focus on the following points:

- the production of electricity from HFO-fuelled reciprocating engines;
- storage and waste management;
- chemical consumption and storage
- staff transport; and

- HFO transport and storage.

Main power plant equipment

The power plant will comprise a main building housing six reciprocating combustion engines of 9 MW each running on HFO connected to an alternator. This scenario is based on Endeavor's engineering consultant's recommendations.

The energy producing equipment at the power plant is expected to be one of the main engine manufacturer's such as Wartsila, Caterpillar or Man.

The main equipment at the proposed power plant are listed in *Table 3.2.*

Table 3.2 Main equipment at the planned TPC power plant

Description	Characteristics of the main components
Energy production system	6 engines of a unit power of 9 MW equipped with de-NO_x selective catalytic reduction systems to reduce NO_x emissions.
Storage in above-ground tanks	2 Heavy fuel oil of 1,600 m^3 each 1 Clean HFO 1 Settling HFO 2 Diesel fuel oil of 425 m^3 1 Raw water tank 1 firefighting water tank. 2 Demineralised water storage tank 1 Sludge tank 2 Urea solution tanks 1 New lubricant of 11 m^3 1 Used lubricant of 11 m^3 1 Maintenance lubricant 11 m^3
Water supply and treatment	Piped water supply from the municipality Water treatment system (demineralisation)
Power station	Main transformer
Other equipment	Loading / unloading area Unloading area Firefighting system Administrative buildings Maintenance workshop Warehouse Liquid effluent treatment system Cooling: closed circuit cooled by air Radiators-coolers Guard house

The locations of the various components are illustrated in *Figure 3.3.*

Characteristics of the stacks

There will be six stacks with identical characteristics grouped in two sets of three stacks. The stacks will be 30 meters high with an internal diameter of 1.4

meter. The emission temperature will be 332 °C and the emission velocity 20 m/s.

Noise emissions

Noise emissions will be associated with the power plant operation, fuel oil transport by trucks and general operation of the reciprocating engines.

Section 5.5 provides more detail on sources of noise linked to the Project and a quantification of noise emissions, notably through the modelling of noise levels carried out based on technical documents relating to the design of the power plant obtained from Endeavor and its engineering consultant.

Atmospheric emissions / De-NO_x system

The combustion of the HFO and DFO (limited volumes) from the reciprocating engines of the power plant will be the main source of atmospheric emissions from the Project. Key pollutants emitted include:

- particles (including the inhalable fractions PM_{10} and $PM_{2.5}$ are taken into account in this ESIA under the generic term of PM);
- sulphur dioxide (SO_2);
- nitrogen oxides (expressed in NO_x and NO_2); and
- carbon monoxide (CO).

Section 5.5 provides a quantification of these emissions, as well as a study of their dispersal in the atmosphere after discharge.

In order to reduce emissions of NO_x into the atmosphere from the engine exhausts, each engine will be equipped with a selective catalytic reduction (SCR) device. SCR is a chemical process that uses a reducing agent to selectively reduce nitrogen oxides NO_x in the exhaust gas through the extraction of oxygen.

The reducing agent will be urea: $CO(NH_2)_2$. A solution will be prepared based on urea granulates.

The trucks used to transport the fuel to the site daily will also generate exhaust emissions.

Fuel oil consumption and storage

The Project will consume approximately 11 tonnes per hour of HFO at a full capacity. The Project will be supplied with HFO by trucks. It is expected that 10 trucks fully loaded per day will be required to supply the Project.

There will be two HFO above ground storage tank of 1,600 m^3, one clean HFO above ground storage tank, one settling HFO above ground storage tank, two above ground Diesel Fuel Oil (DFO) storage tank of 425 m^3 each and three lube oil tank of 11 m^3 each located on the south east part of the Project site.

The tanks details are presented in *Table 3.3.*

Table 3.3 Project storage tanks specifications

	Diameter (m)	Height (m)	Volume (m^3)
DFO tanks	6.4	13.2	2 x 425
HFO tanks	18	12.6	2 x 1,600
Lube oil tank			3 x 11

Note: to be confirmed with the final layout

The HFO specifications are presented in *Table 3.4.*

Table 3.4 2% Sulphur HFO specifications

Parameter	Limit	Specification
Density at 15°C	max	0.995 Kg/l
Total existing sediments of old fuel oil	max	0.25% of weight
Ash	max	0.05% of weight
Conradson residue	max	15% of weight
Flash point	max	60°C
Viscosity at 50°C	max	380 Cst
Water	max	1 %
Sulphur	max	2% of volume
Hydrogen sulphide	max	2 ppm per liquid phase
Asphaltenes	max	11% of weight
Vanadium	max	150 ppm
Sodium	max	100 ppm

HFO, DFO and lube oil storage tanks are located in bunds to contain the liquid in case of a leak. They are described below:

- 1 for the raw HFO storage tank, clean HFO storage, settling tank and day tank (25m x 26m);
- 1 containing both DFO storage tanks (17m x 14m); and
- 1 containing all three lube oil tanks (8m x 11m).

A loading and unloading area of 25 m by 11m is located in a bund adjacent to the various storage tanks.

Chemical consumption and storage

Urea will be stored on site for the de-NO_x SCR process. For an autonomy of 15 days, approximately 180 big bags of urea granulates will be stored, each 1 MT. To store the urea solution, a tank of 100 m^3 and two urea mixing tanks with a capacity of 5 m^3 each are expected.

Water supply and wastewater

Water for the site will be supplied from the water mains of the municipality of Conakry. Sewage and waste water will be treated onsite via a wastewater treatment plant. The treatment plant will be designed to ensure that discharge meets applicable local and international standards.

The water requirements for the power plant are minimal as it will be limited to domestic use only and power plant top of cooling system.

Site drainage will be provided during the operation phase, linked to perimeter drainage channels to divert storm water from the surrounding area. Drainage will be designed to minimise the potential for uncontrolled run-off, taking into account site-specific factors such as available space, gradient, catchment size, expected flows. The site is near a drainage canal / open-sky sewer, where treated runoff water will be discharged.

In the operational phase, the only sources of liquid effluents will be:

- domestic wastewater from the workforce (approximately 50 people – see *Section* 3.5 below);
- site run-off; and
- industrial wastewater.

Oil & water separators will be installed in the vicinity of the HFO/DFO storage and handling areas.

Waste management

The main waste products expected after start-up of the site are as follows:

- domestic waste;
- ordinary industrial waste;
- oily rags; and
- sludge and oily effluent.

TPC will evaluate recycling, reuse or disposal options for the waste products generated, depending on the waste product processing installations present in the site's environs. TPC will ensure that all waste flows are managed under the terms of a contract with a service provider who holds the necessary certifications in line with Guinean regulations and international best practice.

3.4 DECOMMISSIONING

Decommissioning activities will include equipment site securisation, equipment clean-up, dismantlement of equipment and structures, as well as clean-up of site surfaces in line with applicable regulatory requirements and the requirements of the Site Use Agreement.

3.5 WORKFORCE REQUIREMENTS

Construction phase

Up to approximately 150 workers (peak workforce) are expected to be needed as part of the construction phase to cover the civil, mechanical and electrical engineering tasks.

Operational phase

The Project will employ approximately 50 staff permanently in the operation phase.

3.6 PROJECT TIMETABLE

The construction phase is expected to last for about 18 months starting in the fourth quarter of 2016. Commissioning of the power plant and associated 110KV Interconnection are expected to occur early 2018.

The duration of the PPA is 5 years; however, the total operational life of the Project will depend on economic conditions as well as operation and maintenance requirements.

3.7 PROJECT ALTERNATIVES

3.7.1 Alternative location

Two potential sites were identified as part of the project design process:

- the ''tannerie'' site in Matoto; and

- a site in Kipé.

Both sites where located close to existing power transmission line in order to reduce construction costs and associated nuisances to local communities.

The Kipé site electrical network allowed for the delivery of power at a 20kV level. However the contractual requirements between EDG and Endeavor specified that power should be delivered at a 110kV level which was not possible at the Kipé site. The Tannerie site was therefore selected as it allowed the delivery of power at a 110kV level without further construction works associated with an upgrade of power transmission facilities on site.

3.7.2 Technological choice

Technological choices made by Endeavor in the definition of the industrial process for the power plant's configuration concerned the following topics:

- choice of fuel oil;
- choice of fuel oil supply method; and
- choice of process.

Choice of fuel oil

Different fuel oil could have been used for this power plant project: heavy fuel oil, diesel (light fuel oil), coal and gas.

From an environmental and health point of view, coal was the least good solution due to atmospheric emissions (mainly SO_2) which are potentially not acceptable under Guinean standards and international good practice. The power plant would therefore have had to be fitted with expensive equipment to treat atmospheric emissions. Conversely, natural gas was the best solution in terms of emissions, however no infrastructures are available in country for a power plant application based on Liquefied Petroleum Gas (LPG) and Liquefied Natural Gas (LNG).

From an economic point of view, heavy fuel oil and coal were the most competitive solution, allowing energy production at the lowest cost possible. However a coal fired power plant requires additional investments, both in terms of equipment (to limit the classic negative effects of coal fired power plants) and in terms of controlling supply (the lack of coal resources in Guinea would involve massive imports of coal from the international market). Moreover, choosing coal would have required the installation of a larger unloading and storage area, thus significantly increasing the total surface area of the power plant.

The use of diesel fuel was considered too expensive an option, hence this option was dismissed during initial discussions with the Guinean government.

Considering the significant social impact the construction of the Project will have in terms of electricity supply, HFO presents the best affordability to the end users while having a lesser environmental impact than coal. The HFO option was therefore selected.

Choice of fuel oil supply method

The fuel oil supply method is dependent on the type of fuel oil used. Fuel oil supply possible options associated with HFO include supply by trucks and supply by pipeline.

- The truck option induces additional air emissions from the truck engines and increased health and safety risk associated with road traffic.

- The pipeline supply method is associated with extensive construction works to link HFO depot likely to be located at the Conakry port north west of the city or involve the construction of HFO depot closer to the project site which would involve considerable construction works and increase significantly the project expenditures. In addition, the pipeline option would involve monitoring and maintenance activities during the operational phase.

Considering the lower cost associated with the truck supply method and the absence of need for additional construction, monitoring and maintenance works associated with the pipeline method supply, the truck supply method has been selected.

Choice of process

The choice of process was mainly conditioned by the choice of fuel. The use of combustion engines was motivated by the use of heavy fuel oil. It was also the easiest and quickest technological choice to be implemented, optimising the Project's timetable. As part of the project design, reciprocating engines proved to be the most efficient thermal open cycle and generally provide good operational flexibility and high availability.

3.7.3 "No project" option

The current Guinean energy context requires an increase in electricity production in order to secure the country's supply, thus guaranteeing the population better access to energy and encouraging economic development.

Social

From an economic and social point of view, the "no project" option is part of Guinea's current energy situation, characterised by the frequent cutting off of supply. On the other hand, the installation of the Project will result, in the short term, in an increase in the region's electricity production capacity. Similarly, the Project may represent opportunities for local jobs and economic development.

Environmental

From an environmental point of view, the "no Project" option does not, by definition, represent any quantifiable change to current physical and biological characteristics. The non-increase in electricity production capacity could, however, lead to increased pressure on natural resources (particularly forestry) by populations with only limited access to this energy source (or even with no access at all) across the whole of the Guinean territory with an electricity network.

4 ENVIRONMENTAL AND SOCIAL BASELINE

4.1 INTRODUCTION

4.1.1 Content of this chapter

This chapter presents a description of the environmental and social baseline:

- a summary of basic environmental and social conditions using documentary research, the results of visits on the field and public consultations;
- an identification of the main environmental sensitivities that may be affected by the project.

It includes a description:

- of the physical environment;
- of the biological environment, of protected areas and habitats;
- of the human environment (general review of socioeconomic conditions and the social context).

4.1.2 Sources of information

The topics developed in this analysis of the baseline are based firstly on national, regional and local information. The analysis of environmental and social issues also takes account of the local context in the area in which the Project is located, by means of a description of the baseline of the Project area.

A desktop study covering the various topics at national and regional level (based on available bibliographic data) and a detailed field study of the Project site have been carried out, in order to have available reliable, up to date information as to the environmental and social components inherent to the Project. Detailed list of bibliographic data consulted as part of this assessment is provided in *chapter 9*.

Three different field studies were performed for the Project by ERM and Insuco:

- 22nd to 26th of March 2016 for stakeholder engagement;

- 4th to 11th of April 2016 for environmental sampling (air and noise) and stakeholder engagement including authorities[2]; and

- 18th to 24th of May 2016 for further environmental sampling: particulate matter (PM).

They resulted in a qualitative and quantitative analysis of the biological environment and of ecosystems, as well as public consultations.

Consultations were held with the main commune and district authorities to establish an overview of the socio-economic situation and social dynamics (see Chapter 6 on Stakeholder Engagement).

These interviews provided information on the following features of the districts:

- the administrative and social set-up of the districts and communes;

- the main economic activities;

- social dynamics;

- the area's existing infrastructure;

- the health situation; and

- land tenure.

Field surveys provided us with geo-referenced data on infrastructure, land boundaries and networks within the study area. Thus, the main initial socio-economic environment aspects relevant to the Project have been mapped.

4.2 STUDY AREA

The Project site is located in Simbaya Ecole district in the Matoto commune in Conakry, Guinea. Simbaya Ecole district was created by splitting Simbaya 1 district into two.

In order to carry out a detailed assessment of the impacts on the surrounding environment, the study was undertaken at the micro-local level, i.e. within a 500 meter radius of the site. This is due to the fact that, although the effects of certain impacts may be seen over a wider area (notably, the migration of people from other districts into the districts around the plant, and atmospheric

[2] The air monitoring is expected to be continued for a total period of 3 months
Noise monitoring was performed for 7 hours in total over the course of 5 days

dispersion of air pollutants), the most noticeable impacts will be felt within a limited distance from the site.

Thus, the environmental and social study area has been defined to include the receiving environment of surrounding environmental components (airshed, nearby streams etc.) and communities upon which the Project may have an impact. There is no mention in Guinean law of the exact footprint required for this type of project. The decision to include a 500 meter buffer zone is thus based on a literature review of similar projects and on qualitative investigations undertaken with local communities. These investigations particularly focused on the previous energy production project, which, according to local residents, caused considerable disruption. The buffer zone has therefore been set at 500 meters as this is the distance beyond which the project will cause no noticeable disruption to the surrounding communities.

Figure 4.1 Location of the study area including a 500m and 2000m radius

4.3 PHYSICAL ENVIRONMENT

4.3.1 Climate and meteorology

Rain and temperature

Guinea is located in western Africa on the Atlantic Coast, at latitudes of 7 to 13°N. It has a typically tropical humid climate, characterized by a wet season from mid-May to mid-November, peaking between July and September. Dry season starts from mid-November to mid-May, with its driest period in January.

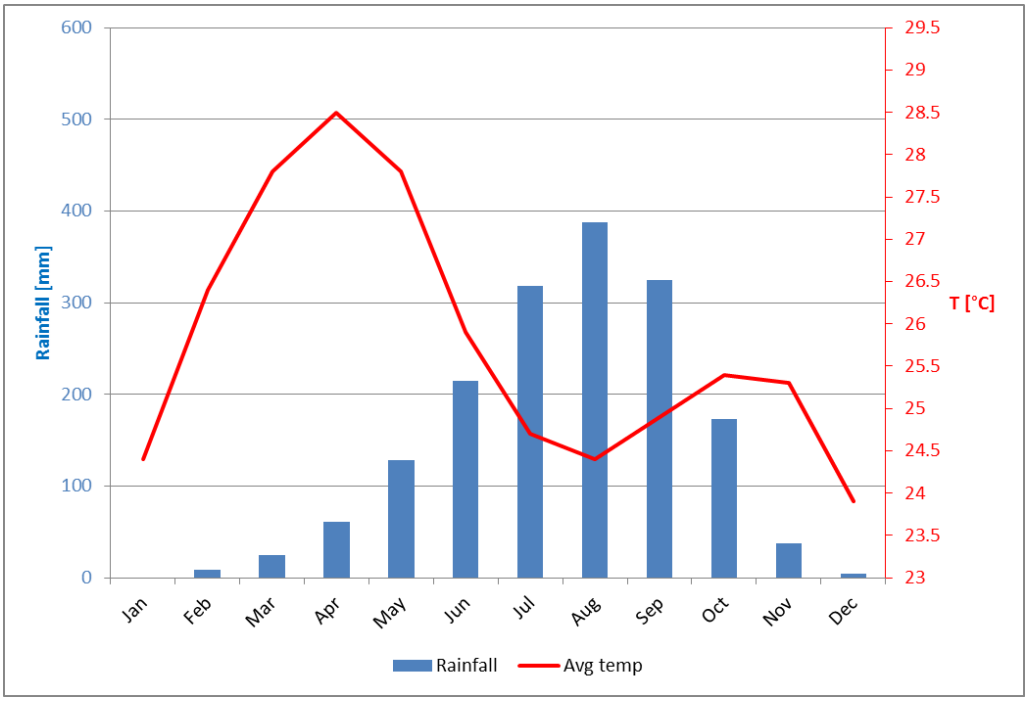
The rainy season is largely controlled by the movement of the tropical rain belt (also known as the Inter-Tropical Conversion Zone, ITCZ) which oscillates between the northern and southern tropics over the course of the year, and triggers the rainy season in Guinea between May and October. There is a strong east-west gradient in total rainfall received in Guinea at this time, with more than 1000 mm per month in the south-east, but less than 150 mm per month in the north-west due to the south westerly monsoon wind regime.

Variations in the latitudinal movements and intensity of the ITCZ, from one year to another, cause inter-annual variability in wet season rainfall. The best documented cause of these variations is the El Niño Southern Oscillation (ENSO). El Niño events are associated with less intense rainy seasons in West Africa. On average ENSO events occur every 3-6 years but only irregularly and not as predictably as the astronomically controlled tides. ENSO events can be weak, moderate and strong. The latest strong event was recorded in 1997-98.

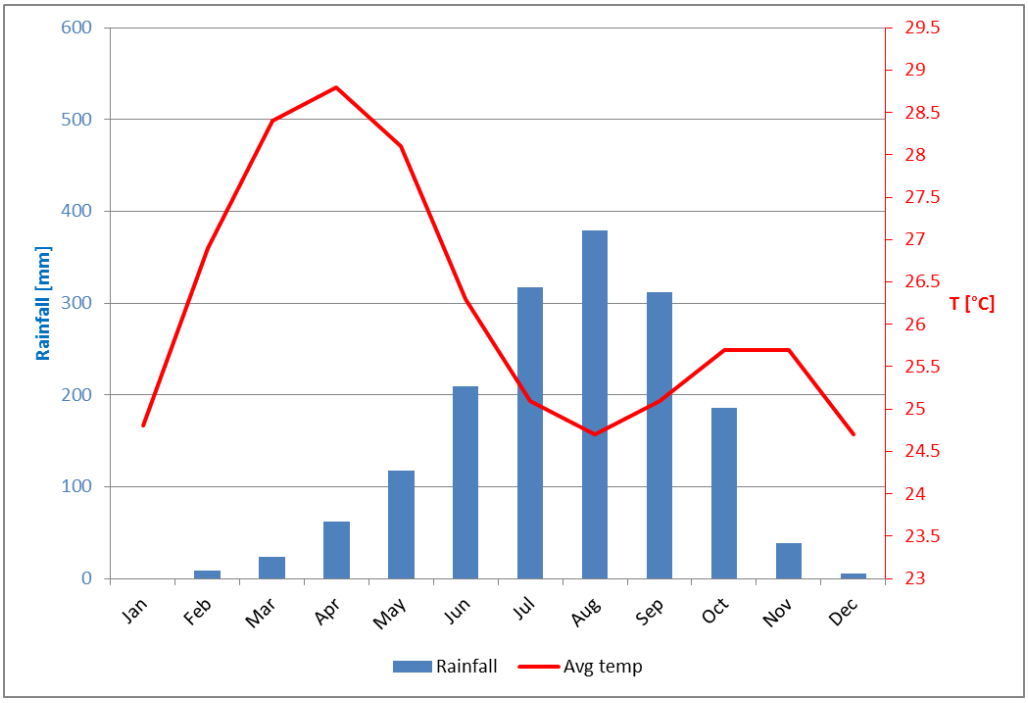
Figure 4.2 shows the average monthly temperature and rainfall data for Guinea observed from 1960 to 2009, obtained from the World Bank Climate Change Knowledge Portal. The annual average rainfall in Guinea for the period 1960 – 1990 was 1683 mm, decreasing to 1659 mm over the period 1990 - 2009.

Figure 4.2 ***Average monthly temperature and rainfall for Guinea observed from 1960 to 2009***

Data observed from 1960 – 1990



Data observed from 1990 – 2009



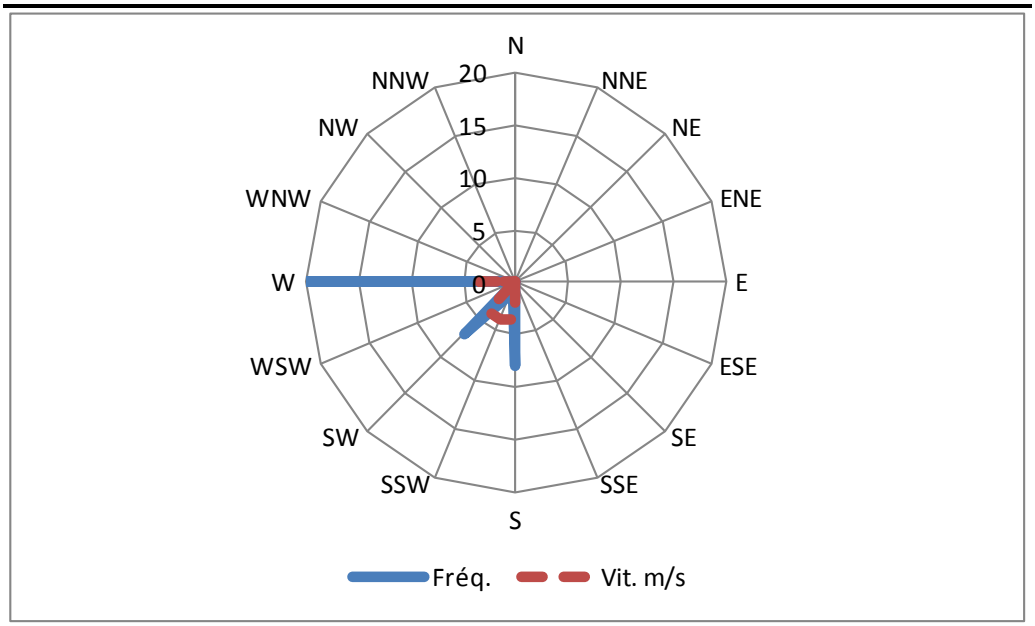
Source: World Bank Climate Change Portal, accessed in 2014- dataset produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

Winds

The data presented below are from the National Department of Meteorology (*Direction Nationale de la Météorologie de Guinée*) for the last three years (2013-

2015). The station is located at the international airport of Conakry. During the period 2013-2015, the prevailing wind in Conakry was from the West (W) with an average speed of 3.6 m/s. However, other directions, such as south (S) and southwest (SW) were also observed but with lower frequencies (See *Figure 4.3*).

Figure 4.3 Wind rose in Conakry (direction and speed of winds)



Source: Direction Nationale de la Météorologie de Guinée, 2013-2015

4.3.2 Geology, hydrogeology and hydrology

Endeavor as commissioned a specialized sub-contractor (Fugro) to perform a geotechnical survey and sub soil investigations. The engineering properties and geologic characteristics of near-surface soils and rocks will be investigated. The results are expected in July-August 2016. This information will be used for foundation design and can provide the Project sponsor with construction materials testing, pavement management and installation support.

The preliminary assessment of Fugro is that the geology in the area is expected to be volcanic bedrock / hard laterite cover between the depths of 10 to 20m. The upper layers are expected to be clayey. Presence of an aquifer at this depth is therefore considered as unlikely.

There are several small streams around the Project site. Most appeared to be very polluted with domestic waste (See *Figure 4.4* and *Figure 4.5*).

Figure 4.4 Small stream 300m south east of the Project site

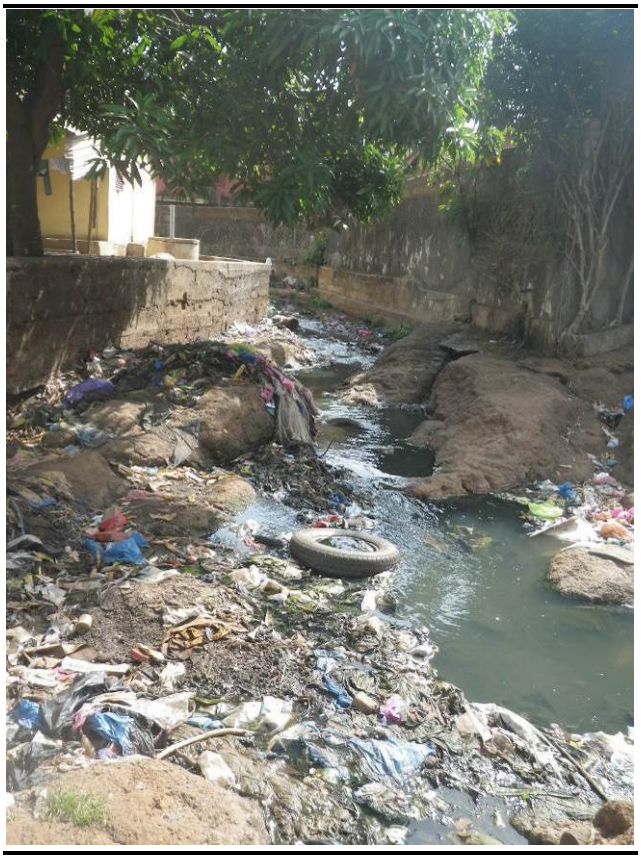


Figure 4.5 Small stream 150m from the Project site

4.3.3 Soils

As mentioned, Endeavor as commissioned a specialized sub-contractor (Fugro) to perform sub soil investigations. The characteristics of near-surface soils will be investigated. The results are expected in July-August 2016.

During ERM's sites visits, several staining were observed on site near the area where the Aggreko containerized power units (CPU) were located (see *Figure 4.6* and *Figure 4.7*).

As a preliminary assessment, it is possible that some contamination with hydrocarbons is observed in soils due to potential leaks during the operation of the Aggreko CPU. During Insuco's first visit, some CPUs were still present on site. *Figure 4.8* shows a CPU where the unloading zone that is not protected against leaks.

Figure 4.6 Soil staining observed on site at footprint of previous Aggreko containerised power unit (April 2016)

Figure 4.7 ***Staining observed on site where an Aggreko containerised power unit was located (April 2016)***

Figure 4.8 ***Photo of Aggreko CPU in March 2016 showing soil staining by heavy fuel oil***

4.3.4 *Air quality*

Air Quality Standards (AQS)

Current air quality conditions at the Project site have been assessed on the basis of the comparison of monitored concentrations against in force National and International Air Quality Standards (AQS). The standards have been described in the legislation chapter in *Sections* 2.2 and 2.4. *Table 4.1* below summarizes the Guinean standards and the IFC standards.

Table 4.1 Guinean and IFC/WHO air quality standards

Pollutant	Averaging period	Guinean AQS [µg/m³]	IFC/WHO AQS (a) [µg/m³]
SO_2	Calendar year	50	-
	24 h	125	125 (Interim target 1)
			50 (Interim target 2)
			20 (Guideline)
NO_2	Calendar year	40	40
	1 h	200	200
PM_{10}	Calendar year	80	70 (Interim target 1)
			50 (Interim target 2)
			30 (Interim target 3)
			20 (Guideline)
	24 h	260	150 (Interim target 1)
			100 (Interim target 2)
			75 (Interim target 3)
			50 (Guideline)
$PM_{2.5}$	Calendar year	65	35 (Interim target 1)
			25 (Interim target 2)
			15 (Interim target 3)
			10 (Guideline)
	24 h	-	75 (Interim target 1)
			50 (Interim target 2)
			37.5 (Interim target 3)
			25 (Guideline)
CO		-	-

(a) IFC Guideline value
(b) It corresponds to the IFC interim target -1 set on SO_2 24h concentration.
(c) Not to be exceeded more than once per calendar year

Air quality monitoring

ERM has undertaken an air quality monitoring survey for the airshed of the Project starting in April 2016. To date, the monitoring survey is still ongoing and the data reported in this Section covers the time period from 6 April 2016 to 5 May/2016 for one month.

The air quality monitoring survey focuses on the following atmospheric pollutants:

- NO_x, NO_2 and SO_2, concentrations have been measured at 5 monitoring sites since April 2016 by means of Gradko diffusion tubes (see *Figure 4.9*); and

- PM_{10} and $PM_{2.5}$, measured at one monitoring site inside the perimeter of the site in April 2016 (2 days) and May 2016 (6 days) by means of DustTrack device manufactured by TSI.

The nearest sensitive receptors that could be affected by a Project-related degradation of ambient air quality are the populations living in the direct surrounding of the site, located about 50-100 metres respectively all around the Project site.

Figure 4.9 shows the location of the monitoring sites. One monitoring site (AQ2) is located at the site boundary and four monitoring sites (AQ1, AQ3, AQ4 and AQ5) are located in the nearby residential areas (sensitive receptors).

Figure 4.9 Air quality monitoring sites

Site AQ1 is the furthest monitoring location upwind of the Project, and is considered as a "reference" point characterising the baseline ambient air quality within the wider Project airshed. Site AQ2 is located at the Power Plant boundary line with the road N1. It is thus located in an area strongly influenced by road traffic. AQ3, AQ4 and AQ5 are located downwind at sensitive receptors (see *Figure 1.4*). The monitoring sites are further described in *Table 4.2*.

Table 4.2 Monitoring sites description

Monitoring sites	Description
AQ1	Residential area – Simbaya area
AQ2	Site - boundary towards road
AQ3	Residential area - Limaniya area
AQ4	Education center - Institute Mohamed VI
AQ5	Town hall of Matoto

Survey methodology

It is noted that observed baseline data were not fully available while developing the ESIA for the Project. The latter included only measured concentrations of NO_x, NO_2 and SO_2 over a one-month period (6 April 20162016 to 5 May 2016).

The following *Table 4.3* provides an overview of the air quality monitoring survey.

Table 4.3 Overview of air quality monitoring survey

Pollutants Monitored	Monitoring Method	Monitoring Equipment	Monitoring Location	Monitoring Period	Monitored concentration
NO_x , NO_2 SO_2	Passive Sampling	Diffusion tubes (1)	Five (5) monitoring sites: AQ1 to AQ5 as shown in Figure 4.9	Ongoing Results available for the period between the 6 April 2016 to the 5 May 2016	Monthly concentration
PM_{10}, PM_{25}	Active Sampling	TSI DustTrack	One monitoring site inside the perimeter of the site	Periods of the monitoring: - between the 6 to 8 April 2016; and - between the 18to the 24 May 2016	1-minute concentration average into hourly and daily concentrations

(1) *Provided by Gradko Environmental Laboratory*

Gaseous components (NO_2, NO_x and SO_2) were monitored with diffusion tubes. This is an internationally recognised approach for collecting long-term average data on baseline ambient air quality.

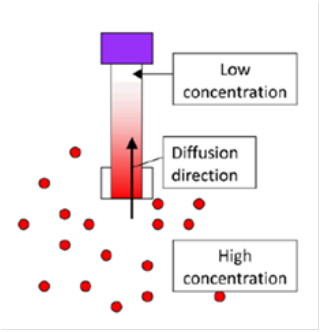
Diffusion tubes are designed for passively monitoring gaseous airborne pollutants and consist of small plastic tubes or box containing a chemical which reacts with NO, NO_2 and SO_2 present in the air. Once in place, diffusion tubes have one end left open to the atmosphere, and are retrieved after the exposure period and sent to a laboratory for the analysis and new tubes are installed.

The diffusion tubes used for this field survey were provided by *Gradko International Ltd*. *Box 4.1* overleaf provides a brief overview of their operating principles and main features.

Gradko tubes can be exposed from 2 weeks up to 4 weeks. An exposure period of 4 weeks was chosen for this survey and after this period tubes were sent to the Gradko laboratory for analysis. The Gradko laboratory conforms to the requirements of ISO/ICE 17025. The concentrations of each component chemically adsorbed are determined by UV / Visible Spectrophotometry (NO and NO_2) and Ion Chromatography (SO_2). Detection Limits are expressed as mass of component on the tube and amount to 0.03 µg S, 0.031 µg NO_x and 0.017 µg NO_2.

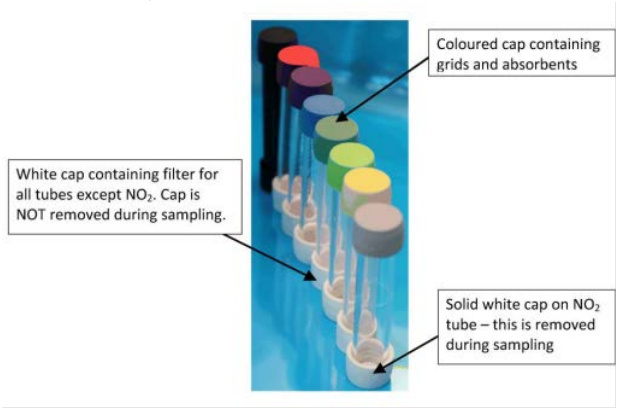
Box 4.1 Diffusion tubes (© Gradko)

How do Diffusion tubes work?
Diffusion tubes work by a process called molecular diffusion. During molecular diffusion, compounds will move from an area of high concentration to an area of low concentration. The compounds in the air are at a higher concentration than those in the tube, so the compounds diffuse into the tube and collect on the absorbent at the end of the tube. Because the compounds are absorbed, the low concentration in the tube is maintained, and therefore diffusion continues. The rate that the compounds move into the tube is called the uptake rate. This is a known rate and is used in the calculations during analysis.



Source: © Gradko International Ltd

Tubes are about 7 cm tall and 1.5 cm wide; many of the tubes are clear as light is required during the absorption process. Tubes are positioned vertically with the open end facing downwards during required sampling period; certain surfaces may act as absorbers leading to reduced atmospheric concentrations immediately adjacent to the tube. For this reason tubes should not be mounted directly onto a surface (ideally a spacer of at least 5 cm should be used between the surface and the tube).



Source: © Gradko International Ltd

Exposure Period and Lab Analysis
The exposure period is from 2 up to 4 weeks. After exposure, the tubes are sealed and returned to the laboratory for analysis. The laboratory analysis conforms to the requirements of ISO/ICE 17025. Different analysis techniques are used for the different diffusion tubes. The laboratory determines the concentration of the compound on the tube. This concentration is in turn used along with the uptake rate, to calculate the average compound concentration in air over the monitoring period.

Source: ERM, 2015

The particulate matter (PM) concentrations were measures by means of a TSI Dusttrak device (see *Box 4.2*). The device calculates in real time the 1 minute average of PM in the surrounding environment by means of an embedded

pump. The 1 min concentrations are average into hourly and daily concentrations. $PM_{2.5}$ and PM_{10} were monitored.

Box 4.2 TSI DustTrak device

DustTrak DRX 8533EP Monitor

Source: TSI user manual
http://www.tsi.com/uploadedFiles/_Site_Root/Products/Literature/Manuals/8533-8534-DustTrak_DRX-6001898-web.pdf

NO_2 and SO_2 monitoring results

The following *Table* 4.4 and *Table* 4.5 present the monitoring results collected for NO_2 and SO_2 respectively; results refer to the monitoring period from the 6th of April 2016 to the 5th of May 2016 It should be noted that the monitoring will go on for two months until the end of June 2016.

The monitoring activities conducted for NO_2 and SO_2 measured monthly concentrations of pollutants during the above mentioned period of one month.

The tables below report the average of the monthly concentration values collected over the first month only in comparison with WHO and Guinean AQS set on annual concentrations. The monitoring period will cover about 3 months in total.

Table 4.4 NO_2 monitoring results in April 2016

Site	NO_2 Ambient measured Concentrations [µg/m³]	Guinean and IFC standards set on NO_2 annual average concentration [µg/m³]	% of AQS at current baseline
AQ1	23.19	40	58%
AQ2	31.97	40	79.9%
AQ3	25.30	40	63.3%
AQ4	26.27	40	65.7%
AQ5	34.02	40	85.1%

Table 4.5 SO_2 monitoring results in April 2016

Site	SO_2 Ambient measured Concentrations [µg/m³]	Guinean standard for SO_2 annual average concentration [µg/m³]	% of AQS at current baseline
AQ1	4.03	50	8.1%
AQ2	6.94	50	13.9%
AQ3	2.92	50	5.8%
AQ4	4.88	50	9.8%
AQ5	5.78	50	11.6%

Monitoring results shows that NO_2 and SO_2 baseline concentrations are well below inforce AQS at sensitive receptors and at site boundary (sites from AQ1 to AQ5). Therefore the local airshed at sensitive receptors is classified as undegraded.

PM_{10} and $PM_{2.5}$ monitoring results

The following *Table 4.6* presents the monitoring results collected with a TSI DustTrack device for PM_{10} and $PM_{2.5}$. Results refer to the monitoring period between the 6th and the 8th of April 2016and the 18th and 24th of May 2016

The monitoring activities conducted for PM_{10} and $PM_{2.5}$ concentrations measured 1-minute concentrations subsequently converted to hourly average and then to daily concentrations for processing.

Table 4.6 Dust monitoring results obtained with the TSI DustTrack in April 2016

Parameters	Unit	IFC Air quality standard (24 hour average)	Guinean standards (24 hour average)	Monitored period: 6th to 8th of May 2016	Airshed Status
$PM_{2.5}$	µg/m³	25 (guideline)	-	41.2 (24 hour average)	Degraded
		75 (Interim target 1)			Undegraded
PM_{10}	µg/m³	50 (Guideline)	260	69.5 (24 hour average)	Degraded
		150 (Interim target 1)			Undegraded

Source: ERM, 2016

Table 4.7 Dust monitoring results obtained with the TSI DustTrack in May 2016

Parameters	Unit	IFC Air quality standard (24 hour average)	Guinean standards (24 hour average)	Monitored concentration 18th and 24th of May 2016	Airshed Status
$PM_{2.5}$	µg/m³	25 (guideline)	-	18.8 (24 hour average)	Undegraded
		75 (Interim target 1)			
PM_{10}	µg/m³	50 (Guideline)	260	29.2 (24 hour average)	Undegraded
		150 (Interim target 1)			

Source: ERM, 2016

4.3.5 Noise

Noise standards

Table 4.8 summarizes the Guinean and IFC HSE guidelines to community ambient noise levels. These prescribe an absolute level of 55 dB(A) during the daytime and 45 dB(A) during night time value in residential areas. These values make reference to noise from facilities and stationary noise sources, and are commonly applied as design standards for industrial facilities; IFC has indicated that these limits are not directly applicable to transport or mobile noise sources.

In environments where the ambient noise levels already exceed a level of 55 dB(A) daytime and/or 45 dB(A) night time the International Finance Corporation (IFC) includes a guideline stating that noise emissions should not cause the ambient noise level in a residential area to rise by 3 dB(A) or more, determined during the noisiest hour of a 24 hour period.

Referring to noise measurements, IFC gives several specifications on noise monitoring programs design, as follow:

- measurements are to be taken at noise receptors located outside the project property boundary;
- typical monitoring periods should be sufficient for statistical analysis and cover an appropriate time period according to noise variation (24h, hourly or more frequently); and
- monitors should be located approximately 1.5 m above ground and no closed to reflecting surface.

Table 4.8 summarizes the ambient noise levels with regards to the proposed Guinean standards and the IFC EHS Guidelines.

Table 4.8 Ambient noise levels: proposed Guinean standards and IFC guidelines

Period	Maximum Ambient Noise Level 1-hour Leq [dB(A)]				
	Guinean standards			IFC Guidelines	
	Class 1 Residential area	Class 2 Commercial area	Class 3 Industrial area	Residential Institutional, Educational	Industrial, Commercial
6:00 – 13:00	50	55	70	55	70
13:00 – 15:00	45	50			
15:00 – 22:00	50	55			
22:00 - 6:00	45	50		45	

Noise monitoring

In April 2016, noise measurements were carried out by ERM on site. Measurements were taken with one hour samples, at the limits of the Project site and at four receptors considered as potentially sensitive. Monitoring sites locations are reported in *Figure 4.10* and *Table 4.9*.

Figure 4.10 Noise monitoring sites

Table 4.9 Noise monitoring sites

Monitoring data reference	Monitoring Site	Receptors	X coordinate [m] WGS84 UTM28N	Y coordinate [m] WGS84 UTM28N
NOI_Rec-.006.s	N1	Residential buildings	653087.76	1060555.83
NOI_Rec-.002.s	N2	Residential buildings	653085.31	1061565.73
NOI_Rec-.003.s	N3	Residential buildings	653275.76	1061742.16
NOI_Rec-.004.s	N4	Residential buildings	653286.15	1061615.20
NOI_Rec-.007.s	N5	School	653619.15	1061913.69
NOI_Rec-.005.s	N2 (night time)	Residential buildings	653085.31	1061565.73

Note: noise monitoring was performed for 7 hours over the course of 5 days.

Survey methodology

1-hour noise measurements were undertaken during the day at the identified sensitive receptors; a monitoring period of 60 minutes was considered sufficient to analyze the acoustic climate of sites not affected by noise sources significantly varying throughout the day.

In addition, a 1-hour measurement was performed also during night time to provide a general overview of the nocturnal acoustic climate and highlight the presence of potential noise sources.

A LarsonDavis SoundTrack LxT® Type 1 Sound Level Meter (SLM) was used to conduct the attended measurements (see Box 4.3 for instrument's details), in compliance with IEC 61672-1/2/3:2002 regulations. The instrument was calibrated before the measurements and no significant calibration drift was detected.

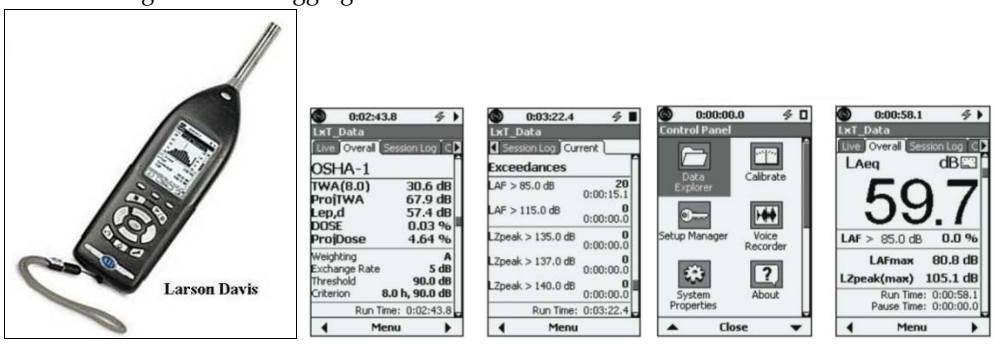
Box 4.3 SoundTrack LxT® Sound Level Meter

The Larson Davis LxT Sound Level Meter combines advanced sound level meter and real-time analyzer capabilities into a rugged, user-friendly, ergonomic package. The base unit is an Integrating Sound Level Meter (ISM) that meets Type 1 Standards and offers simultaneous measurement of sound pressure levels using fast, slow, and impulse detectors, for A, C, and flat frequency weightings.

The SoundTrack LxT® Sound Level Meter was developed to meet the unique needs of those involved in noise exposure assessment and plant noise surveys. It is fully compliant with IEC and ANSI standards for Class 1 or Class 2 sound level meters. In addition, LXT files are fully compatible with the ISO 9612:2009 measurement strategies for task or job-based measurements.

The SLM automatically performs all the necessary calculations of workplace exposure - to multiple compliance standards – and accommodates multiple data processing requirements, including:

- Sound Spectrum Analyzer (SSA) with simultaneous sound pressure level measurement, real-time 1/3 octave frequency analysis, spectral Ln and multiple time histories.
- Real-time Frequency Analyzer (RTA) provides rapid storage of 1/3 octave spectra at rates to 400/second, advanced trigger functions and automated determination of reverberation time.
- Fast Fourier Transform Analyzer (FFT) with 400-line resolution from 1 Hz to 20 kHz for specific frequency investigations. Includes snapshot data storage, THD calculations, user definable linear units, and more.
- Logging Sound Level Meter (LOG) provides advanced time and data logging features, including automatic logging of data associated user-defined noise events.



Source: http://www.larsondavis.com/

Results

Table 4.10 summarizes the ambient noise levels measured ($L_{Aeq,T}$, $L_{A,Min}$, $L_{A,Max}$, L_{A10}, L_{A90}) at each of the monitoring locations.

Table 4.10 Baseline noise measurements levels

Monitoring Site	Period	Duration	$L_{Aeq,T}$	$L_{A,Min}$	$L_{A,Max}$	L_{A10}	L_{A90}
N1	Daytime	1 hour	75.3	54.4	94.0	78.5	59.9
N2	Daytime	1 hour	70.2	56.9	94.6	72.3	62.8
N3	Daytime	1 hour	75.2	59.5	89.8	77.7	69.2
N4	Daytime	1 hour	60.7	49.0	84.3	63.0	52.3
N5	Daytime	1 hour	73.6	59.8	95.1	75.5	64.8
N2 (night)	Night time	1 hour	62.0	53.9	80.6	63.9	57.3

Table 4.11 Comparison of attended noise measurements with noise standards

Monitoring Site	Period	L_{Aeq} [dB(A)][1]	IFC noise limit [dB(A)]		Guinean noise limit [dB(A)]		Noise standard exceeded
			Day	Night	Day[2]	Night	
N1	Daytime	**75.3**	55	-	45	-	IFC/Guinean
N2	Daytime	**70.2**	55	-	50	-	IFC/Guinean
N3	Daytime	**75.2**	55	-	50	-	IFC/Guinean
N4	Daytime	**60.7**	55	-	50	-	IFC/Guinean
N5	Daytime	**73.6**	55	-	50	-	IFC/Guinean
N2	Night time	**62.0**	-	45	-	45	IFC/Guinean

Note:
[1] In bold the values exceeding IFC and/or Guinean noise limits.
[2] Defined for different hourly period, according to Guinean reference.

In comparison with the IFC standards, the measurement results presented in the summary table show that:

- During day time, the existing background noise levels are higher than the IFC day time threshold level of 55 dB(A), set as noise criteria relating to the operation of the Project, at all monitoring locations;

- At the location monitored also during the night, existing background noise level exceeded the IFC night time threshold level of 45 dB(A): receptor N2 experienced a background noise level higher than 60 dB(A). In this case, a significant contribution is caused by cars and trucks movement on the nearby road and by night activities.

In comparison with the future Guinean standards currently under development:

- At receptor N1, monitored between 1 p.m. and 3 p.m., the Guinean day time limit is 45 dB(A); this limit is exceeded.

- At others receptors, N2, N3, N4 and N5, there is an exceedance of the Guinean day time threshold level of 50 dB(A).

- At the locations monitored during the night, existing background noise levels exceeded the Guinean night time threshold level of 45 dB(A): Receptor N2 (night) experienced a background noise level higher than 60 dB(A).

4.4 BIOLOGICAL ENVIRONMENT

The land take of the Project will exclusively be within the existing concession area allocated by the Government; a brownfield area formerly occupied by the

Aggreko containerized plant and for the storage of material (cables, electrical transformers…). The site is located in an urban area and there is very little biodiversity on site.

4.4.1 Flora

A few patches of grassy and shrubby areas were observed during the site visit on the concession (*Figure 4.11*). It is highly unlikely the area hosts any remarkable or sensitive flora or fauna species. The immediate surroundings of the site fence line do not sustain any habitats of note, excepted for peri-urban shrub. The sensitivity of the biological environment of the project is assessed as low.

Figure 4.11 Spots of shrubs / grass adjacent to the Project location

4.4.2 Fauna

The Project is located in a highly anthropised urban area representative of the wider Conakry urban area. Very little diversity of fauna species is likely to be present.

4.5 SOCIAL ENVIRONMENT

4.5.1 National and local context of the Project

Conakry dates from the colonial period and was originally established on Tombo Island at the end of the 1880s. In 1900, the island was linked to the mainland by a bridge. The strait was eventually filled in during the 1950s, enabling the city to spread. Since its foundation, Conakry has undergone

rapid urban development, which continues today with the city now stretching as far as Coyah. Since 1991, the city of Conakry has been divided into 5 urban communes: Kaloum, Dixinn, Matoto, Ratoma and Matam.

The Project site is located in the Matoto commune. The site is known as the 'Tannerie' and is located at the junction between the T3 road and the highway. Until 2015, there was a 30MW diesel-fired power plant on the site. It is located in the Yimbaya Ecole district of Matoto commune.

Geographically, the Project site is in the middle of the built-up urban area and is surrounded by housing, businesses and transport networks. There are two particularly large facilities worthy of note within a 2km radius of the site: Conakry International Airport (1.5km to the south) and the Camp Alpha Yaya military base (660m to the south-west). Illustrations of the areas surrounding the Project site are shown in Figure 4.12 and Figure 4.13 below.

Figure 4.12 ***The roundabout linking the T3 road and the highway to the north-east of the site***

Figure 4.13 Yimbaya Tannerie market, south of the site

4.5.2 *Local government and forms of governance*

Governance of Conakry's communes

The executive powers of the urban communes are held by the mayor and his deputies, who are elected by the commune council, whose members are themselves elected by the local population through universal suffrage.[3] Elected for a 4-year term, the current mayors of Conakry's communes were appointed by the President of the Republic in 2011 and hold the title of "Special Delegates of the Communes"[4].

According to Article 106 of the Local Government Code (*Code des collectivités locales*), the council "makes decisions on all matters covered by the local authority's scope of responsibility, as well as any decisions required to ensure the smooth operation of services, the management of which has been transferred to the local authority by the State". The council must meet at least once a quarter (Article 110); however, it can also be convened whenever the local executive deems it necessary (Article 111). The secretaries general serve as head of the council and coordinate its administration.

The mayor's primary functions are defined in Article 150:

(1) Code des Collectivités Locales en République de Guinée, 2002, Titre II: 'Organisation des collectivités locales' (Republic of Guinea 2002 Local Government Code, Section II: Organization of Local Government).

(2) With the exception of the mayor of Matam commune.

"Under the supervision of the local council, in general terms, the local executive authority is responsible for executing the Council's decisions and, in particular, is responsible for:

- maintaining and managing local authority property;
- managing income, monitoring local services and local authority compliance;
- overseeing local public works;
- taking out contracts, issuing property leases and local works tenders in the form set out in law and regulations;
- representing the local authority in any legal proceedings in which it is involved."

The mayor is assisted by 3 vice-mayors (deputies).

Each council is organized into departments. There are 25 departments in Matoto split into sections. These departments include the departments of Health, the Environment, Housing, Public Health & Hygiene, Business, the Civil Registry and Micro-projects, etc.

There is a police precinct, which falls under the authority of the local council, within each commune, as well as several sub-precincts located in the districts. The communes are divided into districts[5] and there are 38 of these districts in Matoto. Each district is managed by a district head who reports to the mayor. Each district is further split into sectors, although this status is not officially recognized in the Local Government Code. Each sector is overseen by a sector head, assisted by a deputy.

Table 4.12 Governance of Conakry's urban Communes

Administrative Level	Function	Description of duties
Commune	Mayor	o Elected by the population
		o Highest authority of the Urban Commune
		o 4-year term. These are currently 'Special Delegations' appointed by the President in 2011
	Deputies	o 3 deputies or "Vice-Mayors"
	Other	o Council departments divided into sections
Districts	District Head	o Has authority in the district, a section of the urban commune
	1 Deputy	o Assists the District Head
Sector	Head	o Given de facto recognition but not formalized or

(3) Ibid, Article 3

Administrative Level	Function	Description of duties
		recognized by the Local Government Code
		o Generally appointed by local residents and the elders of leading families (within the area)
	Committee	o Not formalized
		o Generally elected by local residents and the Council of Elders
		o Manages sector funds and activities in conjunction with the Sector Head and Council of Elders; reports to the District Head
	Council of Elders	o Not formalized
		o The most important body, made up of elders from traditional, leading families

Governance in the districts in the study area

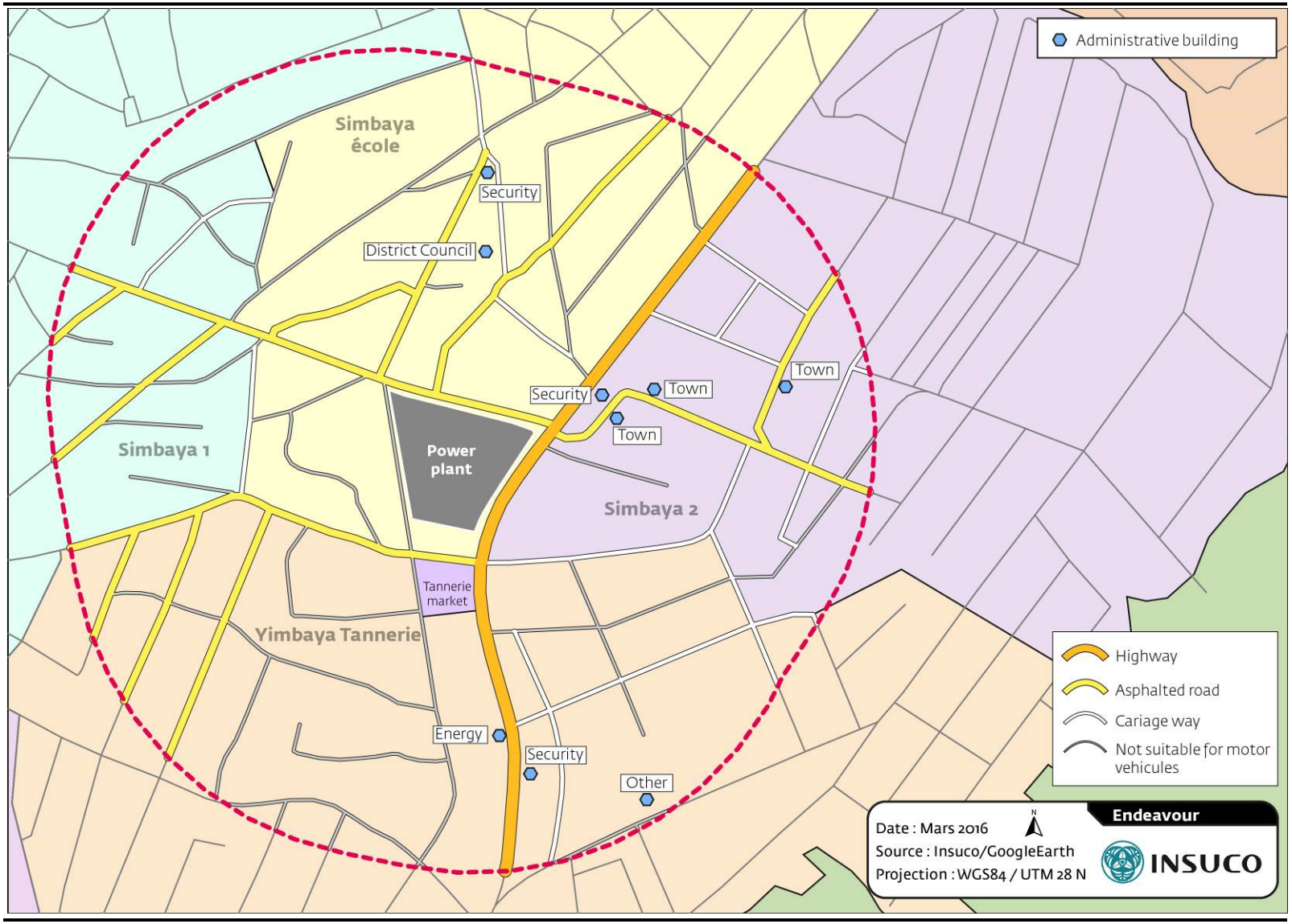
The districts within the study area are divided into sectors. Despite having been allocated a name for the 2014 population census, these sectors remain more commonly known by their number.

Table 4.13 The sectors within the districts in the study area

	Simbaya Ecole	*Simbaya 1*	*Simbaya 2*	*Yimbaya Tannerie*
1	Nomouké Diallo	Poudrière	Condebounyi	Menguebounyi
2	Limaniya	Hadja Kalia	Bah Cond	Déviation
3	Kondéboundji	T3	El Hadl Sedar Senghor	Moritri
4	Lizo Touré	Annour	Senaoui	Waninkhouré
5	Almamiya	La forêt		Agrume
6	Bolonta	Chérif Haidara		Komedh
7	Mosquée Centrale	Sèkhounayah		
8	Makissa Camara	Espace Kadiatou		
9	Marché	La Gare		
10		La Source		

The locations of administrative buildings in the Project area are indicated in *Figure 4.14.*

Figure 4.14 Administrative buildings within the study area



4.5.3 *Study areas' demography, history and social dynamics*

The Governorate of Conakry (1,660,973 inhabitants) is divided into 5 urban communes that all have the same dual status (administrative division and decentralized local authority): Kaloum, Dixin, Matam, Matoto and Ratoma.

The Commune of Matoto is made up of 37 districts and 226 sectors. The social study area covers only 4 districts: Simbaya Ecole, Simbaya 1, Simbaya 2 and Yimbaya Tannerie.

Matoto is the most densely populated commune in Conakry. It is home to nearly 660,640 inhabitants and 91,444 households, or around 7.2 people per household. 49% of the commune's inhabitants are women and 23% of these women are head of their household. Matoto covers a surface area of 37km², giving it a population density of 17,855 inhabitants per km². Thus, the population of the social study area is estimated to be 9,000 inhabitants; however, this population is unevenly distributed as the population density is much higher in the western half of the area (reaching 19,000 inhabitants/km).

The districts within the study area experienced high population growth between 1996 and 2014. According to data from the 1996 and 2014 general housing and population censuses (RGPH: *Recensement général de la population et de l'habitat*)[6], average annual population growth for this period was 3%. At the same time, Simbaya Ecole was created by splitting Simbaya 1 district into two separate districts: Simbaya 1 and Simbaya Ecole. If these two districts are considered to cover the same area as the original district, population growth here has reached as high as 900%.

Population density in all of these districts is very high. Based on the RGPH figures and surface area data obtained using information from the national observatory (*Observatoire National de la République de Guinée*) and field surveys, the population density of each district within the study area is as follows.

Table 4.14 Population density of the districts in the study area

District	Km²	Density - Inhabitant per Km²
Simbaya 1	0.89	17,832
Simbaya 2	0.76	19,326
Simbaya Ecole	0.51	32,564
Yimbaya Tannerie	0.97	26,468

(4) The RGPH data should be interpreted with caution as there are questions over the reliability of the data collection methods used.

According to the RGPH data, there is an average of 7 to 8 people per household in all districts. The local authorities consulted confirmed that young people (under 30 years of age) account for a large proportion of the population. The density of population in the project area is illustrated in *Figure 4.15*.

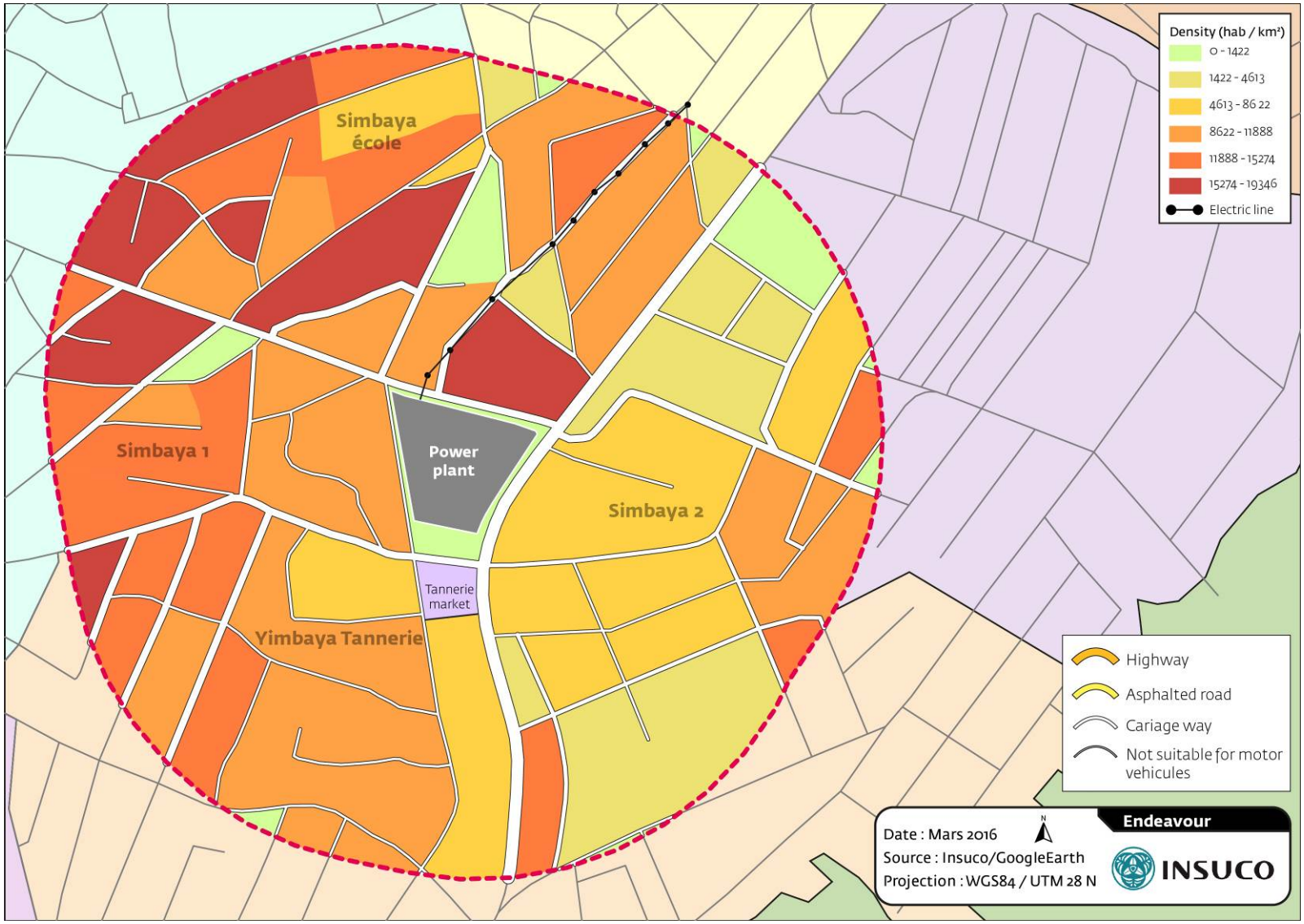
Table 4.15 Population growth within the four districts in the study area

District	*RGPH 1996 (h.hold)*	*RGPH 1996 (pop)*	*Approx. Households 2014*	*Estimated Pop. 2014*	*No. of people per household in 1996*	*No. of people per household in 2014*	*Population growth between 1996 and 2014 (%)*	*Average annual population growth between 1996 and 2015*
Simbaya Ecole	3,386	25,026	2,258	15 803	7.4	7	82	1%
Simbaya 1			2,100	14,700		7		
Simbaya 2	880	7,648	2,390	16,730	8.7	7	46	4%
Yimbaya Tannerie	2,162	15,708	3,681	25,768	7.3	7	61	3%

Source: www.stat-guinee.org

The majority of the people living in the districts are Muslim and from the Susu ethnic group. Other ethnic groups living in the districts include the Fula, Mandinka and Forestiers. Although the people from these various ethnic groups do not appear to mix insofar as they live in different areas, good relationships between ethnic groups and absence of conflicts were reported during public consultations as summarized in Chapter 6 of this report.

Figure 4.15 Map of population density within the study area



4.5.4 *Health*

Conakry's rapid urban development has led to a lack of adequate social and community facilities (such as schools and clinics) and basic infrastructure (roads, sewage, solid waste management and other networks).

Guinea has an 'integrated' health system. National health programs are carried out in all health establishments and a referral system has been set up between the different healthcare area levels. The health charter includes the following facilities:

- regional and prefectural hospitals, which are deconcentrated institutions;
- commune-level medical centers;
- health centers and improved health centers; and
- health posts, to improve people's access to curative care.

As far as public health is concerned, there are 3 health facilities located within the study area, 2 of which are in the immediate vicinity of the site. In Conakry, the most visited types of health facility are NGO/private clinic (42.9%) and health center (28.6%).

Given the size of the population, the number of health facilities available in the study area is limited. Within the study area's 4 districts, there is only one hospital bed for every 2,212 inhabitants.

Table 4.16 Breakdown of the health facilities located within the study area

District	Public health facility	Private health facility	Number of beds	No. of inhabitants/bed
Simbaya 1	1	0	5	3,161
Simbaya 2	0	0	0	0
Simbaya Ecole	0	0	0	0
Yimbaya Tannerie	1	1	28	920

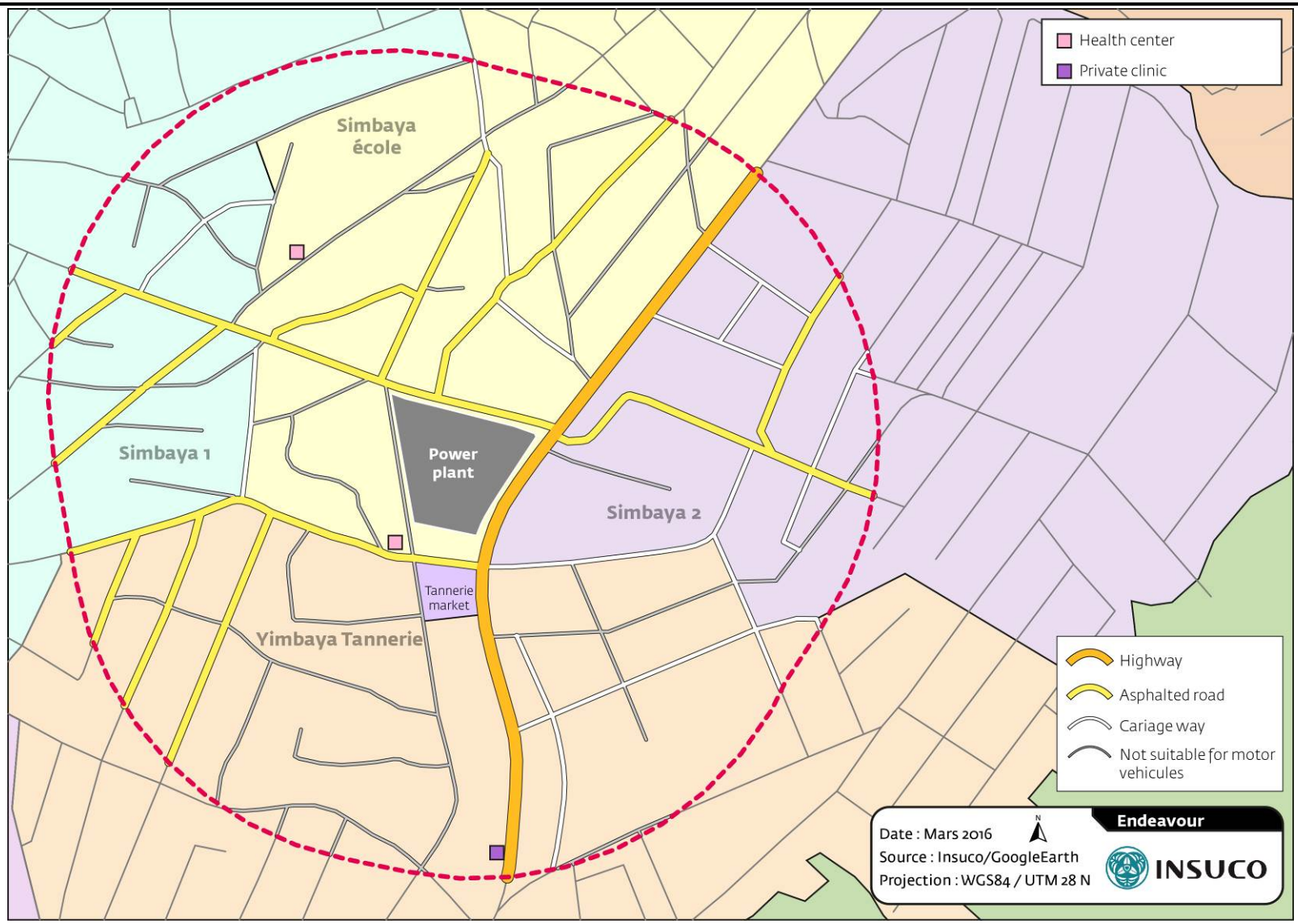
The study area contains two health centers and one private clinic. One of the health centers is in Simbaya 1 and the second is in Yimbaya Tannerie, as is the private clinic. The locations of the health facilities in the Project area are shown in Figure 4.16.

The health centers provide a 'minimum package' of healthcare services, which include primary curative consultations, pre-natal care, general patient care and family planning. They also run expanded vaccination and anti-malaria

programs and work to reduce child malnutrition. The health centers also have a pharmacy. They correspond to referral level facilities for an urban catchment area of 20,000 to 25,000 inhabitants that covers a theoretical radius of 10km.

The leading cause of consultations and visits to the area's health facilities is malaria.

Figure 4.16 Map of health facilities within the study area



4.5.5 *Education*

There are 512 schools within Matoto commune; 468 of these are private, 10 are middle schools and 9 are high schools. Compared to the other communes, Matoto contains a relatively high number of further and vocational education institutions. These include 4 universities and public colleges and 4 vocational training centers.

The number of educational establishments found within the study area is also fairly high. Close to 10 in total, these include 1 university and 3 secondary/vocational schools, as well as a training center. The proximity of these schools means that the school enrolment rate for children aged 6 to 14 stands at 91%.

Figure 4.17 ***One of the many primary schools located within the study area***

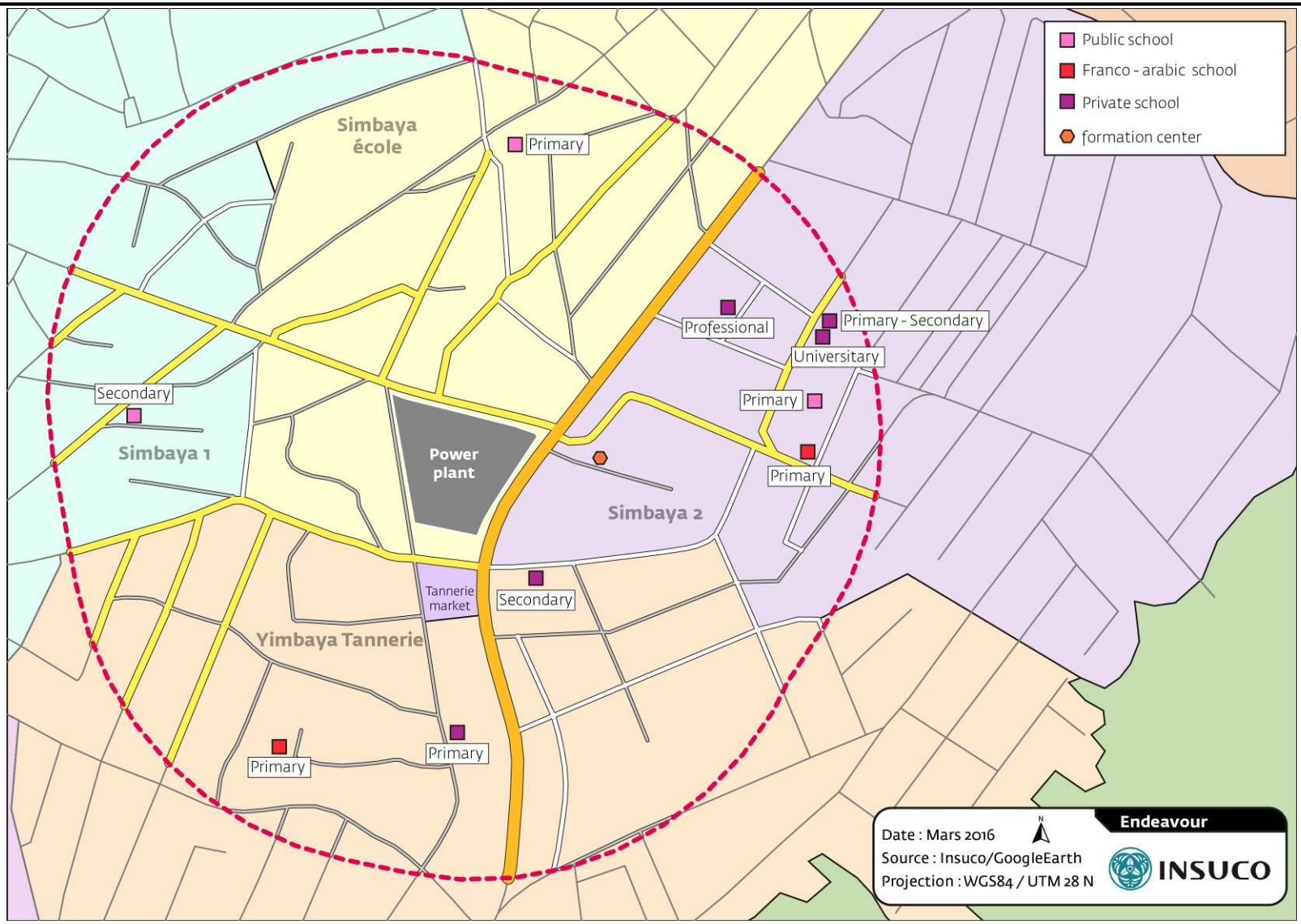
Table 4.17 ***Breakdown of the educational establishments located within the study area***

District	No. of primary schools	No. of secondary schools	No. of university centers	No. of vocational training centers	No. of public schools	Total number of students	No. of female students	Completion rate in 2013 - 2014 (%)
Simbaya 1	0	1	0	0	1	1,050	397	68
Simbaya 2	3	2	1	2	2	3,414	800	84
Simbaya Ecole	1	0	0	0	1	2,813	1,040	50
Yimbaya Tannerie	2	0	0	0	0	1,324	780	95

Therefore, within the study area, there are a total of 8,600 students within a 500 meter radius of the plant site. Over half of the 11 educational and training establishments are located in Simbaya 2 district. Although the exact number of students varies, there is an average of 1,300 students per school, which means that each establishment is comparatively large. In general, 39% of all students are girls; however, this figure is higher in Yimbaya Tannerie district. The average completion rate stands at 74%, with a lower rate recorded for schools in Simbaya Ecole.

The locations of the educational facilities in the Project area are illustrated in *Figure 4.18*.

Figure 4.18 Map of educational establishments within the study area



4.5.6 Socio-economic context

The main activities revolve around:

- The civil service: in the education and health sectors and in devolved administrative departments.

- Micro-enterprises: these are mainly small-scale tradesmen, such as ironworkers, sheet metal manufacturers, mechanics, carpenters, etc., as well as small service providers, notably providing transport services within Matoto commune.

- Small-scale retailers: they form a major part of the informal sector and sell their wares in the many urban markets.

- Agriculture and traditional fishing: these activities continue to be carried out, particularly on the outskirts of the city (next to the mangrove swamp). The crops grown include vegetables, oilseed, fruit and grains. Some families also keep poultry.

Thus, in 2009, average household income in Matoto stood at 150,000 GNF/month. There is a highly diversified mix of sources of income within Conakry. Small-scale retail activities provide an income for 31.2% of households, followed by trades and crafts (12.1%) and the civil service (11.6%), wages (10%) and entrepreneurs (9.6%).

Although there are a number of shopping and business areas within the study area (4 of which have more than 5 shops or retail premises), by far the most popular shopping area is the approximately 14,000m² Yimbaya Tannerie market. This market accounts for one of the main markets of Conakry.

4.5.7 Housing

Due to rapid population growth, urban development in Conakry has been irregular and disorderly, resulting in informal and illegal construction and the illegal occupation of land. Three main types of housing have been identified:

- Informal housing: residents have no official occupancy agreements; houses are all of the same quality and have sprung up haphazardly; they have no services but are built with solid materials.

- Renovated housing that was originally informal but which has undergone reconstruction; housing is laid out in a particularly tight grid pattern, but there is access to water, electricity and urban road services.

- Recently developed, high quality housing built on formal housing estates laid out in an orthogonal grid pattern.

Within the study area, 96% of the urban landscape consists of houses with fewer than 2 stories, with 1,532 of these low-rise houses identified during the survey. However, higher-rise buildings are also being developed as the area currently includes 52 housing units with more than 2 stories.

The majority of the households surveyed are tenants (54.7%), 35.3% are homeowners and the remainder is being provided with free lodging.

Figure 4.19 Development of high-rise apartment blocks in Conakry

The location of business activities in the Project area is shown in Figure 4.20. The location of other key infrastructures is indicated in Figure 4.21. The location of cultural facilities in the Project area is indicated in t

Figure 4.20 Map of business activities within the study area

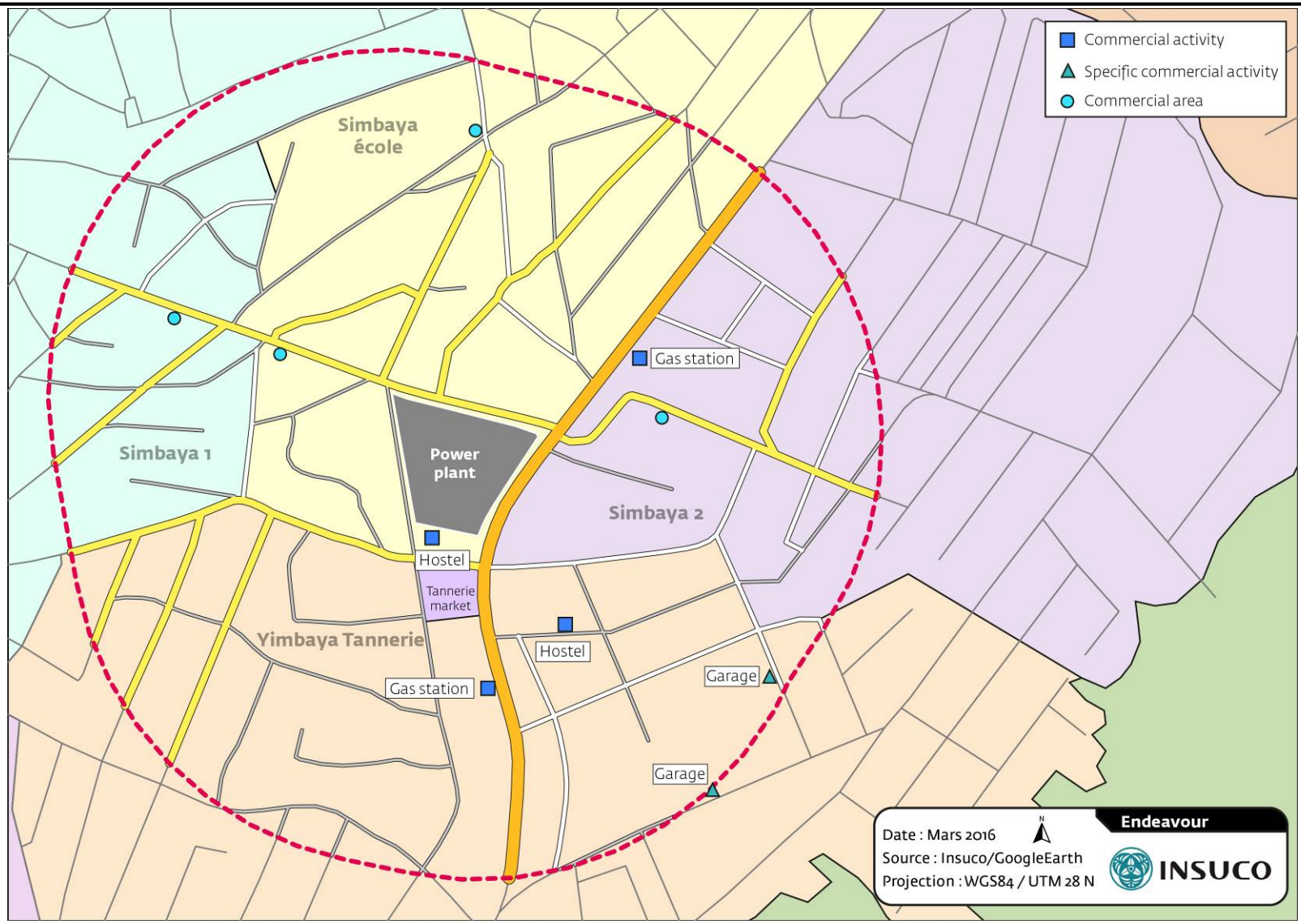


Figure 4.21 Map of other infrastructure located within the study area

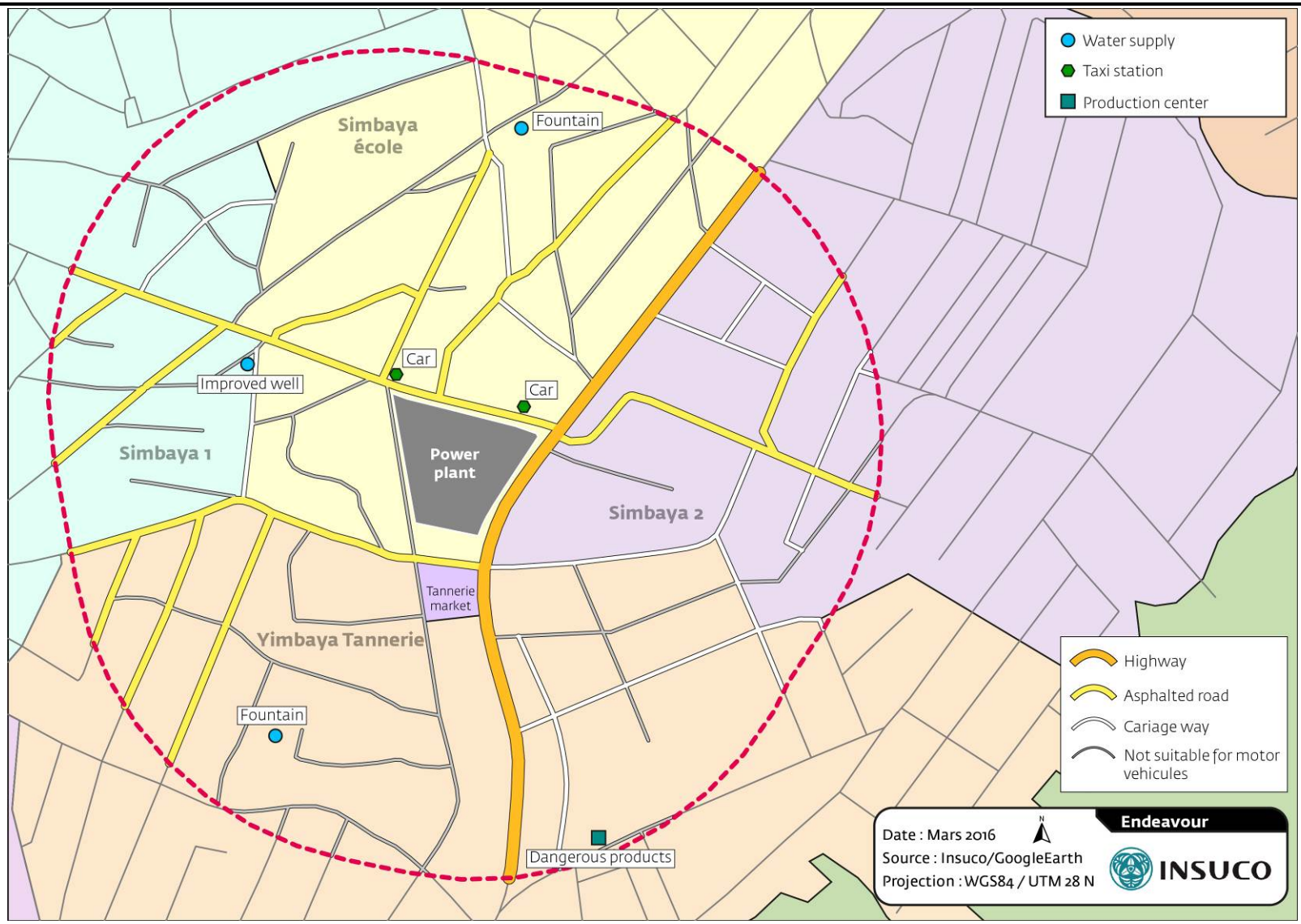
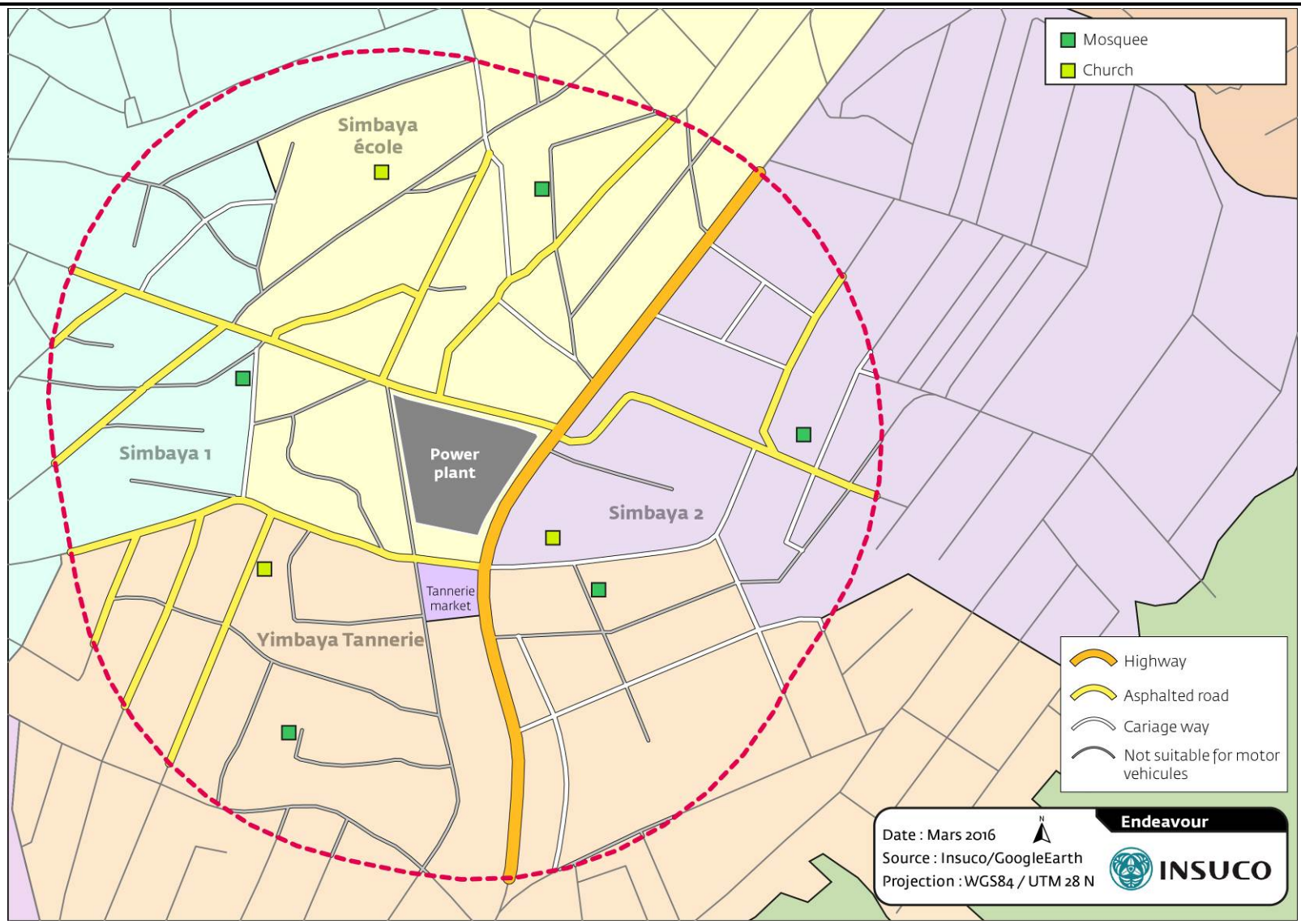


Figure 4.22 Map of cultural facilities within the study area



4.5.8 Water and electricity

With regard to water supply, running water from the tap is the main source of drinking water for the majority of households (87.4%), followed by water from a borehole with pump (5.6%). 4.5% of households continue to draw their water from traditional wells. The study area also contains two improved public water points.

Electricity remains relatively rare in Conakry, as it is used as a main source of lighting by only half of all households; meanwhile a quarter of Conakry's households continue to use candles.

4.5.9 Solid waste management and sanitation

Although the Municipal Direction for Hygiene and Sanitation is responsible for garbage collection, none of the neighborhoods has official point of garbage deposit. Waste collection trucks are in insufficient number and often out of order preventing waste collection and discharge at official landfill. Therefore, "savage" landfills are formed on free land and in gutters.

Figure 4.23 Landfill in the project vicinity

4.5.10 Land tenure

As part of his mandate as representative of the state, the mayor is able to sell state-owned land. Thus, according to certain local stakeholders, since the 1990s, a substantial amount of land has been sold off by the local authorities for financial gain.

Furthermore, procedures for securing land tenure in Guinea are both long and costly, meaning that land tenure insecurity is high, particularly in urban areas where real estate is at a premium. It is not uncommon for the administrative authorities to sell a plot of land on for a second time, with the initial owner being unable to enforce his property rights for lack of proof.

Lastly, land in public areas, such as sidewalks, power line corridors and even roads, are often illegally occupied, either by a housing extension or by retail or other business premises. For example, within the study area, the area around the site, between the surrounding fence and the road, is a public area occupied by a variety of premises, including shops, a garage, oxen sheds and even the landfill for Yimbaya Tannerie market. There is also a significant number of 'closed roads'; these are mainly pedestrian footpaths that have been blocked off by recently built housing developments. Finally, the EDG-owned power line corridor linking the plant site to the national grid is also illegally occupied, both by houses and businesses.

4.5.11 Road traffic and networks

The study area contains 13 paved roads, 13 roads suitable for traffic and 13 tracks that are not suitable for vehicles.

The Project site is located at a local crossroads, bordered by two major roads: Fidel Castro highway, a dual two-lane carriageway that runs east to west through Conakry, and Transversale 3, known as T3, which runs north to south and joins Conakry's second dual two-lane highway, Le Prince, that also runs longitudinally.

Table 4.18 Road traffic survey findings

road	total truck traffic	total car traffic	total motorbike traffic	total traffic excluding motorbike	total traffic during the day	total traffic at night	Total traffic
Fidel Castro highway	784	34,994	12,353	35,777	44,761	3,369	48,130
Le Prince highway	677	31,845	9,634	32,523	39,206	2,951	42,157
T3	97	8,430	3,682	8,527	11,354	855	12,209

The road traffic survey conducted for the study revealed high volumes of traffic on the roads adjacent to the plant site.

During the survey, over 12,000 vehicles used the T3 and over 48,000 vehicles used the Fidel Castro highway, with most traffic travelling from Matoto to Kaloum (63% of the total). More specifically, the majority of traffic on the Fidel Castro highway consists of either cars or minibuses (73%), with motorbikes

coming a distant second (26%) followed by trucks (2%). There are often traffic jams at the 'Tannerie' roundabout that links the T3 with Le Prince highway at peak rush hour periods, with people travelling between Conakry city center, the 'suburbs' and 'outer suburbs'. Thus, there are usually traffic jams here in the morning, between 7 and 10am, and in the evening between 4 and 7pm.

Road traffic accident statistics for Conakry shows a very high number of traffic accidents and casualties.

Between January and November 2014, 898 accidents were recorded; 116 people were killed and 210 others were seriously injured. In addition, 617 vehicles were severely damaged and 91 motorbikes completely destroyed. The main causes of road traffic accidents are linked to the vehicles' braking systems, the state of the roads, speeding and, in particular, poor knowledge of the Highway Code and vehicle regulations (Central Directorate of Traffic Police, 2014).

The rest of the study area contains only secondary roads. Half of these are suitable for cars and are often used as alternative routes to avoid traffic jams on the main roads, particularly paved secondary roads (23%). The other half of the secondary roads in the area are unsuitable for traffic.

5 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 INTRODUCTION

This chapter provides the results of the assessment of the potential environment and social impacts associated with the proposed Project. It is structured as follows:

- *Section 5.2* presents the impact assessment methodology;
- this is followed by an identification of environmental impacts that may potentially arise (*Section 5.3*), and a preliminary assessment of their significance (*Section 5.4*); and
- environmental impacts found to be significant are then assessed in further detail in *Section 5.5 to 5.9*.
- socioeconomic impacts are then assessed in *Section 5.10*.

5.2 IMPACT ASSESSMENT METHODOLOGY

5.2.1 *Rationale*

The purpose of the impact assessment is to identify and evaluate the significance of potential impacts on identified receptors and resources; to develop and describe mitigation measures that will be taken to avoid or minimise any potential adverse effects and enhance potential benefits; and to report the significance of the residual impacts that remain following mitigation.

5.2.2 *Predicting the magnitude of impacts*

The term 'magnitude' covers all the dimensions of the predicted impact to the natural and social environment including:

- the nature of the change (what resource or receptor is affected and how);
- the spatial extent of the area impacted or proportion of the population or community affected;
- its temporal extent (*ie* duration, frequency, reversibility); and
- where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

Table 5.1 provides definitions for the impact characteristics used in this assessment.

Table 5.1 Impact characteristic terminology

Impact Magnitude	
Type	**Direct –** impacts that result from a direct interaction between the project and resource/receptor. **Indirect –** impacts that follow on from direct interactions between the project and its environment as a result of subsequent interactions. **Induced –** impacts that result from other activities that happen as a consequence of the project.
Extent	**Local –** impacts that are limited to the power plant location in Conakry and the surrounding area. **Regional –** impacts that are experienced beyond the local areas to the wider region. **International –** impacts that are experienced at an international scale i.e. affecting another country.
Duration	**Temporary –** predicted to last less than the project duration. **Short-term** - predicted to last only for the duration of the construction activities (ie up to approximately one year). **Medium-term** - predicted to last from one year to the end of the project life (ie 5 years). **Long-term** - predicted to continue beyond the project life but will cease in time. **Permanent –** impacts that cause a permanent change in the affected receptor or resource that endures substantially beyond the project lifetime.
Frequency	**Continuous –** impacts that occur continuously or frequently. **Intermittent –** impacts that are occasional or occur only under specific circumstances
Likelihood*	**Unlikely –** the event is unlikely but may occur during the project. **Possible –** the event is likely to occur at some point during the project. **Likely –** the event will occur during the project (ie it is inevitable).

* For unplanned events only.

Magnitude describes the actual change that is predicted to occur in the resource or receptor (*eg* the area and duration over which land take will occur; the degree of impact on the livelihoods of a local community; the probability and consequences in terms of accidental events). An assessment of the overall

magnitude of an impact is, therefore, provided that takes into account all the dimensions of the impact described above to determine whether an impact is of small, medium or large magnitude.

5.2.3 *Sensitivity/vulnerability/importance of resources and receptors*

The significance of the impacts resulting from an impact of a given magnitude will depend on the characteristics of resources and receptors to that impact in terms of their sensitivity, vulnerability and importance.

The quality or importance of a resource will be judged taking into account, for example, it's national or international designation, its importance to the local or wider community, its ecosystem function or its economic value. The assessment of the sensitivity of human receptors will consider their likely response to the change and their ability to adapt to and manage the effects of the impact.

Where required, specific criteria for assessing sensitivity are presented under the relevant impact assessment sections.

5.2.4 *Assessing and reporting impact significance*

All human activity imposes some level of change to the natural and social environment, because of physical interactions with natural systems or other human activities. To provide information to decision makers and other stakeholders on the importance of different project impacts, the ESIA team makes an evaluation of the significance of each such change.

There is no statutory definition of significance. Therefore, in the ESIA, the evaluation of significance is inherently subjective. It is based on the professional judgement of the ESIA team, informed by legal standards, national and regional government policy, current industry good practice and the views of stakeholders. Where specific standards are either not available or provide insufficient information on their own to allow grading of significance, evaluation of significance will take into account the magnitude of the impact and the quality, importance or sensitivity of the affected resource or receptor.

Magnitude and receptor quality/importance/sensitivity are assessed in combination to evaluate whether an impact is, or is not, significant and if so its degree of significance (defined in terms of *Minor, Moderate* or *Major).* Impacts ranked as *Negligible* include those that are slight or transitory, and those that are within the range of natural environmental and social change. This principle is illustrated schematically in *Table 5.2*.

5.2.5 *Mitigation measures*

One of the key objectives of an ESIA is to identify and define socially and environmentally acceptable, technically feasible and cost-effective mitigation

measures. Mitigation measures are developed to avoid, reduce, remedy or compensate for the significant negative impacts identified during the ESIA process, and to create or enhance positive impacts such as environmental and social benefits. In this context the term mitigation measures includes operational controls as well as management actions.

Where a significant impact is identified, a hierarchy of options for mitigation is explored, as shown in *Box 5.2*.

Table 5.2 Significance matrix

Sensitivity / Vulnerability / Importance	Magnitude of Impact			
	Negligible	**Small**	**Medium**	**Large**
Low	*Negligible*	*Negligible*	*Minor*	*Moderate*
Medium	*Negligible*	*Minor*	*Moderate*	*Major*
High	*Negligible*	*Moderate*	*Major*	*Major*

Box 5.1 Context of impact significances

- An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.
- An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance.
- In either case, the magnitude should be well within applicable standards.
- An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
- All other impacts are considered of **major** significance.

For impacts that are initially assessed during the ESIA process to be of *Major* significance, a change in design is usually required to avoid, reduce or minimise these, followed by a reassessment of significance. For impacts assessed during the ESIA process to be of *Moderate* significance, where appropriate the discussion explains the mitigation measures that have been considered, the one selected and the reasons (*eg* in terms of technical feasibility and cost-effectiveness) for that selection. Impacts assessed to be of

Minor significance are usually managed through good industry practice, operational plans and procedures.

The ESIA is intended to help decisions on projects to be made in full knowledge of their likely impacts on the environment and society. As noted below, the residual impacts and their significance reported in this report are based on the proposed power plant development as described, i.e. inclusive of all proposed mitigation.

Box 5.2 ***Hierarchy of options for mitigation***

- **Avoid at Source –** avoiding or reducing at source through the design of the Project (eg avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).
- **Abate on Site –** add something to the design to abate the impact (eg pollution control equipment, traffic controls, perimeter screening and landscaping).
- **Abate at Receptor –** if an impact cannot be abated on-site then control measures can be implemented off-site (eg noise barriers to reduce noise impact at a nearby residence).
- **Repair or Remedy –** some impacts involve unavoidable damage to a resource (eg. vegetation clearance on the site where the development will be stablished) and these impacts can be addressed through repair, restoration or reinstatement measures.
- **Compensate in Kind –** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (eg planting to replace damaged vegetation, financial compensation for damaged crops).

5.2.1 *Reporting residual impacts significance*

The degree of significance attributed to residual impacts indicates the level importance that should be associated with each impact, in the decision-making process on the Project.

Box 5.3 ***Weight of residual impacts in the decision-making process***

Impacts of *Major* significance, whether positive or negative, are considered to warrant substantial weight, when compared with other environmental, social or economic costs and benefits; conditions will be expected to be imposed to control and, if necessary, monitor adverse impacts and deliver benefits.

Impacts of *Moderate* significance are considered to be of reducing importance to making decisions, but still warranting careful attention to conditions regarding mitigation and monitoring, to ensure the most appropriate (technically feasible and cost-effective) mitigation measures are used and to ensure benefits are delivered.

Impacts of *Minor* significance are brought to the attention of decision-makers but will be identified as warranting little if any weight in their decision; mitigation will be achieved using normal good practice and monitoring may be required to confirm that impacts are as predicted.

5.2.2 *Uncertainty*

Even with a final Project description and an unchanging environment, predictions of impacts and their effects on resources and receptors can be uncertain. Predictions can be made using varying means ranging from qualitative assessment and expert judgement through to quantitative techniques (*eg* air quality modelling). The accuracy of predictions depends on the methods used and the quality of the input data for the Project and the environment. Where uncertainty affects the assessment of impacts a conservative (*ie* reasonable worst case) approach to assessing the likely residual impacts is adopted with mitigation measures developed accordingly. To verify predictions and to address areas of uncertainty, monitoring plans are proposed.

5.3 *SCREENING/PRELIMINARY IDENTIFICATION OF IMPACTS*

The initial stage of the assessment process is the screening of potential impacts. This was conducted during the scoping phase based on a preliminary Project description and involved the production of a high-level, matrix of potential interactions between the proposed activities and the surrounding environment. The preliminary interaction matrix for the Project is included as *Table 5.3*.

Table 5.3 Impacts screening matrix for the 50 mw power plant project

Project Phases and Activities	Physical					Biological		Socio-Economic						
	Geology and soils	Hydrology and hydrogeology	Air Quality	Climate change	Noise and Vibration	Biodiversity and nature conservation	Invasive / Alien species	Economic displacement	Livelihood and Socioeconomic activities	Community HS	Landscape and Visual	Cultural Heritage	Ecosystem Services	Occupational HS
Construction phase														
Job creation, training and business opportunities									■	■				
Land clearance / creation of watertight surface, generating site runoff/ construction of infrastructure		■	■		■			■		■				■
Chemical storage, waste storage and disposal	■	■								■				■
Equipment / material/worker transport			■	■	■					■				■
Physical presence of workers									■	■				■
Accidental events (spills/uncontrolled releases)	■	■								■				■
Water supply		■							■	■				■
Operational phase														
Reciprocating engines power generation			■	■	■				■	■				■
Accidental events (non-routine hydrocarbon or chemical spills)	■	■								■				■
Physical presence of workers									■	■				■
Site runoff (uncontaminated rainfall runoff and potentially contaminated drainage)	■	■								■				
Water supply		■								■				■
Induced traffic			■	■	■					■				■
Decommissioning phase														
Equipment / material/worker transport			■	■	■					■				■
Accidental events (spills/uncontrolled releases)	■	■								■				■
Induced traffic			■	■	■					■				■

Note that the absence of environmental aspects related to biodiversity is due to the fact that the Project is located within an urbanised area, on a brownfield site, with no nearby natural habitat of note.

5.4 *PRELIMINARY ASSESSMENT OF IMPACTS*

From the information provided in the screening matrix, a more detailed preliminary assessment was performed.

Potential interactions between the Project and environmental and social sensitivities are listed the left hand of the Table 5.4. These are assessed to determine whether they are significant or not, based on the magnitude of impacts and the quality, importance or sensitivity of the receiving environment. Mitigation measures are taken into account in assessing the significance of the impact.

- *Table 5.4* presents the preliminary assessment of the impacts associated with the construction phase of the Project; and

- *Table 5.5* presents the preliminary assessment of the impacts associated with the operational phase of the Project.

Table 5.4 Preliminary assessment – environmental impacts on construction phase

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
CONSTRUCTION PHASE – ROUTINE EVENTS					
Geology and soils	Pollution of soils by Project due to improper storage of chemicals and/or wastes.	• appropriate sealing of soil surfaces, in particular where hazardous chemicals (hydrocarbons, maintenance chemicals etc) are used; • spills prevention plan; • spills response and cleanup plan, • storage of hazardous substances and wastes (i.e. oil) in tanks / containers in bunded areas; and • hazardous wastes will be disposed of through recycling and industrial waste disposal companies in Guinea.	**Negligible**– The potential degradation of soil quality due to the storage of chemicals and wastes is considered unlikely and in any case of local scale and temporary.	**Low -** The site is a brownfield already transformed for its previous usage located in an urban area. Note that the site may already be impacted by previous activities. This will need to be determined through specific site investigations, and possibly remediated	**Negligible**
	Deterioration of soil quality (soil erosion, loss of soil) due to civil works (land clearance creation of watertight surface, etc.).	• areas of ground disturbance will be clearly defined; ground disturbance outside these areas will be avoided; • top soils removed will be stored and reused when practicable; and • excavated material will be used, where possible, for onsite landscaping/re-profiling.	**Small** – Potentially affected area will be of local scale and limited to the site (max 26 500 m²). Additional erosion due to rainwater or wind will be non-significant considering the creation of a watertight surface.	**Low -** The site is a brownfield already transformed for its previous usage located in an urban area.	**Negligible**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
Hydrology and Hydrogeology	• deterioration of surface or groundwater quality due to hazardous substances spills or infiltration of water run-off from contaminated areas; and • affection to groundwater due to liquid discharges (eg black and grey water).	• appropriate sealing of soil surfaces, in particular where hazardous chemicals (hydrocarbons, maintenance chemicals etc) are used; • spills prevention plan; • spills response and cleanup plan; • creation of watertight surface to avoid infiltration and affection to groundwater; • storage of hazardous substances and wastes (i.e. oil) in tanks / containers in bunded areas; and • sewage / sanitary effluent will be treated in a wastewater treatment unit before being discharges into the public sewage system or used to water green spaces.	**Negligible–** Infiltration of pollutants with runoff water will be prevented through appropriate site management, and is not expected unless in the unlikely event of accidental spills given the mitigation measures in place and that the majority of wastes generated will be inert. Hazardous chemicals and wastes will be properly stored and secured.	**Medium –** Potential use of shallow groundwater by local communities for domestic use. Note that the site, nearby stream, and underlying groundwater aquifers may already be impacted by previous activities. This will need to be determined through specific site investigations, and possibly remediated	**Negligible**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
Noise	Increase in noise levels with the associated disturbance to communities and fauna.	• select recent, well maintained construction equipment and vehicles compliant with international best practice for noise emissions; • prefer electrical power plant to mechanical alternatives, where feasible; • use of power generators equipped with sound mufflers; • enclosure of the main fixed sources of noise (power generators mainly); • switch off equipment when not in use; • avoid night-time work; • whenever feasible, schedule different noisy activities to occur concurrently, since the combined noise levels produced may not be significantly greater than the level produced if the operations were performed separately; and • locate stationary equipment as far as practicable from nearby receptors.	**Small** – noise emissions will be of temporary nature and limited to civil engineering works and site deliveries.	**Medium** – the site is located in an urban area already considered noisy due to routine activities. The presence of sensitive receptors in the vicinity (schools, hospitals, residential areas), increases the sensitivity to this type of nuisance.	**Minor**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
Biodiversity and nature conservation and alien species introduction	• destruction of fauna and flora habitats; • removal of existing vegetation in the site; • disturbance to fauna and flora due to noise and dust generation; and • introduction of alien/invasive species.	• the site layout has been optimized to minimize the size of the footprint during construction activities; • areas of required ground disturbance will be clearly defined and ground disturbance outside these areas will be avoided; and • no alien / invasive species will be planted in the site.	**Small –** the maximum area that will be affected by vegetation clearance is limited to 26 500 m², corresponding to the full area of the site, though most of it currently lacks of vegetation.	**Low -** The site is a brownfield in an urban area with very low density of vegetation cover and absence of protected flora or fauna species in both, the site and the surroundings. Nearest natural site is located 700 m SE of the site, a location already affected by the influence of the urban area	**Negligible**
Landscape	Affection to landscape and urban skyline due to the presence of cranes and the creation of facilities	The site will be fenced	**Small –** the presence of cranes and other equipment will be temporary during the duration of the construction works and its visibility will be limited.	**Low -** The site is a brownfield located in an urban area (relatively homogenous landscape) where civil works are not unusual. In addition no big trees or relevant facilities will disappear during construction works.	**Negligible**
Traffic	• increase in traffic density; and • impact on traffic safety	• application of the company's road safety policy to operator and contractor vehicles; and • optimization of routes and schedule of transport of goods and workers to avoid main traffic times to the extent possible	**Small–** increase in traffic will extend for a year during construction including the daily transport of workers (up to 150 people) and goods. The construction fleet is still not known, but it will be relatively small (expected approximately 8-10 mini buses, 11 trucks daily and some cars).	**Medium-** Traffic in Conakry is already busy, with significant traffic jams at peak hour, and poor road safety conditions.	**Minor**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
UNPLANNED / ACCIDENTAL EVENTS: CONSTRUCTION PHASE					
Accidental spill of chemicals / fuel during construction	Impact to soil , to groundwater by infiltration of pollutants, to surface water by runoff and/or to flora and fauna	• proper storage of chemicals, fuels and hazardous wastes (liquids stored in watertight storage tanks, in bunded areas/sealed soil areas, with appropriate roofing to prevent infiltration of rainwater.); • oil and chemicals spill prevention equipment, measures and procedures; • maintenance of vehicles and machinery; and • management plan of dangerous products.	**Small –** potential spills during construction would be of very small volume as no major storage of fuel or chemicals are expected. Occurrence is unlikely. In the event of an incident the extent of impacts would be directly related to the duration and volume of the release and in most occasions limited to the construction site.	**Medium –** medium sensitivity due to the potential affection to groundwater used to supply the city and the natural area extending 700 m east of the site.	**Minor**

Table 5.5 Preliminary assessment – environmental impacts on operation phase

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
OPERATION PHASE – ROUTINE EVENTS					
Geology and soils	• pollution of soils due to storage of chemicals and/or wastes; and • land occupation.	• creation of watertight surface to avoid infiltration and affection to groundwater; • storage of hazardous substances and wastes (i.e. oil) in tanks / containers in bunded areas; and • oil and water separators in the vicinity of the HFO/DDO storage and handling areas.	**Small–** Considering the creation of a watertight surface and the mitigation measures in place the potential affection to soils and geology due to the storage of chemicals and wastes is considered limited in extent and temporary in nature, considering any pollution will be cleaned. The land occupation will be limited in extent to a maximum of 26 500 m².	**Low -** The site is a brownfield already transformed for its previous usage located in an urban area. Existing soils are unproductive.	**Negligible**
Hydrology and Hydrogeology	• potential degradation of soil / groundwater quality due to infiltration of potentially polluted water runoff; • potential degradation of soil / groundwater quality due to liquid discharges (black and grey water).	• site area will be watertight in particular for hazardous chemicals or waste storage areas and processing area, to avoid infiltration and affection to groundwater; • storage of hazardous substances and wastes (i.e. oil) in tanks / containers in bunded areas; • oil and water separators in the vicinity of the HFO/DDO storage and handling areas; and • liquid discharges will be treated in a wastewater treatment unit before being routed to the effluent pond and discharged into the public sewage system or used to water green spaces	**Negligible–** Infiltration of pollutants with runoff water is not expected unless in case of accidental spills (see Section 5.10 accidental events).	**Medium –** Potential use of shallow groundwater by local communities for domestic use.	**Negligible**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
	• affection to surface water due to potentially polluted water runoff; and • affection to surface water due to liquid discharges (black and grey water).	• storage of hazardous substances and wastes (i.e. HFO, DFO, sludge, lubricants) in tanks / containers in bunded areas; • oil and water separators in the vicinity of the HFO/DDO storage and handling areas; • liquid discharges will be treated in a wastewater treatment unit before being routed to the effluent pond and discharged into the public sewage system or used to water green spaces	**Small –** Runoff water from rainfall is expected to contain low quantities of pollutants, if any. Liquid discharges will be done after treatment into the public sewage system or used to water green spaces, not being discharged into water courses	**Low -** The site is a brownfield in an urban area. Closest surface water course is located 700 m SE of the plant	**Negligible**
Air Quality and Climate change	Release of gaseous emissions (PM_{10}, SO_x, NO_x, VOC, CO) – with potential effects on air quality from the operation of the power plant generators	• stack height will be of 30 m to provide for better dispersion of atmospheric emissions, as calculated through numerical modelling as part of this ESIA; • use low-sulphur fuel (2% maximum sulphur content); and • routine inspection and maintenance of engines, vehicles, generators and other equipment to minimise air emissions.	**Small –** modelling studies (see hereinafter) show that impacts on air quality will be very limited.	**Medium –** Presence of sensitive receptors in the vicinity of the plant location.	**Minor**
	Emission of greenhouse gases (CO_2, CH_4)	Appropriate maintenance of combustion engines to ensure adequate / efficient operation.	**Medium –** the operation of the combustion engines will generate CO_{2eq} emissions during the lifetime of the Project , estimated in 5 years	**Low –** Greenhouse gas emissions in Guinea are limited when compared to other countries	**Minor**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
Noise and vibration	Increase in noise levels with the associated disturbance to communities and fauna.	• best practice and good operation management will be applied; • routine inspection and maintenance of combustion engines to ensure adequate operation; and • routine inspection and maintenance of engines, vehicles, generators and other equipment to minimise noise emissions.	**Minor –** noise emissions will occur at site during operation 24 hours a day. Emissions will not affect local residents as noise level increase above background levels will be barely perceivable for most receptors.	**Medium –** the site is located in an urban area already considered noisy due to routine activities. The presence of sensitive receptors in the vicinity (schools, hospitals, residential areas), increases the sensitivity to this type of pollution.	**Negligible**
Biodiversity and Nature Conservation and alien species introduction	Disturbance to fauna and flora due to noise and air emissions	No mitigation required in addition to best practice and good operation management	**Negligible –** No affection to biodiversity, other that urban related fauna already adapted to such an environment, is expected.	**Low -** The site is located in an urban area with very low density of vegetation cover and absence of protected flora or fauna species. Nearest natural site is located 700 m SE of the site, a location already affected by the influence of the urban area (noise emissions and air quality)	**Negligible**
Landscape	Affection to landscape and urban skyline due to the presence of power plant facilities, especially from the 6 planned stacks	No mitigation required	**Medium –** the 30 m height stacks will be visible hundreds of metres away from the site becoming a relevant point in the city's skyline.	**Low -** The plant will operate in an urban area where industrial activities already occur. Landscape is relatively homogenous.	**Minor**

Aspect	Potential Impact	Mitigation & Management Measures	Impact Magnitude	Receptor Quality, Importance or Sensitivity	Residual Significance
Traffic	• increase in traffic density; and • impact on traffic safety.	• application of the company's road safety policy to operator and contractor vehicles; • optimization of routes and schedule of transport of HFO/DFO.	**Small–** it is expected that 10 trucks will supply daily the power plant.	**Medium-** Traffic in Conakry is already busy, with significant traffic jams at peak hour, and poor road safety conditions.	**Minor**
UNPLANNED/ ACCIDENTAL EVENTS: OPERATION PHASE					
Accidental spill of chemicals / fuel (HFO/DFO) during construction	Impact to soil , to groundwater by infiltration of pollutants, to surface water by runoff and/or to flora and fauna	• proper storage of chemicals, fuels (HFO/DFO) and hazardous wastes (liquids stored in tanks in bunded/ sealed areas, all in covered places, etc.); • oil and chemicals spill prevention equipment, measures and procedures; • management plan of dangerous products; and • oil and water separators in the vicinity of the HFO/DDO storage and handling areas.	**Medium–** a large spill of HFO or DFO or other compounds is considered unlikely, though in case of occurrence it could have an effect on the local area soil and groundwater quality, or even the nearshore marine environment (if spill extends to nearby stream and into the sae).	**Medium** – medium sensitivity due to the potential affection to groundwater used to supply the city and the natural area extending 700 m east of the site.	**Moderate**

The majority of environmental aspects of the proposed Project have been identified to be *Negligible* or *Minor* significance. Of those operational impacts identified as significant, only air emissions during operation phase are assessed as *Moderate* significance. Events related to accidental occurrences (hydrocarbon spills) could also trigger a significant impact, but are highly unlikely and will be prevented by appropriate site design and operational management.

The following subsections present the discussions on those impacts assessed as significant (*Minor* or *Moderate*) warranting a more detailed assessment and a more comprehensive discussion of the mitigation measures adopted.

5.5 IMPACTS ON AIR QUALITY

5.5.1 Overview

Approach taken

The assessment of construction impacts from the Project was based on qualitative criteria, whereas the assessment of operational impacts was supported by an atmospheric dispersion study and was based on quantitative criteria.

The choice of a qualitative evaluation for the Project's construction phase is based on the temporary and variable nature of atmospheric emissions produced during this phase. The significance of potential impacts on air quality was assessed based on the type of emissions and the dispersal capacity of emissions into the atmosphere.

During the operations phase, atmospheric emissions will be continuously released into the atmosphere by the Project facilities, and impacts on local air quality are more likely to occur. As a consequence, the assessment of operational impacts was supported by an atmospheric dispersion modelling study performed with the USEPA-approved modelling system CALMET-CALPUFF[7]. The modelling study quantified the contribution of the Project emissions to atmospheric concentrations of pollutants in the Project area. Quantitative criteria have been developed to correlate the outcome of the modelling study to the impacts intensity (defined in section below in this section). These criteria are reported in the following part of this section.

Applicable Air Quality Standards

Guinean air quality standards and World Health Organization (WHO) standards have been selected for the purpose of this assessment. The WHO

(1) [7] http://www.epa.gov/scram001/dispersion_prefrec.htm#calpuff

Air Quality Standards establish Interim Targets and guideline values for protection of human health:

- the guideline values are aspirational and are intended to confer a maximum degree of protection; and

- the Interim Targets are set at points to allow the staged achievement of air quality standards. These are proposed as incremental steps in a progressive reduction of air pollution and are intended for use in areas where pollution is high.

Given the above, for the purpose of this assessment, WHO Interim Target 1 has been used to derive the evaluation criteria (considered to represent concentrations in ambient air above which health effects can reasonably be expected to occur). The standards are set out in *Table 5.4*.

Table 5.4 Air quality standards for the protection of human health

Pollutant	Averaging period	Air quality standard (µg/m^3)		
		IFC Interim Target 1	IFC Guideline	Guinean limit
PM_{10}	24 hour mean	150	50	80
	Annual mean	70	20	260
$PM_{2.5}$	24 hour mean	75	25	-
	Annual mean	35	10	65
NO_2	1 hour mean	200	200	200
	Annual mean	40	40	40
SO_2	24 hour mean	125	20	-
	10 minute mean	500	500	-
	Annual mean	-	-	50

Magnitude criteria for Operational Impacts on Air Quality

The definition of the intensity criteria is based on international guidance released by the IFC and World Bank(8) and takes into account the following elements:

- the Process Contribution (PC): this is the impact on air quality from the process emissions only;

- applicable air quality standards (AQS), presented in the Air Quality Baseline *Section 4.3.4* and reported below in *Table 5.5*;

(8) Environmental, Health, and Safety Guidelines for Air Emissions and Ambient Air Quality, IFC / World Bank, 2007.

- the Predicted Environmental Concentration (PEC): this is the PC cumulated with the existing baseline; and

- consideration of the exiting baseline conditions, and evaluation of whether the local airshed is degraded or undegraded.

Table 5.5 summarises the impact magnitude criteria used in this assessment.

Table 5.5 Evaluation criteria for the magnitude of impacts on local air quality

Magnitude of impacts	Undegraded Airsheds (Baseline < AQS[b])	Degraded Airsheds (Baseline > AQS[b])
Negligible	PC < 25% of AQS	PC < 10% of AQS
Low	PC > *25% of AQS, <50% of AQS*[1] and *PEC<100% of AQS*	PC > 10% AQS, <15% of AQS
Moderate	PC > 25% AQS, <50% of AQS and *PEC >100% of AQS;* or PC > *50% of AQS, <100% of AQS*[1] and *PEC <100% of AQS*	PC >15% of AQS, <25% of AQS
High	PC > 50% of AQS, <100% of AQS and *PEC >100% of AQS;* or PC > *100% of AQS*[1]	PC >25% of AQS

(a) *In italics, criteria based solely on the PC, used to evaluate the intensity of impacts over the short term (e.g. hourly, daily concentrations)*
(b) *AQS= Air Quality Standards*

5.5.2 Summary of baseline conditions

Endeavor is undertaking an air quality monitoring survey since April 2016 at 5 air quality monitoring sites in the area surrounding the Project.
The survey is aimed at characterising the existing baseline conditions in terms of NO_x, SO_2, PM_{10} and $PM_{2.5}$ concentrations. Monitoring activities are currently ongoing, and results collected up to May 2016 are presented in *Section 4.3.4* of this ESIA.

With regard to the classification of the quality of the local airshed, the IFC General EHS Guidelines state that: *"An airshed should be considered as having poor air quality [degraded] if nationally legislated air quality standards or WHO Air Quality Guidelines are exceeded significantly".*

Based on the available results and on the above criteria, the local airshed has been classified as undegraded for all the monitored pollutant.

5.5.3 *Potential impacts during the construction phase*

Impact sources

The main sources of emissions during the construction phase are:

- motorised equipment and energy generators used to supply electricity during construction activities; and
- heavy machinery and vehicles: front loaders, trucks, compactors and pick-ups will be used for construction activities such as site preparation and the transport of materials and workers.

These emissions sources imply two types of atmospheric emissions:

- release of exhaust emissions from vehicles and engine driven machinery; and
- release of dust from earthworks.

Exhaust emissions

The use of motorised vehicles and equipment (e.g. trucks, generators), will produce gas emissions from to the combustion of fuel oil and hydrocarbons. These emissions may cause an increase in pollutant concentrations in the atmosphere, such as carbon monoxide (CO), nitrogen oxides (NO_x) and sulphur dioxide (SO_2), from exhaust fumes.

The engines of vehicles and motorised equipment and energy generators will also generate atmospheric emissions.

The quantities of pollutants discharged into the air by site machinery and generators are expected to be relatively small. In addition, emissions will be dispersed into the atmosphere at a distance from areas where people live and work. In light of the nature of emissions sources, impacts should not be observed at a distance greater than 0.5-1 km from the construction site. Significant increase in the atmospheric concentration of pollutants is unlikely.

In conclusion, *direct* impacts associated to exhaust emissions during the Project construction phase are expected to have a *local* extent, a *short-term* duration, *negligible* magnitude, *intermittent* frequency and *unlikely* likelihood.

Assuming a medium sensitivity of receptors, the significance of this impact is assessed as **negligible** (see *Table 5.6)*.

Emissions of particles and dust

During the construction phase, dust emissions will be mainly caused by excavation activities (e.g. site clearance, scraping and levelling) and by dust resuspension due to the wind action on exposed surfaces and vehicles transit on unpaved roads.

In particular, the following activities are most likely to produce dust emissions:

- clearance of remaining vegetation;
- removal of the existing infrastructures (concrete foundations, shelters,…);
- surface stripping and topsoil stockpiling;
- ground surface grading;
- rolling and resurfacing to create a flat areas; and
- transport and handling of fill material.

Minor emissions of particles and dust may also come from the indirect transport of particles, due to adherence of dust to the wheels and chassis of vehicles entering the site and involved in the evacuating excavation materials. This phenomenon depends on several factors, as follows:

- the number of vehicles accessing the site;
- the cleanliness of traffic routes at the site;
- the installation of wheel and chassis washing units; and
- weather conditions.

Particles and dust may also be emitted in case of dust clouds or accidental spillage from the vehicles during the transport of backfill earth or the evacuation of excavated earth.

Emissions of particles and dust during the construction phase are by nature highly variable. The potential impacts associated to dust emissions during the construction phase depends to a great extent on the type of soil, the type of activities, the prevalence of hot, dry weather during the work, the speed of prevailing winds and the ability of the wind to carry particles and dust towards potential sensitive receptors.

The closest residential receptors likely to be affected by emissions of fine particles and dust emitted by activities taking place during the construction phase are the first dwellings located at about 100 m from the project area. Sensitivity of receptors is assumed to be medium for the purpose of this assessment.

Based on the above, *direct* impacts associated to dust emissions during the Project construction phase are expected to have a *local* extent, a *short-term* duration, *low* magnitude, *intermittent* frequency and *possible* likelihood.

Assuming a medium sensitivity of receptors, the above leads to **minor** impacts significance as summarised in *Table 5.6*.

Evaluation of the significance of impacts

Table 5.6 Evaluation of significance of potential impacts on air quality – Construction phase

Impact criteria	Impact Magnitude	Sensitivity	Impact Significance
Exhaust emissions			
• Type: direct • Extent: local • Duration: short-term • Frequency: intermittent • Likelihood: unlikely	Negligible	Medium	Negligible
Dust and Particulate emissions			
• Type: direct • Extent: local • Duration: short-term • Frequency: intermittent • Likelihood: possible	Low	Medium	Minor

5.5.4 Potential impacts during the operational phase

Overview of atmospheric dispersion modelling study

The main atmospheric emissions released by the Project during operation are linked to the activity of the six (6) reciprocating combustion engines of 9 MW each running on Heavy Fuel Oil (HFO).

The operation of the six reciprocating combustion engines leads to atmospheric emissions of nitrogen oxides (NO_x), particles (such as PM), carbon monoxide (CO) and sulphur dioxide (SO_2). It is noted that a Selective catalytic reduction (SCR) system will be installed to limit NO_x emissions from the six (6) reciprocating combustion engines.

The above mentioned emissions have the potential to result in *direct* impacts on air quality for each of these pollutants.

Detailed air dispersion modelling was performed to assess the intensity and extent of the potential impacts associated with the above presented emission sources and emissions. The air dispersion modelling estimated ground concentrations of pollutants produced by the power plant operation under normal operative conditions.

The modelling was carried out with the US EPA approved CALMET-CALPUFF modelling system(9) and evaluated ground concentrations of pollutants produced by the operations over a 30 km x 30 km domain, centred on the Power Plant location, *Figure 5.1* shows the modelling domain of the study. The modelling assumed a realistic representation of local meteorological condition considering a time frame of one year (2015). In particular, the US EPA CALMET- CALPUFF modelling system used for the study, calculated 3 dimensional meteorological field varying in time and space based on surface data observed by the local meteorological station of Conakry and upper air data from the MM5 model; the latter is a widely used three-dimensional numerical meteorological model developed by Pennsylvania State University and the U.S. National Centre for Atmospheric Research (NCAR).

A brief description of the modelling system, along with its set up and main assumptions is provided in Annex A. All the emission parameters provided in this section are based on engine specifications and on project design data. The emission inventory is presented in *Table 5.7* and *Table 5.8*; in particular, *Table 5.7* presents the coordinates and characteristics of the Project's emission sources and *Table 5.8* shows the rate and composition of emissions considered as input data into the modelling study. It is noted that atmospheric emissions presented in *Table 5.8* comply with the Guinean emission limits for stationary combustion units, currently under development. In particular the compliance with the emission limit set on NO_x concentrations is guaranteed by the installation of the SCR system.

The engines are expected to operate 24 hours per day, thus the model simulated a continuous release of atmospheric pollutants at the rates presented in *Table 5.8* during the whole simulation year (year 2015, 8760 hours). This approach enabled to identify the ground level concentration of pollutants occurring in the worst weather conditions predicted for the simulated year (2015).

(9) Peer Review of the Calmet/Calpuff Modeling System, Allwine, Dabberdt, Simmons, 1998.

Figure 5.1 CALPUFF simulation domain

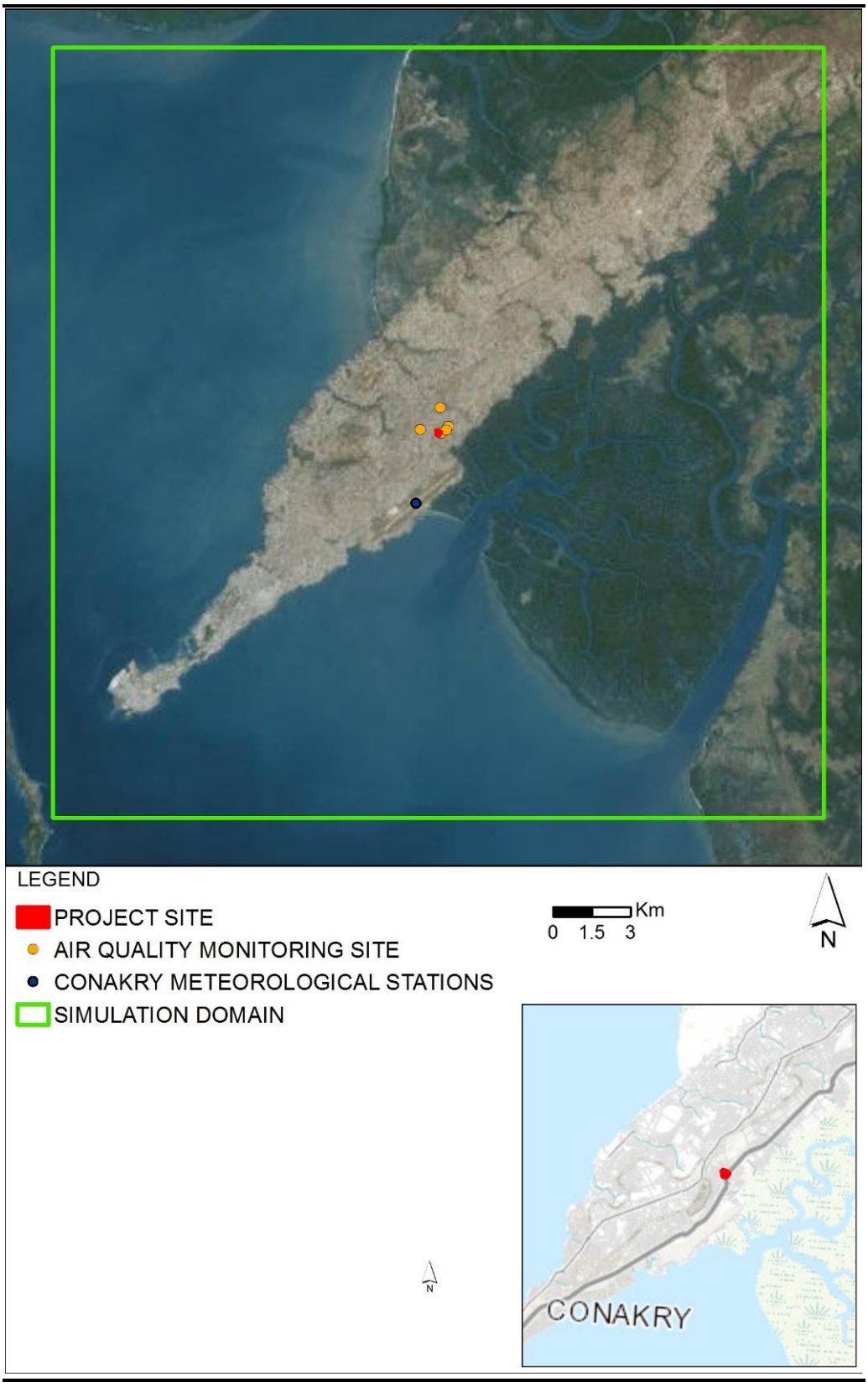


Table 5.7 Characteristics of emission sources

Emission sources (b)	X	Y	Stack height	Stack Diameter	Exit Temperature	Exit Velocity
	UTM 28N [m]		[m]	[m]	[°C]	[m/s]
Reciprocating engine 1 (a)	653145	1061652	30	1.4	332	20
Reciprocating engine 2 (a)	653143	1061650	30	1.4	332	20
Reciprocating engine 3 (a)	653145	1061649	30	1.4	332	20
Reciprocating engine 4 (a)	653165	1061646	30	1.4	332	20
Reciprocating engine 5 (a)	653163	1061644	30	1.4	332	20
Reciprocating engine 6 (a)	653165	1061644	30	1.4	332	20

(a) *The six stacks are grouped together into two clusters of 3 stacks each. Each cluster has been modelled as a single stack based on the standard modelling procedure for stack emissions ([10] and [11]). This is reflected in the input data and the equivalent stack diameter used in the model for each cluster of 3 stacks is based on the equivalent area of 3 stacks with 1.4m diameter each.*

(b) *The simulation assumed that engine stacks operate 24 hours a day.*

(1) [10] Good Practice Guide for Atmospheric Dispersion Modelling, Prepared by the National Institute of Water and Atmospheric Research, Aurora Pacific Limited and Earth Tech Incorporated for the Ministry for the Environment, Published in 2004

(2) [11] Guidance for Air Dispersion Modeling, San Joaquin Valley Air Pollution Control District, Published in 2006

Table 5.8 Emission rate and composition

Emission sources (b)	Concentration in dry fumes, @ 15% of O_2 [mg/Nm^3]				Emission rate [g/s]			
	NO_x	CO	PM	SO_2	NO_x	CO	PM	SO_2
Reciprocating engine 1 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88
Reciprocating engine 2 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88
Reciprocating engine 3 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88
Reciprocating engine 4 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88
Reciprocating engine 5 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88
Reciprocating engine 6 (a)	300 (c)	60	50	1170	4.33	0.9	0.7	16.88

(a) *The six stacks are grouped together into two clusters of 3 stacks each. Each cluster has been modelled as a single stack based on the standard modelling procedure for stack emissions ([12] and [13]). Thus, the model considers that each cluster emits the sum of emissions produced by the 3 stacks*

(b) *The simulation assumed that engine stacks operate 24 hours a day.*

(c) *The installation of the Selective catalytic reduction (SCR) system leads to NO_x concentration in dry flue gases in compliance with the Guinean emission limits (under development) for stationary combustion units*

Modelling results

The modelling study simulated the PC (Process Contribution) arising from the Project operation phase.

Modelling results should be interpreted in light of the following model conservative assumptions, presented in more details in Annex A

- the model does not account for dry and wet deposition or photochemical reactions of the pollutants which in reality takes place and would reduce pollutants concentrations in the atmosphere;
- the model assumed atmospheric emissions constant throughout the year 24h per day, and this is assumption is also conservative as in reality the operational profile might vary.

Table 5.9 sets out the maxima concentration values obtained in the simulation domain for the Project Operation in its base design for NO_2, NO_2, SO_2 and PM_{10} along with applicable AQS (IFC Interim target 1). For short term concentrations (e.g. hourly and daily concentrations) the numerical results

(3) [12] Good Practice Guide for Atmospheric Dispersion Modelling, Prepared by the National Institute of Water and Atmospheric Research, Aurora Pacific Limited and Earth Tech Incorporated for the Ministry for the Environment, Published in 2004

(4) [13] Guidance for Air Dispersion Modeling, San Joaquin Valley Air Pollution Control District, Published in 2006

presented correspond to the worst hour/day predicted by the model over the temporal domain (one year time frame: 2015).

Table 5.9 Maximum concentrations of atmospheric pollutants modelled

Pollutant	Averaging period	IFC standards (a) [µg/m³]	PC(b)– Maximum predicted concentrations [µg/m³]
NO_2 (e)	annual	40	3.38
	1 h	200	78.63 (c)
SO_2	24 h	125	80.96 (d)
PM_{10}	annual	70	0.75
	24 h	150	3.45

(a) *Intermediate objective-1*
(b) *PC= process contribution*
(c) *Correspond to the worst hour predicted by the model over the temporal domain (one year time frame: 8760 hours) and spatial simulation domain*
(d) *Correspond to the worst day predicted by the model over the temporal domain (one year time frame: 8760 hours) and spatial simulation domain*
(e) *NO_2 concentrations have been derived from NOx concentrations. The conversion rate used for the conversion of NO_x to NO_2 is 50%in the short term (hourly) and 75% in the long term (yearly). More details on the NO to NO_2 conversion ratio are provided in Annex A*

Table 5.9 shows that predicted concentrations comply with regulatory limits for all pollutants and averaging periods.

The following concentration maps have been produced to spatially localise predicted concentration maxima for SO_2 and NO_2:

- *Figure 5.2 SO2 24-h Concentration*
- *Figure 5.3 NO2 annual concentration*

Figure 5.4 NO2 maximum hourly concentrations

For short term concentrations the concentration maps *(Figure 5.2* and *Figure 5.4)* show for each grid cell (500 m x 500 m) of the simulation domain the worst day/hour predicted by the model over a time frame of three year.

Concentration maxima for NO_2 annual concentrations and SO_2 24h concentrations (*Figure 5.3* and *Figure 5.2* respectively) fall in the near proximity of the Project site; whereas concentration maxima for NO_2 hourly concentration fall about 1.5 km north-east of the project site.

Figure 5.2 SO_2 24-h Concentration

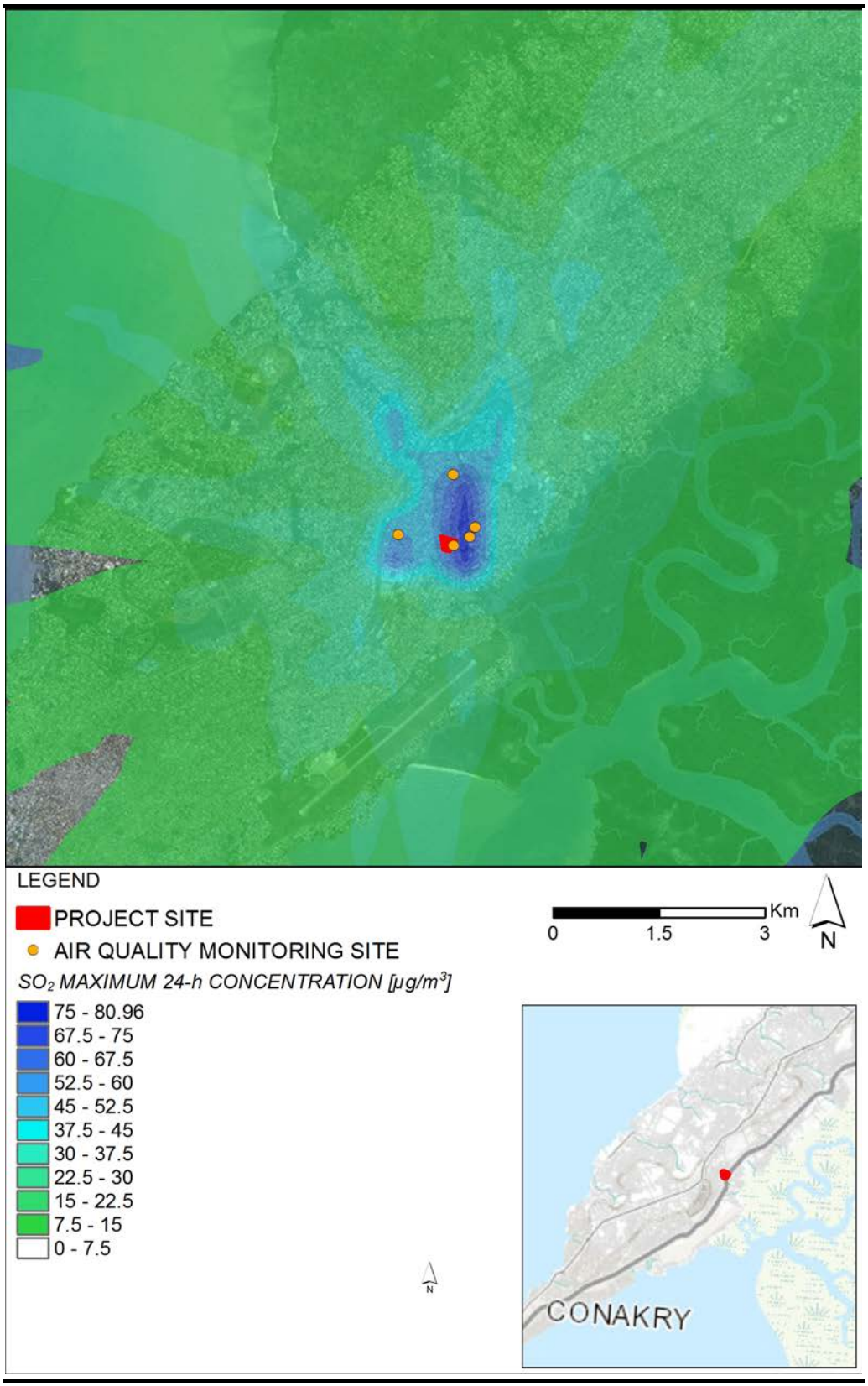


Figure 5.3 NO_2 annual concentration

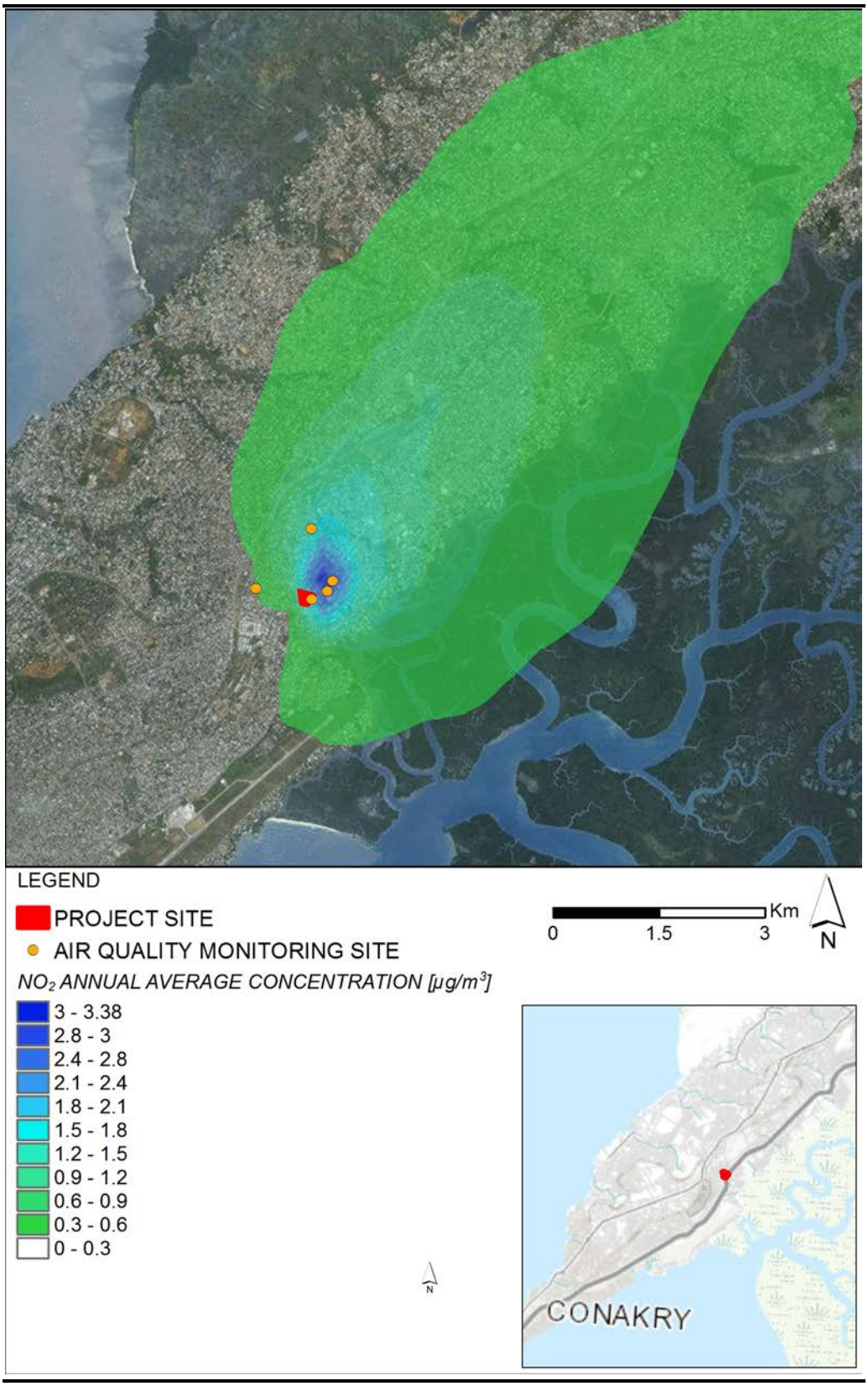
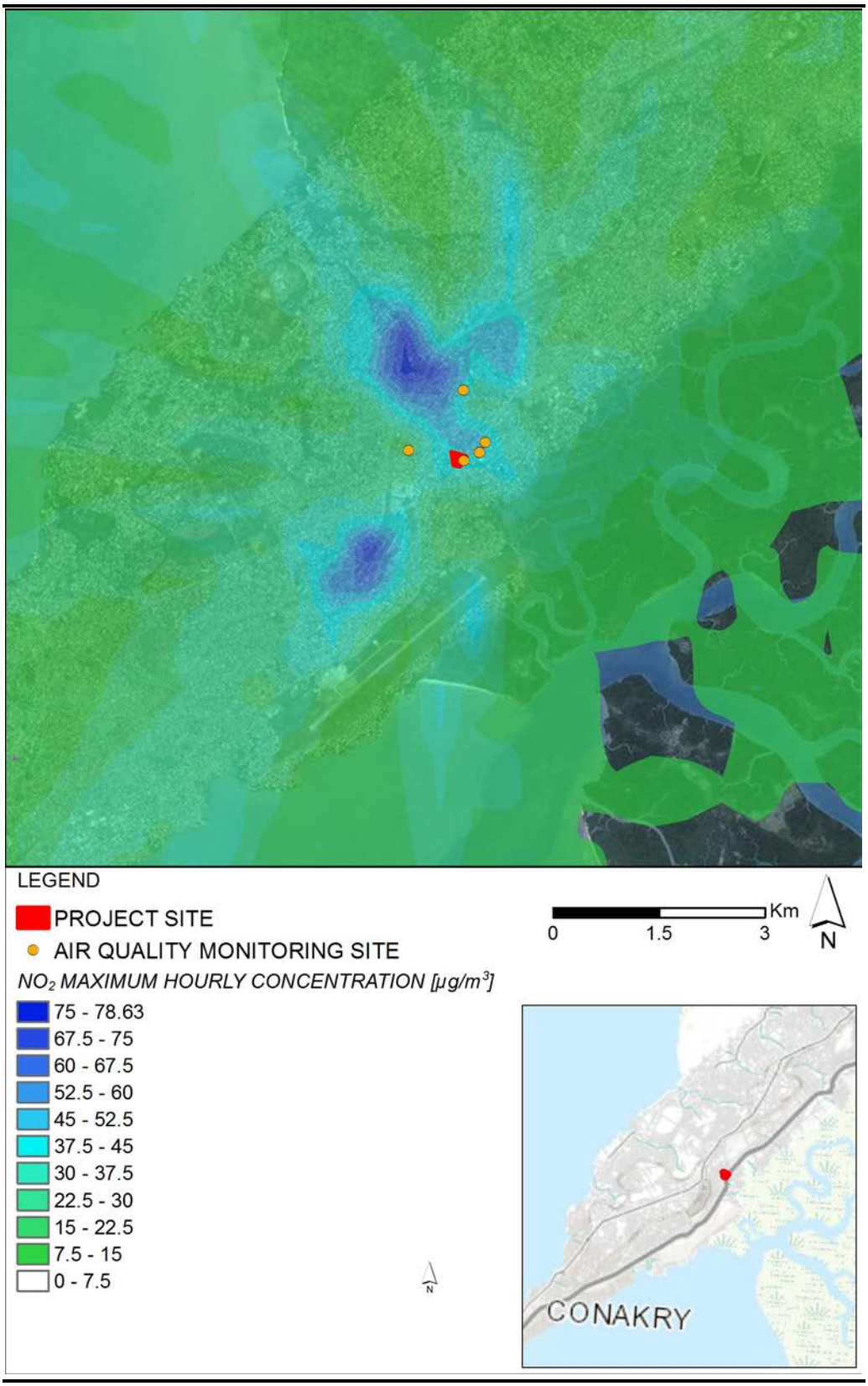


Figure 5.4 NO_2 maximum hourly concentrations



Results at AQ monitoring sites

To refine the assessment, predicted concentrations have been analysed at the 5 AQ monitoring sites (presented in *Figure 5.5). Table 5.10* shows the maximum predicted concentration at the air quality monitoring sites.

Figure 5.5 Air quality sensitive receptors

Table 5.10 Maximum concentration modelled at air quality monitoring sites

AQ Monitoring sites	NO_2 annual average	NO_2 1 h	SO_2 24-h	PM_{10} annual average	PM_{10} 24-h
	[µg/m³]	[µg/m³]	[µg/m³]	[µg/m³]	[µg/m³]
IFC standards (a) [µg/m³]	*40*	*200*	*125(a)*	*70(a)*	*150(a)*
AQ1	*0.30*	*19.86*	*51.62*	*0.07*	*2.21*
AQ 2	*1.05*	*33.07*	*78.17*	*0.23*	*1.53*
AQ 3	*1.47*	*27.20*	*74.60*	*0.33*	*2.26*
AQ 4	*2.86*	*53.08*	*80.95*	*0.64*	*3.35*
AQ 5	*3.69*	*53.08*	*80.95*	*0.82*	*4.14*

(a)Intermediate target-1

Note: NO_2 concentrations have been derived from NO_x concentrations. The conversion rate used for the conversion of NO_x to NO_2 is 50% in the short term (hourly) and 75% in the long term (yearly). More details on the NO to NO_2 conversion ratio are provided in Annex A

As showed in *Table 5.10*, annual average concentrations predicted at the air quality monitoring sites are well below the regulatory limit; while looking at predicted short term concentrations, PM_{10} and SO_2 24-h concentrations and NO_2 1-h concentrations at receptors never exceeds the regulatory limits.

Evaluation of the significance of the Project's impact

The assessment of Impacts significance for the project operation phase is based on the outcome of the modelling study as follows:

- impacts significance is based on predicted concentrations at sensitive receptors following the criteria presented in *Table 5.5*;
- impacts extent is assessed on the base of the spatial distribution of predicted concentrations, showed in the concentration maps; and
- the assessment of the frequency/probability for short term concentrations is supported by the outcome of the performed modelling study.

The following *Table 5.11* provides a summary of the assessment of air quality impacts related to the project operation.

Table 5.11 Evaluation of Significance of potential impacts on air quality - Operational phase

Impact criteria	Impact Magnitude	Sensitivity	Impact Significance
NO_2 Long Term			
• Type: direct • Extent: local • Duration: medium-term • Frequency: continuous • Likelihood: unlikely	Negligible	Medium	Negligible
NO_2 Short Term			
• Type: direct • Extent: local • Duration: temporary • Frequency: intermittent • Likelihood: unlikely	Small	Medium	Minor
SO_2 Short Term			
• Type: direct • Extent: local • Duration: temporary • Frequency: intermittent • Likelihood: unlikely	Small	Medium	Minor
PM_{10} Long Term			
• Type: direct • Extent: local • Duration: medium-term • Frequency: continuous • Likelihood: unlikely	Negligible	Medium	Negligible
PM_{10} Short Term			
• Type: direct • Extent: local • Duration: temporary • Frequency: intermittent • Likelihood: unlikely	Negligible	Medium	Negligible

5.5.5 Mitigation measures for impacts on air quality

Mitigation measures during construction

In order to minimise the emissions of pollutants by worksite machinery during the construction phase, the following measures must be applied on site:

- as default good practice, site machinery and generators will be regularly maintained and inspected by the contractor with responsibility for the works; and
- atmospheric emissions discharged by all transport vehicles used during the construction phase (equipment, excavated earth or backfill, staff, etc.) will be reduced by minimising the number of journeys as far as possible.

Concerning the nuisance caused by particles and dust at the site and in its surroundings, the following good practices should be followed:

- suitable management and maintenance of raw materials' storage areas to minimise clouds of particles;
- tarpaulin coverings on trucks during the transport of crumbly building materials or excavated earth or backfill;
- speed restrictions for vehicles travelling on non-asphalted roads;
- washing of vehicle wheels as they leave the site;
- covering of storages of materials likely to be carried by the wind (notably contaminated or hazardous materials);
- in case of activities on surfaces covered with fine materials, access roads and the site must be sprayed during construction activities to reduce dust production;
- check on correct functioning of vehicles and machines, and compliance of their emissions with current regulations; and
- ensure that vehicles and machines are turned off when they are not being used.

With the above mitigation measures enforced, residual impacts arising from both exhaust and dust emissions during the Project construction phase, are expected to be of **negligible** significance.

Mitigation measures during operation

The potential impacts of atmospheric emissions linked to operation of the power plant are mainly due to SO_2 and NO_x emissions.

Endeavor is committed to ensuring the compliance with AQS during the operation phase, by continuing the ongoing monitoring of NO_2 and SO_2 concentrations as part of the ESMP.

Regular maintenance and Inspections of the reciprocating engines will be also performed in accordance with the manufacturer specifications to guarantee the compliance with atmospheric emissions limits.

5.5.6 *Residual impacts*

Following the identification of mitigation measures, impacts are re-assessed to determine their residual impact. The latter are summarised in the following *Table 5.12*.

Table 5.12 Residual impact significance

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
Exhaust Emissions -	***Negligible***	• traffic Management Plan; • planning of activities to minimise the use of vehicles and machinery; and • regular maintenance and inspection of engine driven equipment will be performed in accordance with manufacturer instructions.	***Negligible***
Dust Emissions	***Minor***	• the covering of materials that can be transported by wind (e.g. topsoil, aggregate). • dust suppression, using water, shall be used for dust activities such as road construction where appropriate (e.g. dry periods). This shall be subject to water availability and potential impacts on other users of the designated water supply. • vehicle speed limited to minimise dust generation by the transit of vehicles on unpaved roads.	***Negligible***
Operation phase			
NO_2 Short-Term	***Minor***	• regular maintenance and inspection of the reciprocating engines will be performed in accordance with manufacturer instructions; and • monitoring of NO_2 and SO_2 concentrations as part of the ESMP.	***Minor***
NO_2 Long Term	***Negligible***		***Minor***
SO_2 Short-Term	***Minor***		***Minor***
PM_{10} Short and Long Term	***Negligible***		***Negligible***

5.6 *IMPACTS ON AMBIENT NOISE LEVELS*

The Project has the potential to adversely impact the acoustic climate of the surrounding environment. A dedicated noise study has been performed to assess:

- the impacts on local acoustic climate arising from the construction phase of the Project, based on a qualitative analysis of the emissions generated by the main equipment in use for construction activities; and

- the impacts on local acoustic climate arising from the operation phase of the Project, by means of a noise modelling study.

5.6.1 *Potential impacts during the construction phase*

A qualitative assessment for construction phase has been performed to predict the noise levels for the area surrounding the Project plant.

The predicted noise levels generated during Project construction at fixed distances from emission sources and at the sensitive receptors are reported, respectively, in *Table 5.13* and *Table 5.14*. The assessment is based on the emission scenarios reported in *Annex B, Section 2*, and on the appropriate attenuation formula for noise propagation due to distance, as set out in the BS:5228 British Standard.

It should be noted that the predicted construction noise levels are indicative and are subject to variables including location, buildings, specifications of construction plant (including power output, silencers, etc.) and works phasing.

Table 5.13 Predicted construction noise levels at fixed distances from project site (project contribution)

Construction activity	Noise pressure level [dB(A)] at							
	25 m	50 m	100 m	200 m	300 m	500 m	1000 m	2000 m
Site preparation	83	75	68	60	56	50	43	35
Civil works and installation	82	74	67	59	55	49	42	34

Table 5.14 Predicted construction noise levels at sensitive receptors (project contribution)

ID	Receptor (a)	Distance from Project Site [m] (a)	Predicted Noise Level LAeq [dB(A)]		Noise Limit for Daytime [dB(A)] (b)
			Site preparation	Civil works / Installation	
N1	Residential buildings to the south-west	150	63	62	45-50 (Guinean) 55 (IFC)
N2	Site boundary (representative of houses to the north-east)	90	69	68	
N3	Residential buildings to the east	120	66	65	

ID	Receptor (a)	Distance from Project	Predicted Noise Level LAeq [dB(A)]		Noise Limit for Daytime
N4	Residential buildings to the north-east	500	50	49	
N5	Residential buildings to the south-east	1150	41	40	

(a) Calculated from the center of the Project site.
(b) Construction activities are supposed to be undertaken only during daytime.

During construction activities, the noise levels from Project contribution are approximately 75 dB(A) at a distance of 50 m from the work sites and decrease to approximately 35 dB(A) at 2000 m from the work sites.

Guinean and IFC limits for daytime are exceeded at the receptors located at the boundary of the Project site (N1, N2, N3). They are respected at receptors N4 and N5, located at a distance of 500 m and 1150 m from the site, respectively.

However it has to be noted that:

- the assessment considered a worst case scenario, with all construction equipment in operation at the same time in the same place; lower noise may be expected to actually occur at receptors;
- the noise emissions during construction will be temporary, limited to the period of construction, and the noisiest activities (eg piling) will be undertaken during daytime only; and
- the noise emission levels will vary during the day, on the basis of the type of activities ongoing and the location of the equipment/vehicles within the construction site.

The assumed Project's noise construction criteria for negligible impacts 55 dB(A), *Annex B, Section 1.1.1*) is achieved at about 300 meters from the work site where construction activities will take place. At receptors N4 and N5, the construction activities are unlikely to affect the offsite ambient noise levels; in fact, noise emission levels from construction activity are expected to be well below 55 dB(A), resulting in a *Negligible* impact magnitude. At receptors N1, N2 and N3, guideline exceedance is predicted due to the proximity to the plant boundary, but the short-lived and temporary nature of the emissions will mean that the overall impacts will be limited in time. *Medium* impact magnitude is therefore expected.

The impact significance has been assessed based on key factors, as receptor sensitivity, magnitude of impact and duration of occurrence, as per criteria reported in *Annex B*. *Table 5.15* shows the impact magnitude and significance assessed for Project construction at each sensitive receptor.

Table 5.15 Noise significance matrix for construction phase

ID	Receptor	Maximum Predicted Noise Level Constr. Phase LAeq [dB(A)]	Impact Magnitude	Sensitivity	Impact Significance
N1	Residential buildings to the south-west	63	Medium	Medium	Moderate
N2	Site boundary (representative of houses to the north-east)	69	Medium	Medium	Moderate
N3	Residential buildings to the east	66	Medium	Medium	Moderate
N4	Residential buildings to the north-east	50	Negligible	Medium	Negligible
N5	Residential buildings to the south-east	41	Negligible	Medium	Negligible

(b) Construction activities are supposed to be undertaken only during day time.

The significance of impacts on local acoustic climate during the construction phase is assessed as *Moderate* at receptor N1, *Moderate* at receptors N2 and N3, *Negligible* at receptors N4 and N5.

Moderate impacts are a consequence of the proximity of receptors to the Project boundary.
Considered the above, it is reasonable to assume that *Moderate* impacts are expected to occur only during the noisiest activities (only at daytime) and for a limited period of time.

Moreover, background noise levels monitored at receptors already identified a degraded acoustic climate, characterised by existing noise levels ranging between 70 to 75 dB at receptors in the proximity of the Project site. Thus, the noise contribution of the Project will be barely perceived by the communities. Nevertheless, best practices for construction activities will be put in place to reduce as low as reasonable possible the Project construction noise.

5.6.2 *Potential impacts during the operations phase*

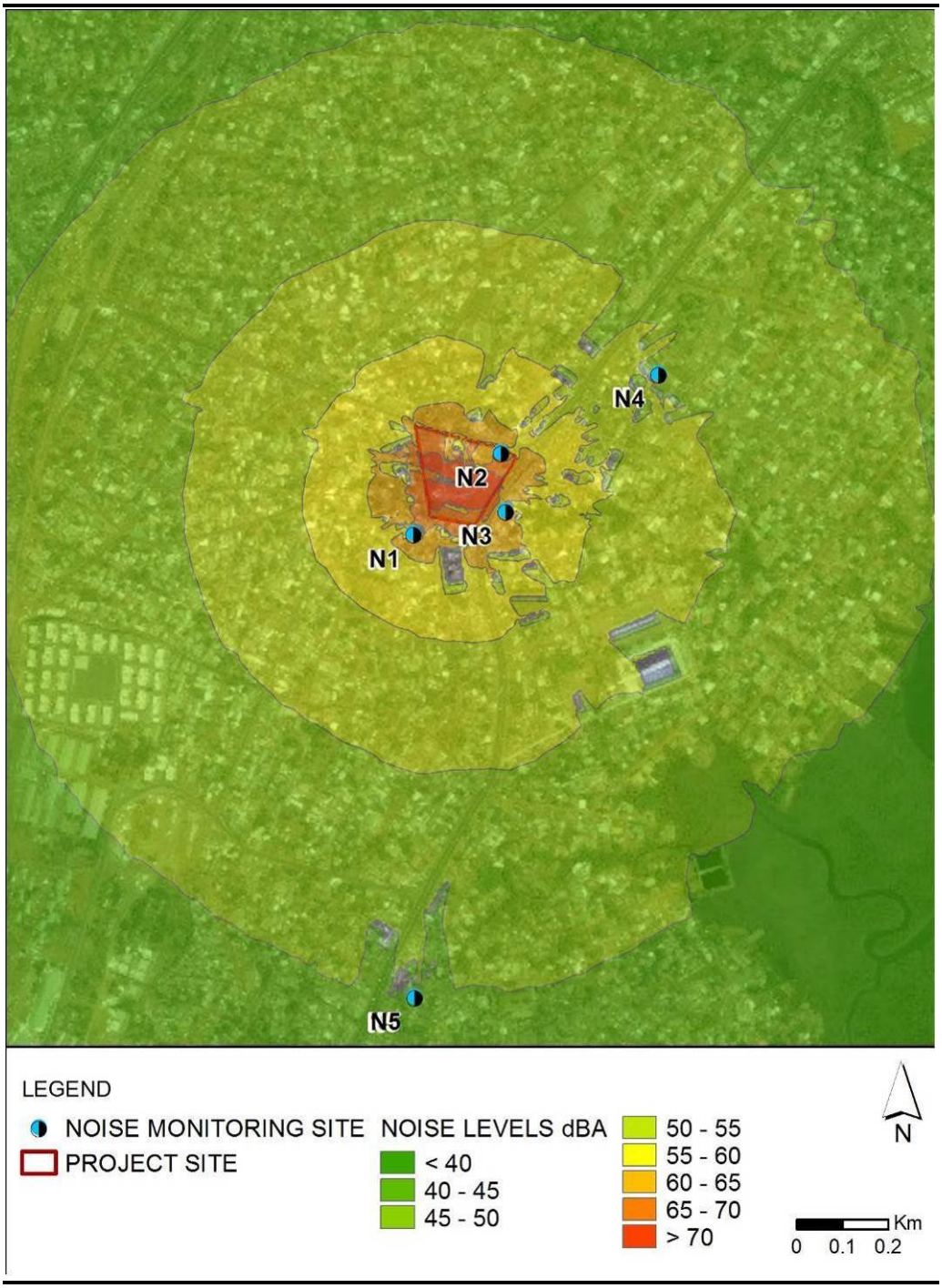
A quantitative modelling study for the operation phase has been performed to predict the noise levels for the area surrounding the Project plant and at sensitive receptors. Modelling details and emission scenario are reported in *Annex B*

Predicted noise levels for Project operation are reported as iso-contours noise map in *Figure 5.6* below, with locations of the nearest sensitive receptors.

As detailed in *Annex B*, the assessment of impact significance due to operation noise, has been evaluated both considering the Project contribution, in terms

of predicted noise levels at receptors (Criteria 1), and considering the increase above the background noise (Criteria 2).

Figure 5.6 Noise contour map - project operation phase



Modelled project contribution to ambient noise

Table 5.16 and *Table 5.17* report the predicted noise levels at sensitive receptors during Project operation during daytime and night-time, respectively. As the

Project will operate 24 hours, the emissions levels are the same over the entire day, with no differences between day and night time.

The impact significance has been assessed based on key factors, as receptor sensitivity, magnitude of impact and duration of occurrence, as per criteria reported in *Annex B*. Even if Project noise emissions don't vary from daytime to night-time, the significance of the impact change as a consequence of the different noise limits established for day and night.

It has to be noted that the study has considered a worst case scenario for noise emissions, with all equipment in operation at full load for 24hours. It is likely to assume that, when operational load capacity is reduced, such as at night, noise emissions for the Project will be lower.

Table 5.16 Contribution to ambient noise from Project for operation phase during daytime (criteria 1: project contribution)

ID	Receptor	Predicted Noise Level Operat. Phase LAeq [dB(A)]	Noise Limit Daytime [dB(A)]
N1	Residential buildings to the south-west	58.5	45-50 (Guinean) 55 (IFC)
N2	Site boundary (representative of houses to the north-east)	63.0	
N3	Residential buildings to the east	63.5	
N4	Residential buildings to the north-east	46.5	
N5	Residential buildings to the south-east	43.0	

Table 5.17 Contribution to ambient noise from Project for operation phase during night-time

ID	Receptor	Predicted Noise Level Operat. Phase LAeq [dB(A)]	Noise Limit night-time [dB(A)]
N1	Residential buildings to the south-west	58.5	45 (Guinean and IFC)
N2	Site boundary (representative of houses to the north-east)	63.0	
N3	Residential buildings to the east	63.5	
N4	Residential buildings to the north-east	46.5	
N5	Residential buildings to the south-east	43.0	

These modelling results on Project Contribution only must be evaluated in light of the current baseline.

Noise impact significance - (increase above the background noise levels)

The local acoustic environment is already affected by existing noise sources that result in high levels of background noise.

It is generally accepted that a change in background noise of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound [14].

Thus, to better contextualize the Project noise contribution and potential impacts, the evaluation of the increase above the background due to Project emissions has been considered as an additional impact assessment criterion.

Table 5.18 and *Table 5.19* report the predicted increase above the existing background levels and impact significance at sensitive receptors during Project operation during daytime and nigh-time, respectively. The impact significance has been assessed as per criteria reported in *Annex B*.

(1) [14] UK Department for Communities and Local Government. Planning Policy Guidance 24.

Table 5.18 Noise significance matrix for operation phase during daytime (increase above the existing background noise levels)

ID	Receptor	Predicted Noise Level Operat. Phase LAeq [dB(A)]	Monitored Noise Level LAeq [dB(A)]	Cumulative Noise Level [dB(A)] (a)	Increase above Background [dB(A)] (b)	Impact Magnitude	Sensitivity	Impact Significance
N1	Residential buildings to the south-west	58.5	75.3	75.4	0.1	Negligible	Medium	Negligible
N2	Site boundary (representative of houses to the north-east)	63.0	70.2	71.0	0.8	Negligible	Medium	Negligible
N3	Residential buildings to the east	63.5	75.2	75.5	0.3	Negligible	Medium	Negligible
N4	Residential buildings to the north-east	46.5	60.7	60.9	0.2	Negligible	Medium	Negligible
N5	Residential buildings to the south-east	43.0	73.6	73.6	0.0	Negligible	Medium	Negligible

Notes:
(a) Cumulative noise level calculated as the logarithmic sum of the predicted operational noise (Project contribution) and the monitored background noise.
(b) Increase above the background calculated as the difference between the cumulative noise level and the monitored background noise.

Table 5.19 Noise significance matrix for operation phase during night-time (increase above the existing background noise levels)

ID	Receptor	Predicted Noise Level Operat. Phase LAeq [dB(A)]	Monitored Noise Level LAeq [dB(A)]	Cumulative Noise Level [dB(A)] (a)	Increase above Background [dB(A)] (b)	Impact Magnitude	Sensitivity	Impact Significance
N1	Residential buildings to the south-west	58.5	65.0 (c)	65.9	0.9	Negligible	Medium	Negligible
N2	Site boundary (representative of houses to the north-east)	63.0	62.0	65.5	3.5	Small	Medium	Minor
N3	Residential buildings to the east	63.5	65.0 (c)	67.3	2.3	Negligible	Medium	Negligible
N4	Residential buildings to the north-east	46.5	50.0 (c)	51.6	1.6	Negligible	Medium	Negligible
N5	Residential buildings to the south-east	43.0	63.0 (c)	63.0	0.0	Negligible	Medium	Negligible

Notes:
(a) Cumulative noise level calculated as the logarithmic sum of the predicted operational noise (Project contribution) and the monitored background noise.
(b) Increase above the background calculated as the difference between the cumulative noise level and the monitored background noise.
(c) Night-time level not monitored; it was assumed 10dB lower than monitored daytime level.

During daytime, the increase above the background is well below 3 dB(A) at all sensitive receptors, resulting in *Negligible* impacts. This is a consequence of the high monitored noise levels mainly due to road traffic noise. During daytime the Project is not expected to generate noise emissions perceivable by the communities.

Also during night-time, the increase above the background is below 3 dB(A) at all sensitive receptors, resulting in *Negligible* impacts. Only at receptor N2, the nearest to the Project site, *Minor* impacts may occur. This is a consequence of the proximity of the receptor to the boundary. However, it can be stated that also during the night, the Project emissions will be barely perceived above the current noise levels.

Conclusion

The Project will generate noise emissions exceeding the daytime and night-time at the sensitive receptors located in the proximity of the site boundary. However the local acoustic climate is currently dominated by road traffic noise that already generate high background noise levels. Thus, the Project emissions are not predicted to be significantly perceived by the population both during the day and night-time.

5.6.3 Mitigation measures

Mitigation measures during construction

Noise impacts associated with the construction phase of the Project are deemed to be significant only at receptors located in the near proximity of the project site. The impacts will be essentially temporary and mostly confined to mobile tools /equipment and generators on the process plant construction site.

Nevertheless the Project is committed to adopt best practices for noise management to minimize noise during construction.

The following mitigation measures shall be implemented, where appropriate, throughout the construction:

- selection of recent, well maintained construction equipment and vehicles compliant with international best practice for noise emissions;
- prefer electrical power plant to mechanical alternatives, where feasible;
- undertake all noisiest construction / maintenance activities during daytime (eg piling);

- whenever feasible, schedule different noisy activities to occur concurrently, since the combined noise levels produced may not be significantly greater than the level produced if the operations were performed separately;

- use of power generators equipped with sound mufflers;

- enclosure of the main fixed sources of noise (power generators mainly);

- switch off equipment when not in use; and

- locate stationary equipment as far as practicable from nearby receptors.

Mitigation measures during operation

Considering the current conditions of the acoustic climate, the Project will generate Minor to Negligible impacts in the environment.

Achievement of project noise guidelines may be further accomplished through the use of best practice and good operation management.

Minor significance impacts will be managed by adoption of good site practices during operation including:

- locating plant equipment (e.g. generators) as far from the nearest potential sensitive receptors as possible, orienting any direct emissions away from receptors, and using on-site structures and terrain to screen sensitive locations wherever practicable;

- regular maintenance of noisy equipment and vehicles in accordance with supplier specifications to prevent increases in noise emissions;

- considering noise performance in the selection of equipment and procure equipment in line with international good practice in terms of noise emissions.

5.6.4 Residual impacts

Considering the assessed impact significance and the proposed mitigation measures presented in the previous sections, the potential residual impacts on the acoustic environment associated with noise emissions are summarized in *Table 5.20*.

The mitigation measures listed in *Section 5.6.3*, are in general control/management measures that are usually implemented in the Project design as best practices, in order to minimize the noise impact.

Table 5.20 Residual noise impacts

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
Noise emissions from construction activities (daytime only)	Moderate (receptors located at the site boundary – N1, N2, N3)	• select equipment compliant with international best practice for noise emissions; • prefer electrical power plant to mechanical alternatives, where feasible; • use sound mufflers and enclosures; • switch off equipment when not in use; • whenever feasible, schedule different noisy activities to occur concurrently; • locate stationary equipment as far as practicable from nearby receptors.	ALARP (as low as reasonable possible)
	Negligible (all other receptors – N4-N5)		Negligible
Operation phase			
Increase above the background due to Project operation noise during daytime	Negligible (all receptors)	• Implementation of best practice and good operation management; • locating plant equipment (as far from the nearest potential sensitive receptors as possible, orienting any direct emissions away from receptors; • use on-site structures and terrain to screen sensitive locations wherever practicable; • regular maintenance of equipment; • considering noise performance in the selection of equipment.	Negligible
Increase above the background due to Project operation noise during night-time	Minor (receptors located at the site boundary – N2)		Negligible
	Negligible (all other receptors)		Negligible

5.7 IMPACTS ON THE VISUAL AND AESTHETICAL ENVIRONMENT (LANDSCAPE)

5.7.1 Potential impacts during the operations phase

As indicated in the preliminary assessment, no significant impacts to landscape are expected during the construction phase and only the impacts resulting from the operations phase are further discussed within this section.

The study area landscape is highly dominated by urban constructions, mainly residential houses of limited height, which alternate with some industrial facilities, including the electrical substation and overhead transmission lines.

No tourist activity was found in the Project area.

No landscape area of interest is present in the surroundings of the Project site and the landscape does not have any sensitive characteristics in terms of heritage buildings or cultural heritage (archaeological sites, monuments or sites of intangible heritage) close to the proposed site.

Sensitivity in terms of landscape impact associated with installation of a new power plant is therefore considered to be low.

The two main sources of visual and landscape impacts are the height and volume of the proposed infrastructures. The main potential impacts resulting from the Project can be summarised as follows:

- long term visual and landscape impacts from new buildings on the Project's main site, particularly installation of the six stacks, which will be about 30m high and will be visible from the edge of the site; and

- installation of storage tanks for HFP and DFO of 12.6 m height each, also visible beyond the boundaries of the site.

In addition to these potential impacts associated with the buildings are those linked to site lighting and, to a lesser extent, those caused by atmospheric emissions (even though their visibility will be very limited).

The magnitude of landscape impacts connected to the Project will be medium, since they will integrate within an urban area dominated by residential uses where the stacks will be highly visible, especially from the main highway that passes next to the plant location and used by more than 40 000 vehicles per day.

Regarding the installation of transmission lines, only the option of an overhead line will have an impact on the landscape as the underground line will not be visible. In any case the presence of the nearby EDG power overhead transmission line limits the global impact of such facility in terms of landscape. The most affected receptors will be those living along the planned course of the transmission line.

All these changes will be of local extent, of medium-term duration as the lifetime of the project is 5 years, when most of the facilities will potentially be decommissioned.

As a result, the resulting impacts on the landscape during the operational phase of the Project are considered to be direct and continuous and assessed to be of **minor significance**.

Measures to mitigate and control impacts on the landscape during the operational phase

The following mitigation measures are recommended throughout the power plant's operational phase in order to reduce visual and landscape impacts:

- design, orientation and materials will be properly and reasonably developed to fit in with the site's existing characteristics and with the landscape's characteristics;
- appropriate usage of non-reflecting surfaces and coloured surface treatments; and
- external lighting as discreet as possible and directed downwards to limit light emissions in the area during the night-time.

5.8 IMPACTS ON ROAD TRAFFIC

5.8.1 Context

The power plant site is located at a local crossroads, bordered by the main highway in the city, the Fidel Castro highway that currently supports the passage of more than 44 000 vehicles per day at daylight, including almost 800 trucks.

The second road that borders the power plant location is the Transversale 3 (T3) that supports approximately 12 000 vehicles per day.

Both roads constitute an important element within Conakry's transport system, leading even to the airport. Any significant disruption to these roads can have important effects in the traffic of the whole city affecting severely the population. The roundabout that joins the two roads currently suffers periodic traffic jams at peak rush hours (7-10 am and 4-7 pm). The absence of valid alternative routes, given that some of the nearby streets are not suitable for vehicles, increases the risk of traffic disruption.

The project does no plan to generate traffic disruptions during the construction or operation of the power plant, and will only affect the traffic by increasing it with the project fleet. Similarly, no modification to existing access routes is planned.

5.8.2 *Potential impacts during the construction phase*

During the construction phase the traffic related to the project will include the transport of workers (up to 150 workers – 8 to 10 mini-buses) and goods for the construction (assumed a maximum of 11 trucks a day). Main concern related to traffic disruption is related to both, the supply of heavy equipment that may require a special transport that could temporarily affect the usual local traffic and the installation of the transmission lines (applicable to both options considered, underground or overhead transmission lines), that may require the temporary and partial cut of the streets where it is planned.

The expected impact on traffic during the construction phase will be of direct, local, short term (one year duration) and intermittent nature (morning/ evening staff transfers and occasional equipment deliveries to site, with no road obstruction), resulting in a small magnitude given the existing amount of traffic that will not increase significantly due to project activities.

As a result the resulting impacts on the traffic during the construction phase of the Project are considered to be of **negligible significance**.

Measures to mitigate and control impacts on the traffic during the construction phase

The following mitigation measures are recommended throughout the power plant's construction phase in order to reduce impacts on the traffic:

- application of the company's road safety policy to operator and contractor vehicles;
- optimization of routes and schedule of transport of goods to avoid peak traffic times (7-10 am and 4-7 pm) to the extent possible;
- optimization of the schedule and duration of the installation of transmission lines; and
- in case of temporary road closure or any other disruption, place adequate signalling in advance of operations to inform road users of potential disruptions

5.8.3 *Potential impacts during the operations phase*

The Project fleet during the operations phase will be composed of 10 trucks per day to supply of fuel the power plant plus some cars /mini-buses to transport the employees. These figures imply an increase of 1.5% in the truck traffic and only a 0.03% increase in the general traffic.

No traffic disruption is expected from routine operation activities.

As a result, the expected impact on traffic during the operations phase will result in a small magnitude given the existing amount of traffic that will not increase significantly due to project activities.

The resulting impacts on the traffic during the operations phase of the Project are considered to be of **negligible significance**

Measures to mitigate and control impacts on the traffic during the operational phase

The following mitigation measures are recommended throughout the power plant's operational phase in order to reduce impacts on traffic:

- application of the company's road safety policy to operator and contractor vehicles; and
- optimization of routes and schedule of transport of HFO and DFO to avoid peak traffic times (7-10 am and 4-7 pm) to the extent possible.

5.9 RISK OF ACCIDENTAL SPILLS

5.9.1 Potential impacts during the construction phase

In the event of an incident, the extent of the impacts would be directly associated to the duration and volume of the release of pollutants.

During the construction phase of the Project unplanned events that may occur are mainly related to accidental spillage of chemicals, fuel or oil from the intermediate storage tanks or vehicles used on the site, which in all cases would involve a reduced amount of pollutants given that no big storage is planned during this phase.

In these cases the expected impacts would imply soil pollution, that when detected should be collected and treated as a hazardous waste. Similarly, if infiltration occurs groundwater could also be affected. These minor spills are possible during construction phase but their effects are considered limited and any slight changes in groundwater or soil conditions will probably be reversible and limited to the construction site.

Larger accidental spillages of fuel or chemicals (i.e. total loss of containment of any storage tank) could result in a medium term reduction in groundwater quality and a bigger extension of soil affected though such an event is considered unlikely, and considered the quantities stored during construction their effects will also remain of small magnitude.

The presence of a watertight surface along the project construction site will also contribute to limit any potential effect derived from unplanned events.

Considering that the groundwater in Conakry is used to supply the population, the sensitivity was considered as medium and the impacts from unplanned events in the construction phase is assessed as **Minor significance**.

Measures to mitigate and control impacts on unplanned events during construction phase

The following mitigation measures are recommended throughout the power plant's construction phase in order to reduce impacts associated to unplanned events:

- proper storage of chemicals, fuels and hazardous wastes (liquids stored in bunded areas, all stored in covered places, etc.);
- development of oil and chemicals spill prevention measures and procedures;
- use of oil and chemicals equipment (i.e. sepiolite) on areas more likely to suffer spills (chemicals, fuel and waste storage areas) and training on how to use it;
- proper maintenance of vehicles and machinery according to manufacturer's specifications; and
- development of a management plan of dangerous products.

5.9.2 Potential impacts during the operations phase

During the operations phase the potential unplanned events are similar to the ones considered during the construction phase with the only difference that the amount of fuel stored is larger. The Project foresees to install two storage tanks for HFO with a capacity of 1,600 m^3 each and two tanks for DFO with a capacity of 425 m^3 each.

The largest spill possible would therefore involve the loss of containment of any of those tanks and the spillage of all its content. As part of the hazard assessment, a "worst-case" scenario of two simultaneous tank failures has been modelled (without taking into account secondary containment in the bunds). This scenario is highly unlikely considering that tanks will be equipped with secondary containment.

Given the quantities of fuel stored, such a spillage could not only affect soils in the plant site but also arrive through runoff to areas outside the plant site and even to the estuary located approximately 700 m east of the plant. If that would be the case, the water quality would be affected leading to potential mortality of fishes, birds and other species present in that natural area, considered as a sensitive location.

Soils and groundwater would also be affected.

However, the tanks will be located in a bunded area which would prevent fuel from being released whitin of the plant site. In addition the presence of watertight surface in the plant will limit any impact to soils or groundwater.

The likelihood of such an event remains unlikely and the most probable events are minor spills, mainly from vehicles or due to improper handling of chemicals, all with limited consequences to the environment and most probably reversible.

Considering the extent and magnitude of the worst case scenario assessed the impact derived from an unplanned event implying the release of 3,000 m^3 of fuel is assessed as **moderate** though is considered unlikely.

Measures to mitigate and control impacts on unplanned events during operations phase

The following mitigation measures are recommended throughout the power plant's operations phase in order to reduce impacts associated to unplanned events:

- development of oil and chemicals spill prevention measures and procedures;
- development of a management plan of dangerous products;
- HFO, DDO and lube oil tanks located in bunded areas;
- use of oil and chemicals equipment (i.e. sepiolite) on areas more likely to suffer spills (chemicals, fuel and waste storage areas) and training to employees on how to use it;
- proper maintenance of storage tanks, vehicles and machinery according to manufacturer's specifications; and
- installation of an oil-water separator on the plant process water / contaminated drainage system. Hydrocarbon products to be separated into a sludge tank.

5.10 IMPACTS ON THE SOCIO-ECONOMIC ENVIRONMENT DURING THE PROJECT

5.10.1 Impacts on the socio-economic environment during the construction phase

The social impacts screening matrix is presented overleaf.

Table 5.21 Social impacts matrix for the proposed project

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
CONSTRUCTION - DEMOGRAPHY AND SOCIAL DYNAMICS							
Presence of Project and workforce	Increased pressure on basic service infrastructure	Short	Local	Low	low	Envisage targeted community development support in line with Endeavor's community investment policy.	Minor
	Increased prevalence of contagious diseases and STDs - HIV/AIDS	Medium	Local	Low	low	Conduct an awareness-raising campaign with people in the target area and workers on STDs, including HIV/AIDS.	Minor
Construction work	Competition for jobs on the construction sites	Short	Local	Low	Low	Set up a fair and transparent recruitment system that includes a provision to prioritize local residents where applicants are equally qualified	Negligible
	Involuntary resettlement – No involuntary resettlement will be required as part of the construction phase and therefore this impact is not discussed further in this report.	Negligible	Negligible	Low	negligible	No mitigation measure will be required	Negligible

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
CONSTRUCTION - GOVERNANCE AND CIVIL SOCIETY							
Presence of Project and workforce	Weakened local governance bodies	Low	Local	Medium	Medium	• provide the local authorities concerned with information on the future construction work (scope, timetable) and on the area to be affected by this work; and • involve local authorities in implementing the impact management tools at all levels of project development.	Minor
Construction work	Increased risk of corruption	Short term	Local	Medium	Moderate	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skilled based, equal opportunity policy, with publicly advertised employment opportunity); • develop a project information campaign for all sections of the population; and • prioritize the communication methods most likely to reach the largest number of stakeholders (local media).	Minor
CONSTRUCTION – SOCIO-ECONOMIC CONTEXT							
Construction work	Development of economic opportunities	Medium	Regional	High	Positive	Envisage targeted community development support in line with Endeavor's community investment policy.	Positive
	Improved economic situation of the people recruited and their families	Low	Local	High	Positive	Ensure employment and salary policy are in line with or more favorable than standard Guinean practice.	Positive

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
	Increased demand and opportunities for local production, greater diversification of economic opportunities and the development of local entrepreneurship	Low	Regional	Medium	Positive	• regularly provide information on contracts to provide goods and services available through the project both locally and nationally, as well as on the standards to be met to win these contracts; • prioritize local or national providers whenever the goods or services required are available at comparable prices, quantities, quality and delivery lead-times; • support the development of local entrepreneurship through training, notably on compliance with quality, hygiene and security standards – this measure could be included in a support plan for Guinean companies.	Positive
	Larger budgets allocated to local development initiatives	Medium	Local	High	Positive	• envisage targeted community development support in line with Endeavor's community investment policy; • involve local authorities when implementing development projects.	Positive

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
CONSTRUCTION – HEALTH AND SAFETY							
Presence of Project and workforce	Diseases linked to health and hygiene conditions	Low	Local	Medium	Positive	• The Project site redevelopment will lead to a reduction in stagnant water bodies at the site, hence contributing to malaria prevention in the local area. Endeavor will reinforce this with malaria prevention & awareness trainings to staff. • Effluent pond will be treated to prevent mosquitos' proliferation. • Support the authorities (particularly the local health department) and civil society (especially NGOs) to implement hygiene awareness-raising campaigns. • Monitor and assess health and hygiene conditions using an indicator monitoring dashboard.	Positive
	Local development support: Improved health services	High	Local	High	Positive	• focus project investment in the health sector; • involve local authorities when implementing development projects; • introduce a health facilities monitoring plan to ensure service quality is maintained and facilities are used appropriately.	Positive
	Inequalities in access to healthcare	Medium	Local	Low	Positive	• envisage targeted community development support in line with Endeavor's community investment policy.	Positive
Construction work	Risk of workplace accidents	Low	Site-Specific	Medium	Medium	Respect the measures put in place to ensure workers' safety: wearing personal protective equipment, applying safety standards.	Minor

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
Road traffic associated with the Project	Risk of traffic accidents	Low	Site-Specific	Medium	Medium	• implement the HSE policy; • conduct an awareness-raising campaign with local residents; and • identify suitable routes that address local traffic constraints.	Minor
CONSTRUCTION – EDUCATION							
Construction work	Local development support: Improved access to education	Medium	Local	Medium	Positive	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency of recruitment process (skilled based, equal opportunity policy, with publicly advertised employment opportunity); and • work with the relevant authorities to set up an education provision strategy for the area based on need and on the government's capacity to create teaching positions.	Positive
OPERATION - GOVERNANCE AND CIVIL SOCIETY							
Plant operations	Risk of civil society opposition to the Project	Medium	Local	Medium	Moderate	▪ ongoing engagement with stakeholders; • ongoing community investment in line with Endeavor's community investment policy; and • consider associations and grassroots organizations as project stakeholders in their own right whose legitimacy is recognized by both the authorities and local residents: provide them with information, involve them in project monitoring.	Minor

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
	Increased risk of corruption	Medium	Local	Medium	Moderate	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities); • develop a project information campaign for all sections of the population; and • prioritize the communication methods most likely to reach the largest number of stakeholders (local media).	Minor
	Involuntary resettlement – No involuntary resettlement will be required as part of the construction phase and therefore this impact is not discussed further in this report.	Negligible	Negligible	Low	negligible	• No mitigation measure will be required	Negligible
OPERATION – SOCIO-ECONOMIC CONTEXT							
Plant operations	Development of economic opportunities	Medium	Regional	High	Positive	Envisage targeted community development support in line with Endeavor's community investment policy.	Positive
	Improved economic situation of the people recruited and their families	Medium	Local	High	Positive	Ensure employment and salary policy are in line with or more favorable than standard Guinean practices.	Positive

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
	Increased inequalities between households	Low	Local	Low	Low	Ensure economic opportunities are available for the maximum number of directly impacted households (or districts).	Minor
	Larger budgets allocated to local development initiatives	Medium	Local	High	Positive	• as part of Endeavor's community investment policy, consider constructing basic infrastructure or implementing development projects to identify community needs in relation with local authorities and communities; and • ensure transparency when assigning project funding to local institutions' budgets.	Positive
	Electricity supply	Long	Regional	High	Positive	Positive effect of improved power supply to Guinea and the Conakry area.	Positive
OPERATION – HEALTH AND SAFETY							

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
Plant operations	Diseases linked to health and hygiene conditions	Long term	Local	Medium	Positive	• the Project site redevelopment will lead to a reduction in stagnant water bodies at the site, hence contributing to malaria prevention in the local area. Endeavor will reinforce this with malaria prevention & awareness trainings to staff; and • as part of Endeavor community investment policy, consider supporting the authorities (particularly the local health department) and civil society (especially NGOs) to implement hygiene awareness-raising campaign.	Positive

	Local development support: Improved health services	High	Local	High	Positive	• consider focusing project investment in the health sector:
						  • involving the communities and local authorities when constructing basic infrastructure or implementing development projects to identify their exact needs (ensure the investment is included in the communes' local development plans); and
						  • carrying out monitoring by implementing a health facilities monitoring plan at the start of the project to ensure service quality is maintained and facilities are used appropriately.
							Positive

	Inequalities in access to healthcare	Medium	Local	Low	Positive	Introduce awareness-raising, communication and information programs for women to facilitate their access to primary healthcare (for themselves and their children).	Positive

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
	Risk of workplace accidents	Low	Site-Specific	Medium	Moderate	Respect the measures put in place to ensure workers' safety: wearing personal protective equipment, applying safety standards.	Minor
Storing hydrocarbons	Risk of traffic accidents	Low	Site-Specific	Medium	Moderate	• implement the Project HSE policy; • conduct an awareness-raising campaign with local residents; and • identify suitable routes that address local traffic constraints.	Minor
OPERATION – EDUCATION							
Plant operations	Local development support: Improved access to education	Medium	Local	Medium	Positive	• as part of Endeavor's community investment policy, consider develop investment in health education facilities and program in the Project area; and • work with the relevant authorities to set up an education provision strategy for the area based on need and on the government's capacity to create teaching positions (taking the map of the area's schools into account prior to creating a new establishment).	Positive
CLOSURE – SOCIO-ECONOMIC CONTEXT							
Closure	Reduction in local employment opportunities	Long	Local	High	Major	• Envisage supporting local entrepreneurship through local community development strategy. • Provide employees with a severance package in line with Guinean standard or more favorable.	Moderate
	Reduced economic circumstances of the people made redundant and their families	Long	Local	High	Major		Moderate

Aspect	Potential Impact	Magnitude		Sensitivity of receiving environment	Impact significance	Mitigation/enhancement	Residual Significance
		Duration	Impact extent				
	Discontinuation of budget allocations to local development initiatives	Long	Local	High	Major	• Decrease the amount allocated to community investment over time to phase in the transition. • Gradually withdraw allocations to local institutions' budgets. • Support local authorities to review the local development budget.	Moderate

5.10.2 *Key sources of social impacts and key social impacts*

The key impacts section describes the positive and negative impacts that have 'high' importance or significance, along with the sources of these impacts.
9 different sources of impact have been identified in relation to the project. Of these, 2 have an influence over the construction and operational phases and one has an influence over all project phases. These sources relate to the use of vehicles, their circulation and operation (carburetion and maintenance). It is to be noted that a detailed description of the final infrastructure and its design, its operating plan and closure/decommissioning plan are required to provide further clarification for 3 sources of impact, namely: the construction work, plant operations and plant closure/decommissioning.

5.10.3 *Impacts during the construction phase*

Construction work covers the tasks of assembling and building the required energy production infrastructure (see the project description) prior to the start of operations. This also includes other infrastructure (storage facilities, guard posts, etc.) needed for the plant.

Impact on governance and civil society

Considering the history related to the site with the presence of Aggreko, surrounding communities might oppose the project. Indeed, local people expressed some concerns noise and pollution related to thermal power plant projects, which deteriorate their living conditions. The duration of this tension will be medium but the impact will be local. However, the sensitivity will be medium.
Representatives involved in project-development initiatives and local recruitment could use their position to misuse some funds or turn policies to their advantage. This impact will have a medium duration and a local extent, but it has a high sensitivity. Therefore, its potential significance (if unmitigated) is medium.

Table 5.22 Impact assessment: increased risk of corruption amongst Project stakeholders

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
Increased risk of corruption	Moderate	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skills	Minor

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
		based, equal opportunity policy, with publicly advertised employment opportunities); • develop a project information campaign for all sections of the population; and • prioritize the communication methods most likely to reach the largest number of stakeholders (local media).	

The following measures have been identified to prevent the risk of corruption among local community representatives involved in operator-funded local development initiatives:

- thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors;
- ensure transparency when allocating funding to the local communities' budget;
-
- ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities);
- develop a project information campaign for all sections of the population; and
- prioritise the communication methods most likely to reach the largest number of stakeholders (local media).

The residual impact level is expected to be minor as there could still be potential for corruption, particularly should the representatives change.

Impact on the socioeconomic context

The construction of the power plant will be associated with the presence of workers on the site, who will probably consume locally. In addition, some materials might be bought in local and regional businesses. The duration of this impact will be medium on a local to regional scale. The sensitivity is high. Its significance is positive.

Table 5.23 ***Impact assessment: development of economic opportunities for local businesses***

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
Development of economic opportunities	Positive	• regularly provide information on contracts to provide goods and services available through the project both locally and nationally, as well as on the standards to be met to win these contracts; • prioritize local or national providers whenever the goods or services required are available at comparable prices, quantities, quality and delivery lead-times; • support the development of local entrepreneurship through training, notably on compliance with quality, hygiene and security standards – this measure could be included in a support plan for Guinean companies.	Positive

Endeavor will develop a community investment strategy in line with its corporate policy appropriate and relevant to the Project area. As part of this strategy, Endeavor will consider contributing to local funds dedicated to development initiatives including funding basic infrastructure.

Table 5.24 ***Impact assessment: positive impacts of Project community investment***

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Construction phase			
Larger budgets allocated to local development initiatives	Positive	• as part of Endeavor's community investment strategy consider funding community investment projects • involve the communities and local authorities when implement community development programs; • ensure transparency if/when assigning project funding to local institutions' budgets.	Positive

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance

The residual impact level is expected to be positive as local development will be improved both quantitatively (budgets, deliverables) and qualitatively (management procedures).

Impact on demographic dynamics

It is unlikely that any migration will result from the project. However, the project will boost the employment prospects of local communities who are constantly in search of work. It is thus highly likely that young people from other communes will also come to seek work at the plant. However, it is not clear whether these jobseekers will want to live in the area around the plant. In all likelihood, they will spend the working day in the area and then leave to go home in the evening.

This trend will probably last the whole project but apply only to a local extent. The impact is assessed as positive.

Table 5.25 Impact assessment: improved health services as a result of local development support

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Local development support: Improved health services	Positive	• Envisage focusing project community development programs towards the health sector.	Positive

The following measures have been identified to enhance this positive impact:

5.10.4 Impacts during the operations phase

Impact on governance and civil society

Like during the construction phase, there might be a risk of increased corruption among community representatives. Significance for this impact is still high if unmitigated by Endeavor.

Table 5.26 ***Impact assessment: increased risk of corruption among community representatives***

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Increased risk of corruption	Moderate	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities); • develop a project information campaign for all sections of the population; and • prioritize the communication methods most likely to reach the largest number of stakeholders (local media).	Minor

The following measures have been identified to prevent the risk of corruption among local community representatives involved in operator-funded local development initiatives:

Impacts on the socio-economic context

The operation work will generate the creation of economic opportunities for local businesses. Indeed, some services will benefit from the presence of workers on the site. This impact will have a medium duration but a local to regional extent. Its sensitivity is high. The significance is positive.

Table 5.27 ***Impact assessment: development of economic opportunities for local businesses***

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Development of economic opportunities	Positive	As part of Endeavor's community investment policy, consider supporting local entrepreneurs in developing their businesses.	Positive

The following measure has been identified to enhance this positive impact:

Improved economic situation of the people recruited and their families
The households of the workers will benefit from an improved economic situation. Indeed, they will have secure and regular revenues. This impact is local and the duration is medium. The sensitivity is high. Therefore on this aspect the Project will generate a high positive impact.

Table 5.28 Impact assessment: improved economic situation of the people recruited and their families

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Improved economic situation of the people recruited and their families	Positive	Ensure that employment and salary policy are in line with or more favorable than standard Guinean practices.	Positive

Power supply to Guinea and Conakry area
The power plant will improve power supply to Guinea and the Conakry area. The duration of this impact will last as long as the power plant will be in operation. It will have a regional effect and the communities which will be supply with power have a high sensitivity.

Table 5.29 Impact assessment: improved power supply to Guinea and Conakry area

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Electricity supply	Positive	Positive effect of improved power supply to Guinea and the Conakry area.	Positive

Impacts on health and safety

Contributions of the project to local development initiative budgets might generate an improve access to health services. Indeed, the project could contribute to the development of health infrastructures and services. This impact would have a long duration but on the local extent. Its sensitivity would be high. Therefore, its significance is positive.

Table 5.30 Impact assessment: improved health services as a result of local economic development and Endeavor's community investment

Impact Description	Impact before Mitigation	Key Mitigation	Residual Impact Significance
Local development support: Improved health services	Positive	• Envisage focusing project community development programs towards the health sector.	Positive

5.11 CUMULATIVE IMPACT ANALYSIS

Airport, military airbase: noise and air pollution

During the power plant operations phase, the air and noise pollution-related impacts may combine with similar impacts generated by activities at Conakry International Airport and, to a lesser extent, at the military airbase, both of which are located less than 2km south of the study area. However considering the limited impacts from the Project in terms of noise and air emissions and the limited number of flights landing and taking of at the international airport, the cumulative impact is assessed as minor.

Airport facilities, military bases, chemical industries and storage facilities, service stations: risk of explosion/fire

According to the findings of a survey carried out to identify nearby facilities and infrastructure, the following are all located within a 2km radius of the power plant site:

- 3 service stations, 2 of which are fewer than 500 meters away from the power plant;
- 2 military bases: the military airbase and Alpha-Yaya Camp; and
- 1 sensitive industrial plant (production and storage) situated fewer than 500 meters from the power plant site: the "Edigaz plant".

The potential risk associated with an accidental event has been assessed as part of the Hazard assessment for the Project. According to the results of this assessment, all these facilities are outside the hazard distance from the Project

6 STAKEHOLDER ENGAGEMENT

6.1 ACTIVITIES CONDUCTED AS PART OF ESIA

In accordance with the Guinean regulations on environmental and social impact assessment as well as IFC performance standards, stakeholder engagement activities have been undertaken by Endeavor as part of the ESIA process.

Stakeholder engagement meetings were held at various locations around the Project site between the 22nd and the 26th of March 2016.

The stakeholder categories engaged with were:

- representatives of the Bureau Guinéen des Etudes et Evaluation Environnemental BGEEE
- representatives of local authorities of Matoto, Simbaya 1 and Simbaya 2;
- traditional leaders;
- representatives of local associations including youth and women association;
- representatives of local businesses;
- health professionals;
- education professionals; and
- members of the community.

A total of 230 stakeholders were consulted during these meetings. Attendance lists are provided in annex C.

The key concerns and expectations raised by local stakeholders were greatly influenced by the environmental performance of the installations previously located at the Tannerie site, namely the Aggreko containerised power plant. The key stakeholders' feedbacks, concerns and expectations are summarised in *Table 6.1*.

Table 6.1 Summary of stakeholders' feedback, concerns and expectations

Category	Stakeholder comment
Key concerns	
Historical pollution on site	• the Aggreko power plant noise emissions caused health issues in the community including sleep disturbance, stress and hearing loss; • the Aggreko power plant air emissions led to health issues including respiratory diseases; and • water pollution caused by the Aggreko power plant was reported.
Impact to community Health and Safety	• the perceived risk of accidents is very high; • the storage of fuel oil on site is seen as dangerous due to the presence of garbage burning site close to the project; • the traffic of fuel oil supply truck is a high risk due to road conditions and traffic jams.
Impact on governance	• stakeholders feel the ESIA consultation process does not give them any influence on project design or approval process; • representatives of local authorities are concerned that the Project could lead to a reduction of their influence on the community; • members of the community fear the Project will lead to an increase in corruption, particularly associated to the hiring process.
Impact to community cohesion	• stakeholders are concerned the Project will attract people from outside of the community seeking employment which would lead to tensions within the community.
Key expectations	
Employment	• stakeholders expect the Project to hire locally for unskilled position
Local investment	• stakeholders expect the Project will make local investment to help support community development.
Provision of local services	• stakeholders expect the Project will improve health facilities and communication networks; • stakeholders expect the Project will supply electricity to the communities around the Project site continuously during the Project lifetime.

6.2 KEY PRINCIPLES OF PROPOSED STAKEHOLDER ENGAGEMENT PLAN FOR PROJECT

6.2.1 Objectives

The objectives of a Stakeholder Engagement Plan (SEP) are to:

- develop a list of Project stakeholders;
- define the basis for compliance with regards to external stakeholder engagement required as part of the Project;
- provide a framework for stakeholder communication to help ensure that the Project is:
    1. well understood by external stakeholders; and

2. build constructive relationships between the Project and stakeholders;

- provide a framework for monitoring stakeholder relationships and identify issues, expectations and potential constraints that may be raised by stakeholders;

- facilitate Endeavor's community engagement and support strategy; and

- facilitate multilateral communication among stakeholders and ensure disclosure of information as widely and transparently as possible.

6.2.2 Rationale for stakeholder engagement in the IFC PS

Performance Standard 1, *Assessment and Management of Environmental and Social Risks and Impacts*, includes specific requirements for stakeholder engagement in projects, including external communication and management of grievance (paragraphs 25 to 36).PS 1 includes specific focus on:

- Ensuring that stakeholder engagement addresses relevant stakeholders that may be affected by, or have an interest in, the Project.

- Managing external communication in such a way as to reach relevant stakeholders and facilitate a dialogue between the Project and its stakeholders.

- Tailoring stakeholder engagement to the specifics of the Project and of affected communities, ensuring that a locally appropriate, effective approach disclosure and consultation is implemented.

- Disclosing of relevant Project information to help stakeholders understand the risks, impacts and opportunities of the Project, including relevant information on the purpose, nature, scale, duration of the Project, its possible environmental and social risk and impacts and proposed mitigation, the stakeholder engagement process and the Project's grievance management process.

- Ensuring that consultation is undertaken in a meaningful manner, early in the Project planning phase; that it reaches out to all relevant Project stakeholders; that it is undertaken in a culturally appropriate manner; and that it is documented; that stakeholder are provided with information on the Project to understand how the Project may affect them, so that they can express their views on the Project and provide inputs taken into account by the Project.

6.2.3 *Typical SEP structure*

The key elements of a SEP document are the following:

- objectives and justifications ;
- legal framework ;
- stakeholder identification and mapping ;
- stakeholder engagement method ;
- key concerns and expectations raised.

6.2.4 *Next steps for the Project development*

Post ESIA planning/ environmental permitting

Key next steps expected as part of post ESIA activities include:

- public enquiry as per local legislation led by BGEEE; and

- Endeavor regular follow up with BGEEE and local communities during and after the permitting process, in anticipation of the construction phase.

Construction and operation

Once the permit secured, the Project will move forward into the site preparation and construction phase. Stakeholder engagement will need to continue during this phase and then throughout the lifetime of the Project.

6.3 *GRIEVANCE MECHANISM*

The establishment of a grievance[15] management system is widely accepted international best practice for the management of stakeholder interactions and social impacts. It is a requirement of the IFC Performance Standards.

Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities, and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by the Project and beneficial for both the project and stakeholders. The mechanism must not impede access to other judicial or administrative recourse.

In accordance with international good practice, Endeavor will establish a specific mechanism for dealing with grievances that do not involve court

[15] A grievance is a complaint or concern raised by an individual or organisation who judges that they have been adversely affected by the Project during any stage of its development. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts, or perceived impacts.

action. It includes the following steps:

- receive and register the complaint or grievance;
- carry out a preliminary review and categorise the complaint;
- address the complaint; and
- close the complaint.

This grievance management system provides a formal way to register stakeholders' concerns and for these to be addressed in good faith and through a transparent and impartial process. Grievances are monitored to provide signals of any escalating conflicts or disputes.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

7.1 INTRODUCTION

This Environmental and Social Management Plan (ESMP) was prepared on the basis of the results of the ESIA on the TPC Plant project.

Its aim is to meet the requirements of the Environment Code in Guinea. It has also been developed with the aim of complying with international good practices applicable to impact studies, meeting the requirements of IFC environmental Performance Standards.

The aim of the ESMP is to provide a framework for the environmental and social management of the Project, translating the mitigation measures specified in the ESIA into a plan for implementation of the Project. Thus the ESMP:

- lists mitigation measures to be implemented by the Project for every phase in its implementation, with the aim of complying with Guinean regulations and international standards and good practices; and
- provides a framework for monitoring or even auditing project compliance with these standards and good practices.

The ESMP is supplemented by:

- a surveillance and monitoring plan;
- a capacity reinforcement plan; and
- an implementation plan.

7.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN – IMPACTS MITIGATION REGISTER

The ESMP mitigation register is a compilation of the mitigation measures identified in *Chapter 5* of the ESIA report.

As required by the Guinean ESIA guide, for each measure, objectively verifiable monitoring indicators (OVI), means of verification (MV) and the person in charge of implementing the measure are suggested.

Table 7.1 Impact mitigation register – construction phase Table 7.1

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Impacts on air quality								
Site machinery, transport vehicles	Impact on air quality from combustion engine emissions	Local people, Workers	Regular maintenance and inspection by the contractor in charge of the works	100% of vehicles that have been the object of annual maintenance over the past 12 months.	Maintenance report.	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
			Reduction of atmospheric emissions from vehicles by limiting the number of journeys as much as possible	Vehicle fuel consumption	Monthly report from the worksite HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
			Ensure that vehicles and machines are turned off when they are not being used.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
Storage and transport of raw material	Impact on air quality due to dust emissions	Local people Workers	• Suitable management and maintenance of raw materials' storage areas to minimise clouds of particles; and • covering of storages of materials likely to be carried by the wind (notably contaminated or hazardous materials).	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager Daily
			Cover truck loads that generate dust.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
			Spray site access tracks if they are not asphalted.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager Daily
Transport	Impact on air quality due to dust emission	Local people Workers	Set speed limits on non-asphalted site access tracks.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
Transport	Impact on air quality due to dust emission	Local people Workers	Wheels rinsed on vehicles leaving the site.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month
Impacts on ambient noise levels								
Machinery, vehicles and all sources of noise	Ambient noise	Local communities	undertake all noisiest construction / maintenance activities during daytime (eg piling)	Number of nights worked less than 20% of the total number of days worked	Worksite register	Throughout the construction phase	Contractor	E&S manager, Contractor
Machinery, vehicles and all sources of noise	Ambient noise	Local communities	Regular maintenance and inspection by the contractor in charge of the works	100% of vehicles that have been the object of annual maintenance over the past 12 months.	Maintenance report.	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Machinery, vehicles and all sources of noise	Ambient noise	Local communities	• select recent, well maintained construction equipment and vehicles compliant with international best practice for noise emissions; • prefer electrical power plant to mechanical alternatives, where feasible; • use of power generators equipped with sound mufflers; • enclosure of the main fixed sources of noise (power generators mainly); and • switch off equipment when not in use.	Visual observation	Monthly report from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager Daily
Machinery, vehicles and all sources of noise	Ambient noise	Local communities	Whenever feasible, schedule different noisy activities to occur concurrently	At least 50% of noise generating activities planned concurrently	Worksite register	Throughout the construction phase	Endeavor	E&S manager, Contractor
Impacts on water resources								
Water requirements	Quantitative impact on water resource	Water resource	• optimise water consumption and minimise wastage; • check absence of leaking equipment; and • supervise water consumption to identify any over-consumption and provide a basis from which to improve efficiency.	Volume of water consumed per day	Monthly report from the HSE Manager Analysis of water volumes will identify any over-consumption which must be justified.	Throughout the construction phase	Contractor	Service provider's HSE Manager 1/ month
Accidental spillages or leaks from the chemical product or fuel oil storage tanks or from the worksite machinery used at the site.	Impacts on water quality	Groundwater	• retentions on storage tanks for hydrocarbons or hazardous products and on unloading areas; • unloading and storage management procedure which minimises risks of leakage; • provision of cleaning equipment in case of spillage; and • in case of accidental spillage, a "spillage" incident will be opened; this incident will be closed when the area has been cleaned up.	Visual observation Number of incidents involving leakages or spillage	Monthly report from the HSE Manager End of worksite report (in the case of monitoring "spillage" incidents).	Throughout the construction phase	Contractor	Service provider's HSE Manager 1/ month An audit of the way in which products are stored must be carried out once a month.
Discharge of sanitation effluent	Impacts on water quality	Surface water and groundwater	Check and regular maintenance of the waste water evacuation system (temporary and permanent septic tanks)	Volumes of effluent emptied	Monthly reports from the HSE Manager	Throughout the construction phase	Contractor	Service provider's HSE Manager

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Discharge of rain water	Impacts on water quality	Surface water and groundwater	• check and regular maintenance of the drainage system; and • the drainage system for non-contaminated water will be separate from the contaminated water collection system.	Visual check on management means after every major rainfall episode.	Monthly reports from the HSE Manager	Throughout the construction phase	Contractor	Service provider's HSE Manager 1/ month
Impacts from accidental events								
Accidental spillages or leaks from the chemical product or fuel oil storage tanks or from the worksite machinery used at the site.	Impacts on water quality	Groundwater	• proper storage of chemicals, fuels and hazardous wastes (liquids stored in bunded areas, all stored in covered places, etc.); • development of oil and chemicals spill prevention measures and procedures; • use of oil and chemicals equipment (i.e. sepiolite) on areas more likely to suffer spills (chemicals, fuel and waste storage areas) and training on how to use it; • proper maintenance of vehicles and machinery according to manufacturer's specifications; and • development of a management plan of dangerous products.	Visual observation Number of incidents involving leakages or spillage	Monthly report from the HSE manager End of worksite report (in the case of monitoring "spillage" incidents).	Throughout the construction phase	Contractor	Service provider's HSE manager 1/ month An audit of the way in which products are stored must be carried out once a month.
Landscape and visual impacts								
Worksite installation, machinery, presence of the worksite	Landscape and visual impacts	Local people	Machines and materials will be stored in an orderly manner during the works. High machinery, including cranes, will not be left on site for any longer than is necessary for the construction work.	Visual observation	Daily reports from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager
Lighting required for the worksite	Landscape and visual impacts	Local people	External safety lighting directed downwards.	Visual observation	Daily reports from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Impact on road traffic								
Transport of raw materials	Road traffic impact	Local people, road infrastructures	• application of the company's road safety policy to operator and contractor vehicles; • optimization of routes and schedule of transport of goods to avoid peak traffic times (7-10 am and 4-7 pm) to the extent possible; • optimization of the schedule and duration of the installation of transmission lines; and • in case of temporary road closure or any other disruption, place adequate signalling in advance of operations to inform road users of potential disruptions	Monitoring of daily travel associated with the Project	Daily reports from the HSE manager	Throughout the construction phase	Contractor	Service provider's HSE manager
Social impacts								
Construction works	Increased tension within the community	Local communities, local authorities, employees	• consider associations and grassroots organizations as project stakeholders in their own right whose legitimacy is recognized by both the authorities and local residents: provide them with information, involve them in project monitoring; and • implement a grievance mechanism in line with international standards.	Number of grievances received	Weekly reports from community liaison officer	Throughout the construction phase	Contractor	Service provider's HSE manager Monthly
Project presence	Increase risk of corruption	Local communities, local authorities	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities); • develop a project information campaign for all sections of the population; and • prioritise the communication methods most likely to reach the largest number of stakeholders (local media).	Number of grievances received related to corruption	Monthly report from community liaison officer	Throughout the construction phase	Contractor	Service provider's management Monthly

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Community investment	Health and education infrastructures, local businesses	Local communities	• as part of Endeavor's community investment strategy consider funding community investment projects; • involve the communities and local authorities when constructing basic infrastructure or implementing development projects to identify their exact needs; • ensure transparency when assigning project funding to local institutions' budgets; • as part of Endeavor's community investment strategy maximize project investment in the health sector; • involve the communities and local authorities when constructing basic infrastructure or implementing development projects to identify their exact needs (ensure the investment is included in the communes' local development plans); • introduce a health facilities monitoring plan to ensure service quality is maintained and facilities are used appropriately; • as part of Endeavor community investment strategy, consider supporting local entrepreneurs in developing their businesses, both to ensure that the quality of the services delivered meet the operator's requirements if they are chosen as part of procurement activities and to enable these entrepreneurs to enhance their skills and take advantage of the economic opportunities created the power plant operation; and • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities).	Number of community investment projects	Quarterly community investment reports	Throughout construction	Endeavor's community investment manager	Endeavors' management Quarterly

Activity/ Source	Potential impact	Impact receptors	Mitigation measures	OVI	MV	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Employment of local labour	Local employment (positive impact).	Local people and employees	• ensure employment and salary policy are in line with or more favorable than standard Guinean practices; and • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities).	Monitoring of the number of local employees of the Project	Recruitment plan / policy. Recruitment policy. Before the start of the works and checks during the construction work.	Prior to start-up of the construction works	Contractor	contractor's human resources manager
Impacts on health and safety								
Transport	Road safety risk	Local people and employees	• prepare a traffic plan comprising notably the establishment of speed limits for trucks around the power plant area; • installation of adequate signs in the Project's surroundings; • plan a timetable for traffic caused by the Project to avoid, if possible, peak traffic times in Conakry.	Number of deviations observed	Daily reports from the HSE manager	Right from start-up of the construction works	Contractor	Site manager
			Awareness of drivers and populations exposed to the road risk in the plant's surroundings.	100% of drivers who have attended training	Monthly reports from the HSE manager	Prior to and during construction works	Contractor and Service	Site manager

Table 7.2 ESMP – operational phase

Activity source	Potential Impact	Impact receptors	Mitigation measures	OVI	MVI	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Administrative procedures and applicable regulations								
Operation of the plant	Non-compliance with applicable Guinean regulations	N/A	Endeavor will follow the administrative procedures required within the frame of this project, in particular those related to the Classified Installations regulations.	Absence of regulatory non-compliance	Obtained authorizations	Before the operational phase	Endeavor	HSE Manager
Impact on air quality								
Engines running on heavy fuel oil	Gas emissions (NO_x, SO_2, CO) and impacts on air quality	Local people Employees	Sulphur concentration in the fuel oil delivered will not exceed 2%.	100% of fuel oil will have a concentration <2%	Monitoring and recording of fuel oil quality used by means of delivery slips validating the quality requested.	Prior to start-up of the initial Project power plant (54MW), on signature of the supply contract. On every delivery during the operational period.	Endeavor' Fuel supplier	Site operational team. Monitoring terms included in the fuel supplier contract.
		Local people Employees	Air quality monitoring to of baseline conditions and monitoring of ambient air quality over the long term.	Results of measurements	Monitoring report	Monthly report	Service provider specialising in air quality measurements	Site HSE manager 1/ month
		Local people Employees	Monitoring of atmospheric emissions at output from the stack : 1/ month	Results of measurements	Monitoring report	Every 6 month	Service provider specialising in air quality measurements	Site HSE manager 1/ month
Site machinery, transport vehicles	Impact on air quality from combustion engine emissions	Local people Employees	• delivery vehicles will be the object of regular inspections and maintenance; • the number of journeys made by transport vehicles will be optimised; • development of a Transport Management Plan.	Percentage of vehicles that have been the object of maintenance over the past 12 months. Objective of 100%	Vehicle inspection certificates	Operational phase.	Fuel delivery service provider	Service provider's manager (regular maintenance of vehicles). Site operational team 1/month
		Local people Employees	Air quality monitoring of baseline conditions and monitoring of ambient air quality over the long term for NO_2, and SO_2	Results of measurements	Monitoring report	Monthly report	Service provider specialising in air quality measurements	Site HSE manager 1/ month
		Local people Employees	Monitoring of atmospheric emissions at output from the stack: 1/ month	Results of measurements	Monitoring report	Every 6 month	Service provider specialising in air quality measurements	Site HSE manager 1/ month
Impacts of noise emissions on ambient noise levels								
Power plant design	Ambient noise	Local people Employees	Locating plant equipment (e.g. generators) as far from the nearest potential sensitive receptors as possible, orienting any direct emissions away from receptors, and using on-site structures and terrain to screen sensitive locations wherever practicable.	Results of measurements	Environmental monitoring report (section on noise)	During design of the power plant and then prior to start-up. Throughout the duration of power plant operations.	Endeavor Specialised service provider	Site HSE manager
Vehicles and machinery	Ambient noise	Local people Employees	• regular maintenance of noisy equipment and vehicles in accordance with supplier specifications to prevent increase in noise emissions; and	Sale	Environmental monitoring report (section on noise)	During design of the power plant and then prior to start-up. Throughout the duration of power plant operations.	Endeavor Specialised service provider	Site HSE manager

Activity source	Potential Impact	Impact receptors	Mitigation measures	OVI	MVI	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
			• consider noise performance un the selection of equipment and procure equipment in line with international good practice in terms of noise emissions					
Impacts on water resources								
Water consumption	Impacts on water resources	Populations (pressure on the resource)	• optimisation of water consumption and minimisation of wastage; and • monitoring of water consumption to identify any over-consumption.	Volume of water consumed.	Check and analysis of the HSE Manager's reports on water consumption to detect any abnormality. Evolution of consumption over time. Number of unexplained consumption peaks.	Right from start-up of the power plant and throughout operations.	Site HSE Manager	Site HSE Manager twice / week twice / month once / day
Accidental spillage	Impacts on water quality	Groundwater	• regular check on installations to prevent any leakage or accidental spillage; and • installation of a piezometer at the fuel oil storage tanks in order to monitor groundwater quality.	Number of problems observed and results of groundwater monitoring campaigns.	Installation control sheets Environmental monitoring report (section related to groundwater quality monitoring)	Control measures will be undertaken from commissioning of the plant and during all operation duration.	Maintenance manager	Site HSE Manager
Effluent management	Impacts on water quality	Groundwater	Treat oily water in a water separator before discharging it into municipality mains	Daily water volume discharged	Environmental monitoring report (section relating to liquid effluent)	Same	Endeavor	Site HSE Manager
Effluent management	Impacts on water quality	Groundwater	Analyse effluent once a month	Results of analyses (hydrocarbons and pH)	Environmental monitoring report (section relating to liquid effluent)	Same	Endeavor	Site manager Monthly analyses
Risk of Accidental events								
Accidental spillage	Impacts on water quality	Groundwater	• development of oil and chemicals spill prevention measures and procedures; • development of a management plan of dangerous products; • HFO, DDO and lube oil tanks located in bunded areas with secondary containment; • use of oil and chemicals equipment (i.e. sepiolite) on areas more likely to suffer spills (chemicals, fuel and waste storage areas) and training to employees on how to use it; and • proper maintenance of storage tanks, vehicles and machinery according to manufacturer's specifications.	Number of problems observed Results of groundwater monitoring campaigns	Installation control sheets Environmental monitoring report (section related to groundwater quality monitoring)	Control measures will be undertaken from commissioning of the plant and during all operation duration.	Maintenance manager	Site HSE manager

Activity source	Potential Impact	Impact receptors	Mitigation measures	OVI	MVI	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Landscape and visual impacts								
Functioning of the power plant	Landscape and visual impacts linked to the presence of the infrastructures and the effects of the lights at night	Local people	• the design, orientation and materials will be suitably and reasonably developed to fit in with the characteristics of the existing site and with the characteristics of the landscape;. • appropriate usage of non-reflecting surfaces and coloured surfaces; and • external lighting as discreet as possible and directed downwards to prevent lateral lighting.	Not applicable.	Adequate design and implementation	Same	Site HSE manager	Site HSE manager
Impact on road traffic								
Transport of raw materials	Road traffic impact	Local people, road infrastructures	• application of the company's road safety policy to operator and contractor vehicles; • optimization of routes and schedule of transport of HFO and DFO to avoid peak traffic times (7-10 am and 4-7 pm) to the extent possible;	Monitoring of daily travel associated with the Project	Daily reports from the HSE manager	Throughout the operation phase	Contractor	Service provider's HSE manager
Social impacts								
Project presence	Increase risk of corruption	Local communities, local authorities	• thorough implementation of Endeavor's anti-bribery and corruption policy within Endeavor and contractors; • ensure transparency when allocating funding to the local communities' budget; • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities); • develop a project information campaign for all sections of the population; and • prioritise the communication methods most likely to reach the largest number of stakeholders (local media).	Number of grievances received related to corruption	Monthly report from community liaison officer	Throughout the operation phase	Endeavor	Endeavor's management Monthly

Activity source	Potential Impact	Impact receptors	Mitigation measures	OVI	MVI	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Community investment	Health and education infrastructures, local businesses	Local communities	• as part of Endeavor's community investment strategy consider funding community investment projects; • involve the communities and local authorities when constructing basic infrastructure or implementing development projects to identify their exact needs; • ensure transparency when assigning project funding to local institutions' budgets; • as part of Endeavor's community investment strategy maximize project investment in the health sector; • involve the communities and local authorities when constructing basic infrastructure or implementing development projects to identify their exact needs (ensure the investment is included in the communes' local development plans); • introduce a health facilities monitoring plan to ensure service quality is maintained and facilities are used appropriately; • as part of Endeavor community investment strategy, consider supporting local entrepreneurs in developing their businesses, both to ensure that the quality of the services delivered meet the operator's requirements if they are chosen as part of procurement activities and to enable these entrepreneurs to enhance their skills and take advantage of the economic opportunities created the power plant operation; and • ensure transparency of recruitment process (skills based, equal opportunity policy, with publicly advertised employment opportunities);	Number of community investment projects	Quarterly community investment reports	Throughout operation	Endeavor's community investment manager	Endeavors' management Quarterly

Activity source	Potential Impact	Impact receptors	Mitigation measures	OVI	MVI	Timetable for implementation	Implementation Responsibility	Internal monitoring frequency and responsibility
Employment of local labour	Local employment (positive impact)	Local people and employees	Ensure that the recruitment policy is well defined and advertised and that job offers and published at local level. This local procedure for jobs will be established in agreement with the authorities.	Number of local workers	Recruitment plan / policy	Throughout the operational phase	Endeavor	Promoter's human resources manager
Impacts on health and safety								
Transport	Road safety risk	Local people and employees	• prepare a traffic plan comprising notably the establishment of speed limits for trucks around the power plant area; • installation of adequate signs in the Project's surroundings; and • plan a timetable for traffic caused by the Project to avoid, if possible, peak traffic times in Conakry.	Number of deviations observed	Daily reports from the HSE manager	Same	Endeavor	Site manager
			Awareness of drivers and populations exposed to the road risk in the plant's surroundings.	100% of drivers who have attended training	Monthly reports from the HSE manager	Same	Endeavor	Site manager

7.3 *ENVIRONMENTAL MANAGEMENT PLAN MAIN THEMED PROCEDURES*

In addition to the mitigation plan presented above, the following themed environmental management procedures are to be planned:

- waste management;
- transport management;
- environmental emergency response plan in case of spillage; and
- periodic for audit and review of the ESMP.

The essential principles of these procedures are defined in the following sections.

These procedures shall be integrated into the power plant's environmental management system. They will be designed to be adaptable to the various Project phases, in order to remain relevant to the specific issues arising in each phase.

Other procedures relating to the safety of installations and associated industrial risks will also be implemented through the Power Plant's IIP (Internal Intervention Plan) and IOP (Internal Operation Plan). Specific procedures relating to worker health and safety will also be planned.

7.3.1 *Waste management procedure*

This sub-section describes the principles applicable to the development of a management procedure for waste at the power plant. These principles are defined on the basis of good practices relating to waste management.

The optimisation of waste management is a continuous process and Endeavor will periodically review this procedure with a view to continual improvement. This revision should not be restricted to the evaluation of waste treatment and disposal facilities, but should also focus on the use of technical solutions with a view to the reduction of waste at source.

Table 7.3 Principles applicable to the waste management procedure

Aspect	Management principle
Purchasing team's selection of materials and products that generate the least possible waste	• In its supplies policy, Endeavor will take waste generation potential into account in order to selection options that generate the least waste, wherever possible.
Inventory management	• inventory management system will be kept up to date with a view to identifying product consumption, ensuring the traceability of waste and identifying any wastage and over-consumption; • an inventory will be kept of all waste generated and eliminated (type and volumes); and • Endeavor will develop objectives for reductions in the amounts of waste generated, year on year, based on a periodic review of inventories.
Staff training	• Waste will be handled and stored according to its type and risk classification, in compliance with health and safety rules. • An area for central accumulation of waste (ACAW) will be used to store waste. Compatible waste materials will be stored together. • Areas of the ACAW used to store hazardous waste will be covered and the ground will be waterproofed. Liquid and hazardous waste storage units will be fitted with retention systems. • The ACAW will be fenced and only authorised staff will be allowed access to the site. • The ACAW will be maintained in good order, clean and with waste products separated by type and risk classification, in order to minimise risks of pollution, fire and explosion, and the proliferation of vermin.

Aspect	Management principle
Final disposal of waste	• Recyclable waste will be regularly collected for recycling by local recycling companies. Contracts for the collection of waste by these companies will be confirmed after verification of acceptability of their practices from an environmental, health and safety management point of view. • All hazardous and non-combustible waste will be processed appropriately in the country or exported abroad for processing and final discharge. Any export of waste for elimination outside the borders of Guinea will meet the demands of the Basel Convention on the control of transborder movements of waste and other hazardous materials. • Potentially infectious waste will be place in dedicated, labelled recipients, for evacuation to a specialized centre for incineration in a dedicated incinerator. • No waste will be burned in the open air.
Transport of waste off site	• when waste materials are sent off site, suitable transport vehicles will be used (if needed by means of use of a service provider) in order to comply with the rules on ensuring that loads are safe, properly labelled and traceable; and • the transport vehicles used will be fitted with means with which to take action in case of any accidental spillage.
Cumulative impact	• monitoring of what happens to waste in order to anticipate any saturation of the facility; and • the waste management plan will describe possible alternatives to the local facility, in anticipation of any saturation.

7.3.2 Transport management procedure

This section describes the principles to follow for the development of a Transport Management Procedure (TMP), notably associated with the following phases of the Project:

- Construction:
  - transport of construction equipment and machinery; and
  - transport of products and materials purchased or extracted locally, in the periphery of the Project area, to the construction site.

- Operation:
  - transport to the Project area of technical supplies: chemicals, spare parts, equipment/tools for work on installations;
  - fuel;
  - maintenance equipment; and
  - workers transport.

Table 7.4 Transport management principles

Aspect	Management principle

Condition of public roads used by vehicles for the Project	• a review will be carried out of regulations applicable to the transport of staff and goods on public roads, in order to provide a basis for regulatory conformity of transport activities, notably in terms of maximum axle loads authorised depending on the type of road taken;
	• public road preservation measures specific to the Project will be implemented, notably:
	  • compliance with regulatory limits on vehicle axle loads;
	  • compliance with Project speed limits on road and tracks;
	  • transport of site machinery using flatbed trucks; and
	  • creating driver awareness of road driving that respects the state of roads and highways.
	• it may be necessary to improve certain sections of road or track, in agreement with local highway authorities.

Atmospheric emissions linked to car and truck traffic	• vehicles used for the Project's construction phase must comply with the emission limit specifications identified by regulations and by international best practice; • Project's vehicles will be duly maintained by Endeavor and its sub-contractors, in order to ensure correct functioning of their engines and their exhaust fume filtering systems; and • measures to reduce fuel consumption and atmospheric emissions will be considered.

Aspect	Management principle

Site machinery traffic	• safety measures will be implemented to ensure road user safety, notably:
	  • the signalling of heavy vehicles using public roads (use of flashing lights and signs);
	  • escort of wide loads by escort vehicles, (leader cars and cars bringing up the rear);
	  • limitation of the weight and volume of loads to ensure good road stability; and
	  • coordination with local authorities to agree on routes to be taken, times and road safety measures to be implemented and intervention and coordination measures to be implemented in case of incident.
	• where possible, Endeavor and its sub-contractors will ensure that vehicle loads are optimised, if necessary by means of loads shared between different Project operators in order to limit the number of vehicles to be mobilised.

Waste transport	• Any transport of waste, whether hazardous or not, will be undertaken in compliance with the waste management procedure, taking into account applicable regulations and international good practice relating to the packaging, packing, labelling and transportation of waste.
Parking on public roads	• Vehicles, particularly Heavy Goods Vehicles (HGV), which are stopped on public roads or in populated areas, must ensure that they are safely parked and do not obstruct the public highway.

Aspect	Management principle

Training	• driving training will be provided to Endeavors and sub-contractor staff, to ensure that the drivers of vehicles and machinery working on the Project apply good road driving rules, in order to guarantee the safety of staff and third parties;
	• Endeavor and its sub-contractors will ensure that only staff who have taken road safety training and have reached the levels of competence required are authorised to drive the Project's vehicles and machinery; and
	• in addition, all drivers must receive (at least):
	  • training that is specific to their type of vehicle;
	  • defensive driving training; and
	  • driver training in driving rules to ensure the safety of off-site road users (for example pedestrians, farmers using the road to move their farm machinery, herdsmen moving their animals across the road).

Measures in case of accident	• In case of a traffic accident involving one of the Project's vehicles, the Endeavor manager in charge of activity supervision will inform emergency services as quickly as possible. When off the public highway, the emergency services to be mobilised will be Endeavor emergency crew while on the public highway, the public emergency services will be mobilised. Details of the incident or accident will be recorded in an accident report.

7.3.3 *Environmental emergency response plans*

Accidental events may result in various environmental impacts, such as, for example, uncontrolled spillages of hydrocarbons, chemicals or other hazardous waste, notably in case of:

- a leak or crack of the heavy fuel oil tank or container;
- a leak from a collection network;
- an accident situation in the processing installations, during the operational phase, leading to the spillage of hydrocarbons, sludge or potentially contaminated water into the environment;
- a traffic accident involving damage to a diesel tank or a heavy fuel oil tank.

Also industrial sites such as this one present a fire hazard.

An emergency response plan in case of spillage and an emergency response plan in case of fire will be drafted and implemented by Endeavor. This plan will organise a systematic, quick and efficient response to any kind of on-site emergency, fire, accident situation or spillage of water contaminated by hydrocarbons, or of any other hazardous chemical product, in order to reduce/remedy potential damage to the environment and property.

The emergency response plan in case of spillage plan must prepare for immediate confinement of any spillage and rapid cleaning of any deteriorated area.

The plans will define the roles and responsibilities of Endeavor staff and sub-contractors in the response process in case of accidental spillage or fire. The location of intervention equipment and the contact details of trained staff will be clearly displayed.

The emergency response plan in case of spillage or fire will include training and awareness, and will notably specify requirements terms of continuous staff training and the performance of periodic training exercises. It will also include provisions for the correct periodic verification and maintenance of intervention resources.

These procedures will be periodically audited and revised in order to ensure it remains relevant and operational throughout the Project's lifespan.

7.3.4 Periodic audit and update of the ESMP

Audit and review levels

The ESMP will be periodically audited and updated to ensure sustainability and continuous improvement throughout the Project, from detailed design phase to operational phase.

At corporate level, the ESMP will be reviewed within the context of Endeavor Project audits, focusing on risk identification, the ESMP, specific HSE standards and objectives and the reporting process for environmental indicators related to the Project. To ensure audit integrity it is preferable for audits to be carried out by staff members who do not work directly on the Project, or by specialised sub-contractors.

At operational level, a periodic audit program will be drawn up and implemented aiming to check that the environmental management procedures specified in the ESMP are included in operational procedures, effectively implemented and that their results in terms of improving the environmental efficiency of activities are monitored over time. These audits will be

scheduled and accompanied by the Project's environmental management team.

Within this context Endeavor will establish an audit schedule for the environmental management procedures used by sub-contractors involved with the Project, and their environmental performance. To this end all sub-contractors must draw up an internal verification programme, permitting continuous improvement of the ESMP at their level, between each audit.

Integration and use of results

The integration of audit and monitoring results will permit periodic evaluation of the relevance and adequate nature of the Project's ESMP. Any change to or adaptation of the ESMP will be the object of written tracking and an update of the checked version of the ESMP. Changes to the ESMP will be communicated to the Project team and their results will be evaluated during the next audits, in a continuous improvement cycle.

7.4 CLOSURE AND RESTORATION OF THE SITE AFTER OPERATIONS

The contract signed between Endeavor and the Government of Guinea provides for operation of the power plant for 5 years. This duration could be extended depending on local electricity generation requirements and according to the national production strategy defined by the Guinean authorities. The power plant will be subject to a Closure and Restoration Management Plan (CRMP). In compliance with the CRMP, Endeavor will implement the measures required to restore all sites at the end of the Project, and to ensure that environmental and social impacts associated with closure of the site are kept under control, in accordance with regulations and good practice.

In this respect, Endeavor will implement measures throughout operation of the power plant to ensure the absence of any deterioration of the site. If such an event, impacting the condition of the site, were to take place during the operational period, Endeavor would record it and the necessary investigations and remediation would be undertaken. In order to prevent any contamination of the soil and groundwater, various measures in terms of the storage and use of chemicals, lubricants and hydrocarbons, will be implemented.

7.4.1 *Integration of issues linked to closure – design phase*

The power plant has been designed for continuous operation whilst guaranteeing an appropriate level of safety. All the design studies for the power plant have included the good practices currently recognised in the industry. With the aim of minimising impacts linked to site closure, design of

the power plant has taken into account and included the following aspects (this list is not exhaustive:

- choice and use of materials;
- ease of replacement and dismantling.
- location of equipment;
- limitation of pollution accumulation, in waste water networks, for example;
- installation of secondary containment around tanks and storage areas;
- ease of operation; and
- ease of cleaning.

7.4.2 Integration of issues linked to closure – operational phase

Endeavor will adopt a series of measures during the operational phase in order to minimise site restoration requirements after operations are finished. The following measures in particular will be adopted:

- confinement and appropriate management of chemicals, lubricants and hydrocarbons in order to minimise the risk of accidental leakage;
- development and maintenance of a drainage system in order to avoid, in the product spreading, in case of leakage, and contaminating surface water and groundwater;
- storage of anti-spillage kits in the storage areas and employees trained to use them;
- management of sub-contractors during deliveries of chemicals, fuel oil and lubricants as well as during waste product collection;
- regular review of measures implemented for the storage, control and cleaning of chemicals, hydrocarbons and lubricants; and
- adequate staff training.

7.4.3 Site closure and restoration

The CRMP will be established in agreement with the competent Guinean authorities, after a closure audit carried out according to national regulations or international good practice. This plan will be reviewed regularly throughout the project's various phases and updated in case of modification of operating conditions (change in fuel oil delivery methodology). Implementation of the measures described in the preceding paragraph will minimise any contamination of the environment. The management plan will detail the following:

- replacement or cleaning of pipelines and equipment if necessary and evacuation of any hazardous materials that they might contain;
- plans of buried cables, pipelines and equipment;
- site protection and surveillance programme, including soil sample analyses if necessary.

Content of the CRMP will be organised as follows:

- summary of scenarios envisaged in terms of site closure and restoration;
- summary of applicable environmental recommendations (Guinean and international);
- description of standards and criteria applicable to the site, after dismantling;
- initial description of planned dismantling measures for the various site installations;
- surveillance of the site after closure and requirements in terms of maintenance;
- planned timetable for the dismantling of installations;
- responsibilities it terms of dismantling and maintenance; and
- supervision of costs.

The CRMP will include the following appendices:

- cleaning, restoration and remediation methods;

- erosion control; and
- treatment facilities for waste generated by site dismantling.

A report on cessation of activity will also be drafted after operations are ended, reporting on the condition of the site. This report will be communicated to the competent Guinean authorities

Before commencing dismantling operations, an evaluation of risks linked to these operations will be undertaken. This evaluation will address activities, risks and control measures, as well as the following points:

- consumables, chemicals, oils, lubricants;
- exposure to noise and control;
- staff management;
- handling and storage;
- burns, cuts;
- cleaning;
- demolition;
- site dismantling and cleaning;
- evaluation of the presence of hazardous materials;
- accidents and near-accidents;
- loading and unloading;
- elimination of waste and materials;
- contaminated soils and materials; and
- health and safety.

Dismantling of the power plant will be carried out in compliance with good practice in force at the time of these operations. Operations to dismantle the power plant and its associated installations may lead to a risk of exposure to

dust and hazardous and inflammable products. Infrastructures likely to present the greatest risks during their dismantling are as follows:

- fuel oil unloading area;
- heavy fuel oil storage and service tanks;
- oil storage tanks;
- fire water tank;
- pumping station;
- sludge treatment area;
- sludge tanks;
- machines and engines room; and
- stacks.

Exposure to the various hazards identified must be prevented by the implementation of suitable good practice, such as:

- staff training in the removal of potentially hazardous waste from tanks, equipment or contaminated soil;
- staff training in the treatment and removal of potentially hazardous equipment (for example electrical or insulation equipment containing mercury);
- use of personal protection equipment (PPE) adapted and selected after risk evaluation such as, for example, gloves, eyewear and insulating respiratory apparatus; and
- implementation of a work permit system for work by hot work or operations performed close to or on electrical equipment.

During the dismantling phase, all collections or removal of materials and waste will be recorded to ensure the traceability of these movements.

7.5 *ENVIRONMENTAL MONITORING PLAN*

The environmental and social management plan presented in Section 7.2 comprises corrective measures intended to suppress or reduce potential impacts and monitoring measures aimed at ensuring the efficiency of corrective measures.

This environmental monitoring plan considers the issues for which the Project's potential impacts, prior to mitigation, were significant. It aims to evaluate the efficiency of certain environmental measures and possibly to identify impacts which significance is different to those anticipated.

An environmental monitoring plan will thus be implemented to enable regular monitoring of the Project's potential impacts, more specifically of ambient air quality, noise levels, liquid effluent, groundwater and soils. The results of these specific measures will be integrated into the environmental annual report of the Project. This plan is summarised in Table 7.5below.

Table 7.5 Environmental monitoring plan

Aspect	Type of monitoring / location	Method / indicators to follow	Periodicity	Implementation date
Air quality	Monitoring of the Project's atmospheric emissions.	• Air quality monitoring of SO_2 and NO_2 by means of passive samplers, diffusion tubes, deployed at 5 monitoring sites. These sites are located at sensitive receptors which could potentially be affected by the emissions of the Project. • Air Quality Monitoring of PM_{10} and $PM_{2.5}$ at 3 monitoring sites where of SO_2 and NO_2 are also monitored. • Continuous exhaust quality monitoring at the stacks	• SO_2 and NO_2 sampling is performed on a monthly basis. Diffusion tubes are retrieved and replaced after the tube has been exposed for 4 weeks. • PM_{10} and $PM_{2.5}$ measurements are collected on a continuous basis.	Campaign to consolidate data from the baseline, prior to the operational phase Monitoring campaign during operations in "normal" conditions from start-operation.

Quality of liquid effluent	Sampling of liquid effluents and laboratory analysis	• An analysis of liquid effluents prior to discharge will be performed once a month. In case of discharge thought to be abnormal, the water will be recycled to the treatment plant and specific analyses will be performed. • Results of analyses performed after treatment will be recorded and measures will be taken in case of any excessive readings.	Sampling, and monthly analyses.	From start of operation
Groundwater quality	Monthly sampling via the piezometer. Monthly analysis of the quality of groundwater.	• an analysis of the quality of groundwater will be conducted once a month in order to detect potential contamination from the Project; • the analysis results will be recorded and corrective actions will be implemented in case of non-compliance; and • if a groundwater pollution is detected Guinean authorities will be informed.	Monthly sampling and analysis	From start of operation
Water consumption	Monitoring of water consumption to identify any over-consumption.	Control and analysis of the HSE manager's reports relating to water consumption, in order to detect any abnormality.	Monthly control.	From start of operation
Acoustic environment	Noise levels monitoring in the environment.	Noise measurements: • at the site boundary; and • at the closest sensitive; receptors (see points used in the baseline).	Every 6 months Additional measurements will be achieved in case of grievances from a site neighbour	From start of operation

Environmental monitoring will be carried out either by a specialised external company or internally by Endeavor technicians (measurement of air quality at stack output, for example). Roles and responsibilities will be specified at the same time as the monitoring and surveillance methods.

8 REFERENCES

Allwine et al 1998- Peer Review of the Calmet/Calpuff Modeling System, Allwine, Dabberdt, Simmons, 1998.

BSI 2009 - British standard BS 5228: *Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1: Noise. BSi, 2009*).

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Annex A: Atmospheric Dispersion Modelling Study

1 INTRODUCTION

An air dispersion modelling study supported the assessment of impacts on air quality arising during the Project operation.

In particular, the modelling quantified the ground level concentrations of the key atmospheric pollutants resulting from the Power Plant normal operations over its area of influence. The routine emission sources are six (6) reciprocating combustion engines of 9 MW each running on Heavy Fuel Oil (HFO), with the primary pollutants of interest being:

- nitrogen oxides (NO_x);
- carbon monoxide (CO);
- Particulate Matter (PM_{10}); and
- sulphur dioxide (SO_2).

In accordance with the impact assessment methodology reported in *Section 1.4* of the ESIA, the modelling study supported the impact assessment by determining the following factors:

- magnitude of impacts on the basis of the comparison of model output against applicable air quality guideline values;
- extent of impacts on the basis of the spatial distribution of predicted concentrations; and
- frequency/Likelihood of impacts on the base of the concentrations predicted at receptors.

The air quality simulations were performed using the CALMET–CALPUFF modelling system, recommended by Unites States Environmental Protection Agency (US EPA).

This Annex presents an overview of the CALMET–CALPUFF modelling system, the model set up and inputs. It is noted that the emission inventory along with the model outputs and the consequent assessment of impacts on local air quality are reported in *Section 5.5* of the ESIA.

2 AIR QUALITY MODELLING

This chapter presents a brief overview of the calculation code (CALMET–CALPUFF) adopted for this study, a detailed description of the modelling set up, the dispersion modelling tool, model domains, and input data.

2.1 METHODS AND MODEL INPUT

2.1.1 CALPUFF modelling system

The air dispersion modelling was carried out using the CALPUFF modelling system (version 5.8), as adopted and recommended by the US EPA. This modelling system involves state-of-the–art Lagrangian puff modelling for assessing impacts arising from the long-range transport of certain air pollutants. (1)
The CALPUFF model considers complex meteorological conditions, terrain effects, effects from buildings, and simple atmospheric chemical reactions. Ground level concentrations of pollutants can be predicted across a receptor grid, as well as at discrete receptors.
The CALPUFF modelling system requires the following input data:

- meteorological variables, surface data and height profiles; and
- source characteristics and emission data.

Modelling system components

The CALPUFF modelling system consists of three main components, including a pre-processor and post-processor.

- The meteorological pre-processor CALMET produces the three-dimensional fields for the main meteorological variables, temperature, wind speed and direction, over the simulation domain.
- The processor CALPUFF is a non-steady-state Lagrangian Gaussian puff model containing modules for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation. (2).
- The post-processor CALPOST statistically analyses CALPUFF output data and produces datasets suitable for further analysis. Post-processed CALPUFF outputs consist of matrices of concentration values. Receptors in the simulation domain can be discrete or gridded. The values calculated at each receptor could be referred to one or more sources.

(1) Peer Review of the Calmet/Calpuff Modeling System, Allwine, Dabberdt, Simmons, 1998.
(2) A User's Guide for the CALPUFF Dispersion Model (Version 5), Scire, Strimaitis, Yamartino, 2000.

The results can be processed by any Geographical Information System (GIS) software, to create contour maps, which illustrate the spatial distribution of areas with similar ground level concentrations of atmospheric pollutants.

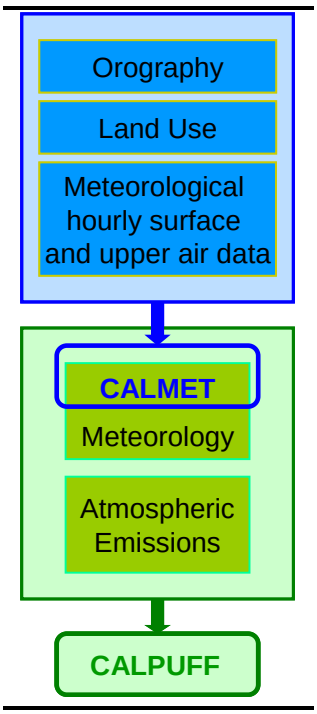
The CALPUFF modelling system requires the following input data:

- meteorological variables' surface data and height profile, to build the three-dimensional wind field, with the meteorological pre-processor CALMET; and

- source characteristics and emission data, to simulate the pollutants atmospheric dispersion, with CALPUFF.

The following *Figure 1* presents a flow chart of the CALPUFF modelling system inputs, while the *Box 1* gives a summary of the CALMET CALPUFF and CALPOST characteristics.

Figure 1 ***CALPUFF modelling system inputs***



Box 1 ***Features of the pre-processor CALMET, CALPUFF and post-processor CALPOST***

CALMET is a diagnostic meteorological pre-processor able to reproduce three-dimensional fields of temperature, wind speed and direction along with two-dimensional fields of other parameters representative of atmospheric turbulence. CALMET is able to simulate wind fields in complex orography domains characterized by different types of land use. The final wind field is obtained through consecutive steps, starting from an initial wind field often derived from geostrophic wind. The wind field is linked to the orography, since the model interpolates the monitoring station values and applies specific algorithms to simulate the interaction between ground and flow lines. The module contains a micro-meteorological module determining thermal and mechanical structures (turbulence) of lower atmospheric layers.

CALPUFF is a hybrid dispersion model (commonly defined 'puff model'). It is a multi-layer and non-steady-state model. It simulates transport, dispersion, transformation and deposition of pollutants, in meteorological conditions varying in space and time. CALPUFF uses the meteorological fields produced by CALMET, but for simple simulations an external steady wind field, with constant values of wind speed and direction over the simulation domain, can be used as input. The module contains different algorithms to simulate different processes, such as:

- buildings downwash and stack-tip downwash;
- wind vertical shear;
- dry and wet deposition;
- atmospheric chemical transformations;
- complex orography and seaboard.(In marine coastal areas, CALPUFF considers breeze phenomena in order to model efficiently the Thermal Internal Boundary Layer (TIBL) as in case of coastal sources, the TIBL causes a quick fall of pollutants to the ground.)

Besides, CALPUFF allows the selection of the source geometry (point, linear or areal), improving in this way the accuracy of the emission input. Point sources simulate emissions coming from a small area while areal sources describe a diffuse emission coming from a wider area; emissions from linear sources are distributed along a main direction (i.e. roads).

CALPOST processes CALPUFF outputs producing an outputs' format suitable for further analysis. CALPOST output files can be fed into graphic software to create concentration or deposition maps

2.1.2 Model domains

The CALMET meteorological domain represents the area in which the CALMET pre-processor computes all the meteorology variables (i.e. temperature, wind direction, wind speed, and atmospheric stability) needed to model the dispersion of pollutants in the air.

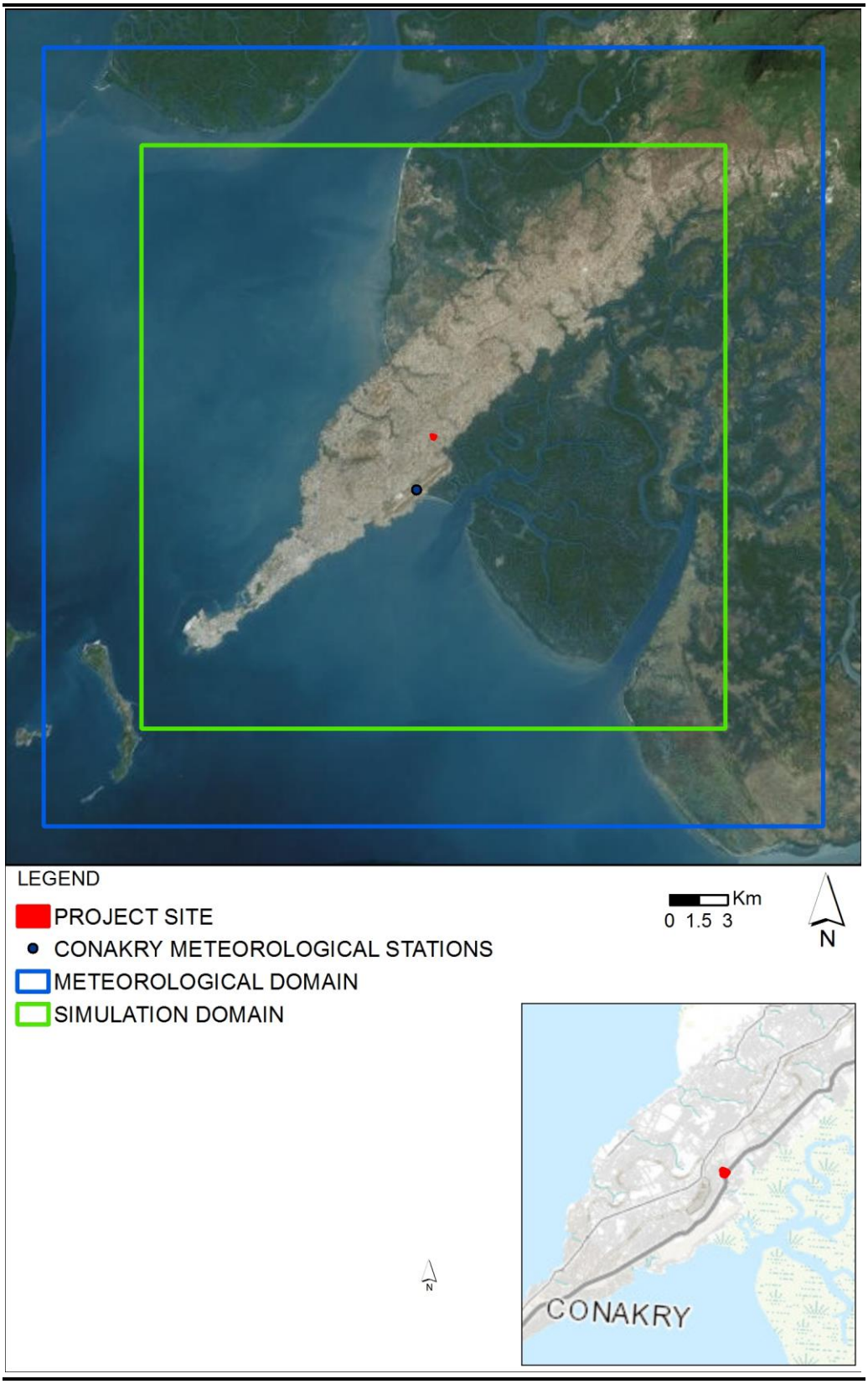
The CALMET meteorological simulation domain used in the modelling study is a 40 km x 40 km square, with a resolution of 500 m, centred on the Power Plant location. The domain size (1,600 km^2) has been set according to the features of the emission sources and their dispersion capability.

The sampling simulation domain represents the matrix of gridded receptors at whose locations the CALPUFF model calculates the pollutant concentrations. The sampling domain used in the modelling study is a 30 km x 30 km subset of the meteorological domain, with a resolution of 500 m.

The central point of each cell in the sampling domain represents a gridded receptor, whose elevation depends on the local orography and is given by the digital elevation model for the area.

Figure 2.1 presents both the meteorological and sampling domain used for the modelling study.

Figure 2.1 Meteorological and sampling domains and potential receptors



The CALMET-CALPUFF models operate in a terrain-following vertical coordinate system, where the terrain-following vertical coordinates are the Cartesian vertical coordinates minus the terrain height. The vertical resolution adopted in the modelling study consists of 9 terrain-following vertical layers, from ground level up to 4000 m elevation (located at 20 m, 50 m, 100 m, 200 m, 350 m, 500 m, 1000 m, 2000 m, 4000 m from ground level). The resolution of the vertical layers is higher near ground level, as this is where the transport and dispersion of air pollutants takes place.

2.1.3 Model input

Orography and land use

Land cover data has been taken from Global Land Cover Map by the USGS Land Cover Institute (LCI). These data describe land cover type, and are based on 10 years (2001-2010) observations from MODIS space borne sensor. The methodology of analysis is detailed in Broxton et Al., 2014(3).

Site-specific information on regional orography has been reproduced using the Shuttle Radar Topography Mission (SRTM) DEM, developed by NASA, and GTOPO30, developed by the USGS.

The resolution of the source data for DEM and Land Cover used in the both performed modelling studies (mining area and port facility areas) is of 90 m and 500 m respectively.

Meteorological data

The dispersion modelling has used meteorological data for 2015 to estimate future conditions.

The CALPUFF meteorological input was obtained using the meteorological pre-processor CALMET. The latter requires two different types of input data:

- hourly surface data for wind speed and direction, temperature, atmospheric pressure, relative humidity, cloud cover and ceiling height; and

- upper air data with a temporal resolution of at least 12 hours for atmospheric pressure, temperature, wind speed and direction.

Upper air data is necessary in order to characterise the wind regime and the atmospheric diffusion parameters (e.g. stability class, mixing height, thermal inversion) and to produce a three-dimensional simulation.

(3) Broxton, P.D., Zeng, X., Sulla-Menashe, D., Troch, P.A., 2014a: A Global Land Cover Climatology Using MODIS Data. J. Appl. Meteor. Climatol., 53, 1593–1605. doi:

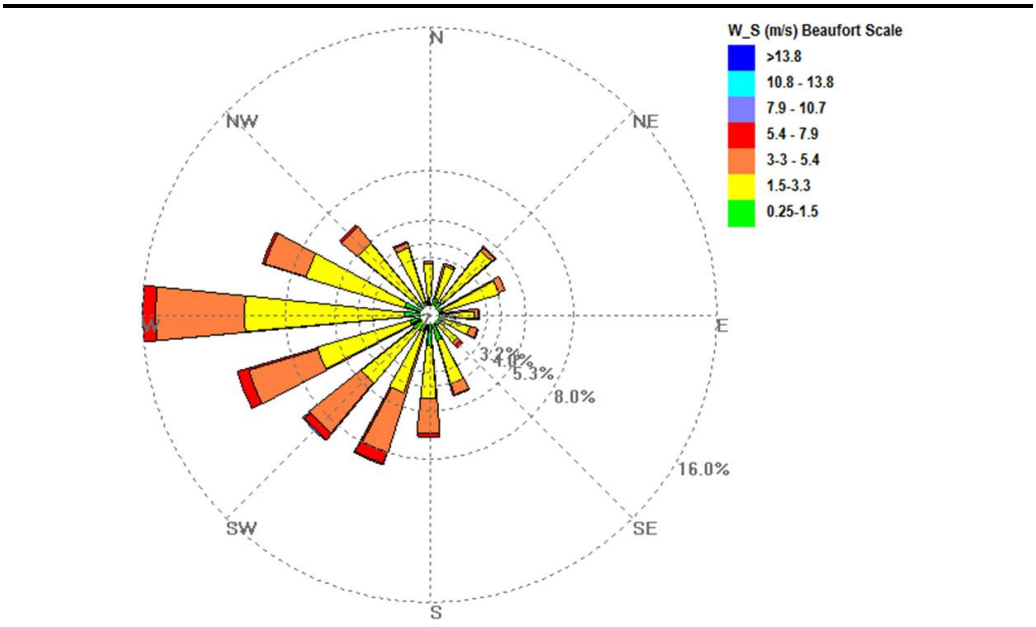
CALMET meteorological surface input data is typically taken from surface weather stations, if these stations are sufficiently close to the project area to be considered representative of its meteorological conditions. For this study meteorological surface data were taken from the surface weather station of Conakry; the latter is located about 3 km south of the Power Plant (Figure 2.1) thus is representative of the meteorological conditions in its area of influence. Data recorded at the Conakry met station are available from the database of the United States National Climatic Data Center (NCDC).

Upper air data are usually taken from radiosondes surveys, representative for the study area. Due to the lack of radiosonde data monitoring meteorological variables over the meteorological domain for this study, CALMET upper air input data have been taken from the MM5 meteorological model.

MM5 has been developed by Pennsylvania State University and the US National Centre for Atmospheric Research (NCAR), and raw MM5 output can be converted into a format recognised by CALMET. All the MM5 meteorological data acquired as input for this study has been provided by Lakes Environmental ™, a worldwide provider of environmental data (terrain and meteorology), recognised internationally for its technologically advanced air dispersion modelling software (4).

Figure 2.2 shows the wind rose from the CALMET run performed for 2015, extracted at the Concacry meteorological station location. Winds are predominantly from the W. Moderate wind speeds prevail in this area (55.6 % between 1.0 and 3.3 m/s; 24.3% between 3.3 and 5.4 m/s), and calm wind conditions (<0.5 m/s) account for 7.4% of the year.

Figure 2.2 CALMET wind rose



Source: ERM Elaboration Data - Based on 2015 meteorological conditions.

(4) CALPUFF/MM5 Study Report Final Report June 2001, Earth Tech, Inc.

2.1.4 Modelling conservative assumptions

Percentage Oxidation of Nitric Oxide to Nitrogen Dioxide

During the combustion process, two nitrogen based pollutants are generated:

- nitrogen dioxide (NO_2); and
- nitric oxide (NO).

These are both emissions of nitrogen oxides. NO_2 is the pollutant of interest from a health perspective as it is considered the more toxic of the two, with NO being largely inert. The emissions from the combined stack will initially comprise primarily NO, but through various chemical reactions that will take place in the atmosphere (e.g. with ozone [O_3]), a proportion of the NO will be converted to NO_2. For the worst case scenario, the assumption is made that the entire NO is converted to NO_2 by the time the emissions reach ground level, and hence human receptors.

However, in reality this does not occur and only a proportion of the NO emitted will be converted into NO_2. This is due to the fact that the chemical reactions take time to occur, combined with the 'mopping up' of other atmospheric chemicals, such as O_3, a process which limits the reaction rate and therefore the generation of NO_2. The conversion of NO to NO_2 is, in part, a function of the amount of ozone in the ambient air and the travel time of the plume in the atmosphere (with time, more ozone is entrained into the plume and more conversion can therefore take place).

A number of international agencies have developed guidelines for assessing the conversion of NO to NO_2. A summary of the main guidelines are set out below in ***Error! Reference source not found.***. The ratios set out in ***Error! Reference source not found.*** indicate that a wide range of NO to NO_2 conversion ratios is recommended by the agencies of different countries. On the basis of the recommended ratios, assuming that the suggested ratios are equally valid, a conservative conversion ratio of 75% has been assumed for long term conversions, whereas an average conversion ratio of 50% has been assumed for short term conversions. These conversion factors have been applied in the results interpretation(5) .

(5) U.S. EPA 40 CFR Part 51

Table 2.1 Recommended NO to NO_2 conversion ratio

Country	Averaging period	Recommended Conversion Ratio
United States	24 hours	80%
	Annual	75%
Germany	24 hours	60%
	Annual	60%
United kingdom	Short term (1 hour)	35%
	Annual	70%
Hong Kong	24 hours	20%
	Annual	20%
Ontario, Canada	24 hours	52%
	Annual	68%

Chemistry, dry and wet depositions

The model does not account for dry and wet deposition or photochemical reactions of the pollutants, which do, in reality, take place and reduce macro pollutant concentrations in the atmosphere. Thus, the result overestimates the likely actual contribution of the sources. The assumptions used in the selected approach are, once again, cautious and maximise the modelled pollutant concentration values over the sampling domain.

Emission scenario

The modelling study assumes that the 6 reciprocating engines will operate continuously (24 hours per day) for the whole of the simulated year. This modelling approach enables a simulation of the dispersion of pollutants for all the meteorological/diffusion conditions encountered during the simulated temporal domain, including the worst possible conditions. This assumption is also conservative as in reality the operational profile might vary.

Annex B: Noise – Assessment Criteria and Modelling Input

1 NOISE ASSESSMENT METHODOLOGY

1.1 NOISE IMPACT MAGNITUDE

The environmental values to be protected are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community; or
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

The following noise assessment is focused on the compliance of Guinean and IFC standards at sensitive receptors identified in proximity of the Project site. Review of the noise guidelines indicates that where possible, the overall noise level at a receptor should not exceed the threshold values. Hence, the noise emissions from the Project should be designed to ensure that compliance with Guinean and IFC standards is achieved.

1.1.1 *Construction phase*

Construction noise is not addressed directly by national and IFC guidance. It is common practice to class impact magnitude as negligible if the predicted construction noise levels do not exceed the existing ambient noise levels.

In consideration of the duration of the construction period, being a period of 12 months, it is considered that the IFC threshold levels of 55 dB(A) for the daytime and 45 dB(A) for the night time would be appropriate for this project. Additionally, a L_{Max} of 85 dB(A) is a well-accepted action limit for occupational noise management as it is the threshold at which the potential for hearing damage starts to occur. This level has been adopted as the threshold for critical impacts.

The magnitude of construction noise is evaluated by establishing a threshold noise level at which significant impacts start to occur and higher levels for *medium* and *large* magnitude impacts. Using these standards and guidelines for reference, usually it is appropriate to set significance thresholds for day and night-time according to the duration of the noise, on the basis that temporary construction (< 1 month) will have lesser impact than short-term (1-6 months) or long-term (> 6 months).

Table 1.1 presents the impact assessment matrix relating to the contributed noise level from the construction phase. Given the duration of construction for this project, a conservative approach has been taken, adopting the most stringent (> 6 months duration) long term criteria.

Table 1.1 Noise Impact magnitude for residential receptors. Construction phase

Operating Period	Daytime Noise Level - $LAeq_{,day}$ dBA				Night-time Noise Level- $LAeq_{,night}$ dBA			
Impact Rating	*Negligible*	*Small*	*Medium*	*Large*	*Negligible*	*Small*	*Medium*	*Large*
Short exposure < 1 month	< 70	< 75	> 75-80	> 80	< 55	55-60	60-65	> 65
Medium term exposure 1 to 6 months	< 65	< 70	> 70-75	> 75	< 45	45-55	55-60	> 60
Long term exposure >6 months	< 55	< 60	> 60-65	> 65	< 45	45-50	50-55	> 55

1.1.2 Operation phase

Noise criteria for residential receptors have been adopted based on noise limits that apply to new industrial facilities in Guinea (45 to 50 dB(A) during the day, 45 dB(A) during the night, *Section* 2.2.5). It is noted that these are comparable with the noise standards in IFC guidance during the night (45 dB(A)), whilst at night the Guinean regulations are 5 to 10 dB(A) more stringent than the thresholds in IFC guidance (55 dB(A)).

Table 1.2 presents the impact assessment matrix relating to the contributed noise level from the Project operational phase. The criteria are based on receptors being residential, and have been selected to be compatible with a *medium* magnitude impact being specified when noise levels are just above Guinean and IFC noise standards for daytime, and respectively with a *small* and *medium* magnitude impact for night-time.

Table 1.2 Noise impact magnitude for residential receptors. Operational phase (criteria 1: project contribution)

Operating Period	Daytime Noise Level				Night-time Noise Level			
Impact Rating	*Negligible*	*Small*	*Medium*	*Large*	*Negligible*	*Small*	*Medium*	*Large*
Project noise contribution Impact Magnitude $L_{Aeq,1hr}$ dBA	< 50	50-55	55-60	> 60	< 40	40-45	45-50	> 50

In case of environments already affected by existing noise sources that result in high levels of background noise, to better contextualize the Project noise contribution and potential impacts, the evaluation of the increase above the background due to Project emissions can be considered as an additional assessment criterion.

It is generally accepted that a change in background noise of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound [1].

[1] UK Department for Communities and Local Government. Planning Policy Guidance 24.

Therefore, the potential increase in noise exposure for human receptors due to the Project is a factor in determining the magnitude of impact, as described in *Table 1.3*.

Table 1.3 ***Noise impact magnitude for residential receptors. Operational phase (criteria 2: increase above the background)***

Increase above background	Impact magnitude	Comment
0 – 3 dB	Negligible	Changes in environmental noise of less than 3dB are often not noticeable to a community
3 – 5 dB	Small	A change of 3dB to 5dB is barely perceptible
5 – 10 dB	Medium	A change of 5dB to 10dB is clearly perceptible
> 10 dB	High	A change of 10dB is often judges as subjectively twice as loud so may have additional significance

1.2 *NOISE IMPACT SIGNIFICANCE*

Four key factors are considered when determining the significance of noise effects:

- Duration – a noise source may not operate continuously but on an intermittent or repetitive basis (typically of construction activities), such that it may be appropriate to downgrade the significance rating.

- Character of noise - noise of a particularly distinctive character (e.g., tonal or impulsive) may be more disturbing than a broadband noise, so it may be appropriate to upgrade the impact significance.

- Sensitivity of receptor – noise guidelines assume receptors with openable windows to sensitive rooms overlooking the noise source. This may not always be the case, so that noise impacts on facades that have no windows to noise sensitive rooms (offices, living rooms, etc) or have upgraded levels of sound insulation can often be downgraded.

- Meteorological conditions – regular occurrence of conditions that enhance noise propagation (e.g., prevailing light stable winds, temperature inversions and drainage winds) may warrant upgrading of significance ratings.

For construction noise, however, duration is more variable factor which is accounted for in the impact assessment matrix by a reduction in the acceptable noise thresholds adopted for the project. For both construction and operational noise, impacts are considered to be direct in their nature and of a local extent.

As indicated above, the determination of significance from magnitude may involve considering factors that influence significance, but in cases where it does not, the relationship between impact magnitude and significance shown in *Table 1.4* can be used.

Therefore, the deciding factor in determining the significance of an impact is the magnitude of the noise level, expressed as an exceedance of the criterion (*Table 1.1*, *Table 1.2* and *Table 1.3*).

Table 1.4 Noise significance matrix

Impact Magnitude Classification		Impact Significance Rating
Negligible	Consider other significance factors if necessary (duration, receptor sensitivity, etc.)	Negligible
Small		Minor
Medium		Moderate
Large		Major

2.1 CONSTRUCTION PHASE

Noise associated with construction, only occurring during daytime hours, will be variable in nature and will depend on the particular activities being undertaken as well as the number and type of equipment in operation.

The details of construction methodology are not available at this stage, therefore predictions are based on a reasonably likely worst case based on the information which is currently available.

To facilitate the noise assessment, the construction activities have been grouped in two main sub-phases, representing the most intense phases of work:

- Site Preparation: this sub-phase includes significant noise-producing activities such as vegetation clearance, topsoil removal, earthworks. These activities will require heavy construction vehicles and equipment (excavators, dozers, rollers, dump trucks).

- Civil Works and Installation: this sub-phase includes significant noise-producing activities such as installation of concrete and asphalt batch plants, installation of foundation structures and paved areas within the plant facilities, assembly of plant items. These activities will require equipment such as concrete trucks, cranes, generators, compressors.

Considering that construction activities will extend throughout the project site, for the assessment it is assumed a typical maximum activity with all equipment operating simultaneously and at full load, and no screening from existing walls or structures between the site and the receptor.

The equipment simulated and their acoustic performances are shown in *Table 2.1*.

Table 2.1 Construction equipment list

Equipment	Sound Pressure Level at 10 m [dB(A)] (a)
Site Preparation	
Tracked excavator	79
Dozer	81
Wheeled loader	68
Roller	76
Road planer	82
Asphalt paver	84
Dump truck	87

Civil Works and Installation Equipment List

Concrete mixer truck	80
Concrete pump	77
Tower crane	77
Mobile crane	82
Fork-lift	67
Moto-driven compressor	75
Generator	74
Dump truck	87

(a) Noise data from "BS:5228, British Standards: Code of practice for noise and vibration on construction and open sites'.

2.2 *OPERATION PHASE*

During operation phase, noise emissions are related to a few number of processes, activities and equipment that have the potential to affect the area adjacent to the Project site. Generally the operational noise sources are steady equipment.

To predict noise emissions from plant processing operations, a typical worst case activity has been simulated based on the assumption that equipment are operating simultaneously and at full load for 24 hours/day, with no modification of the operation load during day and night time.

The main noise sources identified for the Project and their acoustic performances are reported in *Table 2.2*; all the noise sources were simulated as buildings or point sources.

Table 2.2 ***Project operation equipment list***

Process Area/Equipment	N. of items in continuous operation	Sound Pressure Level (Lp) or Sound Power Level (Lw) [dB(A)]
Common machine hall (9MW engines)	6	Lp = 85dBA@1m from facade building
Auxiliaries hall (n. of pumps for lubricating oil system, cooling water system and starting air system)	4	Lp = 80dBA@1m from facade building
Stacks sets (height = 30m)	6	Lw = 100dBA
Radiators – coolers (n. of fans)	48 for 1 engine	Lw = 99dBA
HFO heating system	1	Lp = 80dBA@1m from facade building
HFO conditioning station/HFO, DFO and lube oil pumping house (n. of pumps)	7	Lp = 80dBA@1m from facade building
HFO, DFO, lube oil, sludge loading/unloading station (n. of pumps)	3	Lp = 80dBA@1m from facade building
Raw water treatment/demi-station (n. of pumps)	4	Lp = 80dBA@1m from facade building
Urea storage & urea sol preparation (n. of pumps)	2	Lp = 80dBA@1m from facade building
Main transformers	2	Lw = 83dBA

Noise level predictions must take into account all significant noise sources associated with the proposed operations. One method of determining the impact of numerous noise sources at a receiver is to develop a computer model of the proposed operations using a commercially available software package. To assess noise impacts during operation phase, an acoustic model has been developed using the environmental noise modelling program "SoundPLAN", version 7.3, developed by Braunstein + Berndt GmbH. The model implements the methods identified within ISO 9613 Part 2 for noise propagation.

A description of the main input data for the noise propagation model is reported in the following *Section 2.3*.

2.3 *SOUNDPLAN MODELING SYSTEM*

SoundPLAN is one of the most recognised noise prediction tool, used extensively in road, railway and industry noise modelling.

The industrial model is comprehensive and allows:

- modelling of sound power sources in third of octave;
- modelling of noise sources as point, line or area sources;
- 2D and 3D directivity of sources;
- 3D topography;
- noise sources ranking;
- use of various noise model standards (ISO, Concawe, Nordic, etc.);
- screening and meteorological effects.

This software applies the "ray tracing" method. Sources are simulated as surfaces, lines or points: each source propagates sound waves. The resulting acoustic field depends on the absorptions and reflections characteristics of all existent obstacles between the source and the receptor.

Every ray carries a part of the acoustic energy of the sound source. The energy decreases along the way, as a result of the absorption of surfaces, geometrical divergence and atmospheric absorption. The absorption of sound energy by air is related to the dispersion of energy caused by the collisions of air molecules among them. Every collision scatters one small part of the energy and causes more impacts. In the area of interest, the acoustic field will be the result of the acoustic energies sum of "n" rays which reach the receiver. The levels in the whole area are indicated by iso-phones with equivalent steps, at a conventional height (e.g., 1.5 meters above ground level).

The mathematical model uses international standards for sound attenuation in the environment . In this study *ISO 9613 Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation* has been applied. This standard has many equations regulating the propagation and it allows to calculate noise levels in the study area with a defined accuracy. The aim of such methodology is to determine the equivalent continuous A-weighted sound pressure level, as described in ISO 1996/1-2-3, under meteorological conditions favourable to sound propagation from sources of known power emission.

As all the receivers are considered to be downwind from the source, the propagation takes place under the worst wind conditions, as specified in ISO 1996/2 (part 5, 4, 3).

The medium level of sound pressure to the receiver in the propagation direction (downwind conditions) is calculated for every source with:

$$L_P = L_W - A$$

where:

- L_p = Sound Pressure Level at receptor [dB(A)];
- L_W = Sound Power Level of source [dB(A)].

The factor A is the attenuation that the sound energy endures during the propagation and it is composed of the following contributors:

$$A = A_{div} + A_{atm} + A_{ground} + A_{refl} + A_{screen} + A_{misc}$$

where:

- A_{div} = attenuation due to geometrical divergence;
- A_{atm} = attenuation due to atmospheric absorption;
- A_{ground} = attenuation due to the ground effect;
- A_{refl} = attenuation due to reflections from obstacles;
- A_{screen} = attenuation due to screen effects;
- A_{misc} = attenuation due to other effects.

As specified in ISO 9613, it's necessary to underline that the use of the previous equations is subject to limitations due to model accuracy. The following *Table 2.3* reports the estimated accuracy for noise pressure levels calculated using the noise attenuations described before.

Table 2.3 ***Estimated accuracy for broadband noise of L_{AT} (DW) (a) calculated using previous equations. From ISO 9613-2, Table 5***

Height, h (b)	Distance, d (c)	
	0 < d < 100 m	**100 m < d < 1000 m**
0 < h < 5 m	± 3 dB	± 3 dB
5 m < h < 30 m	± 1 dB	± 1 dB

(a) L_{AT} (DW) is the average A-weighted sound pressure level for downwind propagation
(b) h is the mean height of the source and receiver
(c) d is the distance between the source and receiver

These estimates have been made from situations where there are no effects due to reflection or attenuation due to screening

2.3.1 Computational domain

Conservatively, the noise study has been performed considering a calculation domain of 10 km x 10 km with 5 meters resolution centred on the Project site, in order to include in the study area all the Project facilities and the nearest sensitive receptors.

Noise emission levels have been calculated at a conventional height of 1.5 meters above ground level.

2.3.2 Topography and land cover

A 3-D representation of the terrain's surface has been calculated through the generation of a digital ground model (DGM) in SoundPLAN.
The attenuation due to the ground between the noise sources and the receptors has been included in the noise model; considering that the site is located in a developed urban areas, an absorption coefficient value of 0.0 dB has been applied for all the computational domain.

2.3.3 Obstacles between source and receptor

Obstacles between the source and the receptor, such as buildings and fences, result in additional noise reductions depending upon their size, density and location. To reproduce in a more detailed way the plant layout, administrative buildings and storage tanks have been considered. Also the residential buildings located outside the Project boundary have been included in the model, to simulate the screening effect of this buildings to the farer assessed receptors.

2.3.4 Meteorological data

The following average environmental conditions, set for the whole calculation domain, have been considered according to a desktop review of available and most reliable meteorological data covering a 10-years period for the Project area (*Source*: NCDC Database):

- Air Pressure 1013 mbar
- Air Temperature 20°C
- Humidity 65%.

The atmospheric attenuation coefficient for the previous environmental conditions is based on ISO 9613-2 (*Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*). The noise propagation is carried out under down wind conditions (from source to receptor).

Annex C

Stakeholder engagement register

Table** Error! No text of specified style in document..**1** **Stakeholder engagement register 04/04/2016

Prénoms	Noms	Organisation	Fonction	Telephone	Quartier/Commune
Didier Dialor	FALL	ENDEAVOR	Consultant/Point focal	624 273776/655783939	
K. Wade	CLINE	ENDEAVOR	Managing Director		
David	LEYLE	INSUCO	Consultant international/Chef de mission	628 681 049	
Madiou	BARRY	INSUCO	Consultant national	622 076 144	
Abou	TOURE	INSUCO	Guide terrain	621 844 454	
Ramatoulaye	DIALLO	INSUCO	Enquêtrice	628 335 070	
Mohamed Koumandjan	KEÏTA	Mairie Matoto	Maire		
Sékou	CONTE	Mairie Matoto	Secrétaire Général	622 241056/657 067087	
Hamadouba	FOFANA	Mairie Matoto	Directeur des Microréalisations	622 282 313	
Ibrahima	KOÏTA	Mairie Matoto	Directeur de la Jeunesse	622 575 832	
Djibril	CAMARA	Mairie Matoto	Coordinateur Jeunesse	657 558 110	
Ibrahima	SAVANE	Quartier Simbaya 2	Chef de quartier	664 860080/664 292090	Simbaya 2/C.Matoto
Oumar (Bongo)	SYLLA	Quartier Simbaya 2	Chargé de la sécurité	621 777 838	Simbaya 2/C.Matoto
Abdoulaye	SYLLA	Quartier Simbaya Ecole	Chef de quartier	664 719198/664 828093	Simbaya Ecole/C.Matoto
Abdoulaye	TOURE	Quartier Simbaya Ecole	Secrétaire Bureau	664 853 651	Simbaya Ecole/C.Matoto
Ibrahima	KEÏTA	Quartier Simbaya Ecole	2è Secrétaire	664 228 509	Simbaya Ecole/C.Matoto
Mohamed	SOUMAH	Quartier Simbaya Ecole	Chef secteur 1	620 404 977	Simbaya Ecole/C.Matoto
Boubacar	CONTE	Quartier Simbaya Ecole	Chargé du jugement		Simbaya Ecole/C.Matoto
Hadja Aïssatou Kaliya	DIALLO	Quartier Simbaya 1	Chef de quartier	664 863 180	Simbaya 1/C.Matoto
El hadj Pathé	DIALLO	Quartier Simbaya 1	Membre Bureau/ Epoux de la Chef	664 603 437	Simbaya 1/C.Matoto
Almamy Daouda	TOURE	Quartier Yimbaya Tannerie	Chef de quartier	631 117 733	Yimbaya Tannerie/C.Matoto
Mamadi	CAMARA	Société civile	Membre		Simbaya 1/C.Matoto
Abou	BANGOURA	Conseil des sages	Chef de secteur l	664567820	Simbaya 1/C.Matoto
Sékou	SOUMAH	Consel des sages	Imam mosquée Babadi touré	655321286	Simbaya 1/C.Matoto
Sory	SOUMAH	Conseil des sages	Imam simbaya secteur 2	628454252	Simbaya 1/C.Matoto
Mohamed	CAMARA	Bureau du quartier	Chef de secteur la foret	655817494	Simbaya 1/C.Matoto
Abdoulaye	SYLLA	Société civile	Membre	655425199	Simbaya 1/C.Matoto
Engene	LAMAH	Bureau du quartier	Chef de secteur T3	666357479	Simbaya 1/C.Matoto

Thierno siddy	BAH	Société civile	Membre	621683009	Simbaya 1/C.Matoto
Mohamed	SYLLA	Bureau du quartier	Chef secteur 4	620281640	Simbaya 1/C.Matoto
El mohamed said	CAMARA	Conseil des sages	Imam-ANhour	664361265	Simbaya 1/C.Matoto
Youssouf	THEA	Conseil des sages	Imam mosquée aboubacar keita	624269260	Simbaya 1/C.Matoto
El.Colonel Mohamed lamine	DIABATE	Conseil des sages	Membre	657262780	Simbaya 1/C.Matoto
Sagno	DOUMBOUYA	Conseil des sages	Membre	628005797	Simbaya 1/C.Matoto
Ahmed	CAMARA	Bureau du quartier	Chef secteur aicha kaleya D	664577201	Simbaya 1/C.Matoto
Ibrrahima	CAMARA	Société civile	Membre	666305041	Simbaya 1/C.Matoto
Moussa	BANGOURA	Société civile	Membre	621457374	Simbaya 1/C.Matoto
Mohamed lamine	BANGOURA	Société civile	Membre	621010867	Simbaya 1/C.Matoto
Mamoudou	TOURE	Conseil des sages	5e Imam mosquée haida	622268631	Simbaya 1/C.Matoto
Amadou	DIALLO	Conseil des sages	Membre	664230958	Simbaya 1/C.Matoto
Nantenin	SIDIBE	Société civile	Membre	623588025	Simbaya 1/C.Matoto
Djeneba	SYLLA	Conseil des sages	Membre		Simbaya 1/C.Matoto
Mabinty	CONDE	Société civile	Membre	622846115	Simbaya 1/C.Matoto
Salematou	KEITA	Société civile	Membre	666402040	Simbaya 1/C.Matoto
Hadja mabinty	CHALOUB	Société civile	Membre	664295186	Simbaya 1/C.Matoto
Fatoumata	CAMARA	Société civile	Membre		Simbaya 1/C.Matoto
Foulematou	SYLLA	Société civile	Membre	662053498	Simbaya 1/C.Matoto
Fatou	CAMARA	Société civile	Membre		Simbaya 1/C.Matoto
Hadja mabinty	CAMARA	Société civile	Membre		Simbaya 1/C.Matoto
Rouguiatou	BANGOURA	Société civile	Membre		Simbaya 1/C.Matoto
Hadiatou	DIALLO	Société civile	Membre		Simbaya 1/C.Matoto
Hawa	CISSE	Société civile	Membre		Simbaya 1/C.Matoto
Aminata	CAMARA	Société civile	Membre	666287729	Simbaya 1/C.Matoto
Awa	BANGOURA	Bureau du quartier	Chef de secteur	624263485	Simbaya 1/C.Matoto
Aboubacar	CAMARA	Société civile	Membre	628601490	Simbaya 1/C.Matoto
Mamoudou	TOURE	Bureau du quartier	Chef de carré	621371262	Simbaya 1/C.Matoto
El.ibrahima sory	DIALLO	Bureau du quartier	Chargé de la com.	628633807	Simbaya 1/C.Matoto
Younoussa	YOULA	Bureau du Jeunesse	Secretaire	664557504	Simbaya 1/C.Matoto
LANSANA	CONDE	bureau du quartier	chef secteur 3	664811120	Simbaya 2/C.Matoto

ABDOULAYE	CAMARA	bureau du quartier	membre	655236404	Simbaya 2/C.Matoto
KANFOY	SOUMAH	bureau du quartier	affaires sociales	664434293	Simbaya 2/C.Matoto
IBRAHIMA SORY KEOULEIN	DIALLO	bureau du quartier	Conseiller à la jeunesse	664215398	Simbaya 2/C.Matoto
NABY	CAMARA	bureau du quartier	chef secteur 1	655945177	Simbaya 2/C.Matoto
Mmah	SOUMAH	bureau du quartier	Presidente bureau des femmes	654098389	Simbaya 2/C.Matoto
MARIAMA	CAMARA	bureau des femmes	membre		Simbaya 2/C.Matoto
MORYBA	SANOH	bureau de la jeunesse	membre	622068846	Simbaya 2/C.Matoto
SAFIATOU	SYLLA	Société civile	membre	662023535	Simbaya 2/C.Matoto
OUSMANE	SOUMAH	Société civile	membre	666148921	Simbaya 2/C.Matoto
AICHA	SYLLA	Société civile	membre	664623639	Simbaya 2/C.Matoto
MAMAISSATA	SOUMAH	Société civile	membre	656978595	Simbaya 2/C.Matoto
ABDOULAYE	SYLLA	Société civile	membre	661095950	Simbaya 2/C.Matoto
OUSMANE TOLO	SYLLA	bureau quartier	membre	664608643	Simbaya 2/C.Matoto
MAMADOU	CONDE	bureau quartier	membre	622323686	Simbaya 2/C.Matoto
SOULEYMANE	CAMARA	bureau quartier	membre	657425898	Simbaya 2/C.Matoto
SEKOU 2 OUMAR	SANOH	bureau de la jeunesse	Mobilisation	664936422	Simbaya 2/C.Matoto
ROUGUIATOU	SYLLA	Société civile	membre	654422602	Simbaya 2/C.Matoto
AISSATA	KEITA	Société civile	membre	664766726	Simbaya 2/C.Matoto
MOUSSA	SIDIBE	Société civile	membre	622491075	Simbaya 2/C.Matoto
SEINKOUN	SAMOURA	bureau du quartier	Relation Exterieures	620244278	Simbaya 2/C.Matoto
MARTIN	DOMINIQUE	bureau du quartier	membre	620402872	Simbaya 2/C.Matoto
NENEN	YANSANE	bureau des femmes	membre		Simbaya 2/C.Matoto
MOHAMED	TOURE	Société civile	membre	662208653	Simbaya 2/C.Matoto
ABDOULAYE	BANGOURA	Société civile	membre	662803898	Simbaya 2/C.Matoto
ABOUBACAR	CAMARA	Société civile	membre	654276152	Simbaya 2/C.Matoto
KARAMOKO	SOUMAH	Société civile	membre	666180256	Simbaya 2/C.Matoto
OUMAR	SYLLA	Société civile	membre	655742629	Simbaya 2/C.Matoto
HAMED NABY	SYLLA	bureau du quartier	membre	657465798	Simbaya 2/C.Matoto
CHEICK MOHAMED	KABA	bureau du quartier	membre	620281634	Simbaya 2/C.Matoto
LOUNCENY	KABA	bureau du quartier	Chef secteur	622878911	Simbaya 2/C.Matoto
DIAN	KABA	conseil mosquee	Imam	628505552	Simbaya 2/C.Matoto

MAFERIN	SOUMAH	bureau du quartier	membre	655742629	Simbaya 2/C.Matoto
FODE ISSIAGA	SYLLA	bureau du quartier	membre		Simbaya 2/C.Matoto
ISSIAKA	KOUYATE	bureau des jeunes	trésorier	628129866	Simbaya Ecole/C.Matoto
MAMADY	SOUARE	bureau des jeunes	chargé au sport	664732578	Simbaya Ecole/C.Matoto
MOHAMED AZIZ	DABO	bureau des jeunes	chargé à lorganisation	664315332	Simbaya Ecole/C.Matoto
MOHAMED LAMINE	KABA	bureau des jeunes	chargé à lorganisation	664363115	Simbaya Ecole/C.Matoto
ISSIAGA	CAMARA	bureau du quartier	chef secteur	664778700	Simbaya Ecole/C.Matoto
ALLASSANE	DIALLO	bureau du quartier	membre	664923950	Simbaya Ecole/C.Matoto
IBRAHIMA SORY	SOUMAH	bureau du quartier	chef secteur	664385845	Simbaya Ecole/C.Matoto
OUSMANE	SYLLA	bureau du quartier	chef secteur	657402463	Simbaya Ecole/C.Matoto
SOLIMA SAYON	KALLE	bureau du quartier	chef secteur adjoint	664465990	Simbaya Ecole/C.Matoto
Mmah	BAH	bureau des femmes	membre	662381325	Simbaya Ecole/C.Matoto
SIRADI	FOFANA	bureau des femmes	membre	623906642	Simbaya Ecole/C.Matoto
MOHAMED	CONDE	bureau des jeunes	trésorier	623532131	Simbaya Ecole/C.Matoto
MAMADOU ALIOU	BARRY	bureau des jeunes	membre	666977193	Simbaya Ecole/C.Matoto
HAROUNA	TOURE	bureau des jeunes	membre	669548361	Simbaya Ecole/C.Matoto
AISSATA	CAMARA	bureau des jeunes	membre	666638829	Simbaya Ecole/C.Matoto
SALIFOU	SOUMAH	bureau des jeunes	membre	664009877	Simbaya Ecole/C.Matoto
ABDOULAYE	BANGOURA	bureau des jeunes	membre	666408083	Simbaya Ecole/C.Matoto
SEKOU	CONDE	bureau du quartier	membre		Simbaya Ecole/C.Matoto
AMINATA	BANGOURA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
AISSATA	CAMARA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
NIFA MOUSSA	KEITA	bureau des jeunes	membre	622735736	Simbaya Ecole/C.Matoto
OUMAR	SYLLA	bureau des jeunes	membre	666386249	Simbaya Ecole/C.Matoto
OUMAR	CAMARA	bureau des jeunes	membre	655799635	Simbaya Ecole/C.Matoto
MARIAME	KEITA	bureau des jeunes	membre		Simbaya Ecole/C.Matoto
TENIN	CAMARA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
FATOU	SOUMAH	bureau des femmes	membre	656044627	Simbaya Ecole/C.Matoto
NNAGBE	KONATE	bureau des femmes	Secretaire	664674069	Simbaya Ecole/C.Matoto
MAIMOUNA	SYLLA	bureau des femmes	chargé de lorganisation		Simbaya Ecole/C.Matoto
BINTIYA	SYLLA	conseil mosquée	membre		Simbaya Ecole/C.Matoto

MARIAM	CAMARA	bureau des femmes	membre	622123953	Simbaya Ecole/C.Matoto
BINTOU	CISSE	bureau des femmes	membre	662257742	Simbaya Ecole/C.Matoto
KADIATOU	TOURE	bureau des femmes	chargée à lorganisation		Simbaya Ecole/C.Matoto
ALAMA	CONDE	bureau des femmes	membre	622880517	Simbaya Ecole/C.Matoto
BINTOU	KOUROUMA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
MAKISSA	CONDE	bureau des femmes	membre		Simbaya Ecole/C.Matoto
SALIMATOU	SYLLA	bureau des femmes	membre	664884722	Simbaya Ecole/C.Matoto
KADIATOU	DOUNO	bureau des femmes	membre	662084926	Simbaya Ecole/C.Matoto
MAFOUDIA	DIALLO	bureau des femmes	membre		Simbaya Ecole/C.Matoto
FATOU KABITA	BANGOURA	bureau du quartier	Chef secteur		Simbaya Ecole/C.Matoto
AMINATA	TOURE	bureau des femmes	membre	628095310	Simbaya Ecole/C.Matoto
MARIAM	KEITA	bureau des femmes	membre	623486809	Simbaya Ecole/C.Matoto
FANTA	CONDE	bureau des femmes	membre		Simbaya Ecole/C.Matoto
AISSATOU	BARRY	bureau du quartier	chef secteur		Simbaya Ecole/C.Matoto
MAFOUDIA	TOURE	bureau du quartier	membre		Simbaya Ecole/C.Matoto
MARIAM	CAMARA	bureau du quartier	membre	666816597	Simbaya Ecole/C.Matoto
BOUNTOURABY	CAMARA	bureau des femmes	membre	622288551	Simbaya Ecole/C.Matoto
FATOUMATA	SANKHON	bureau des femmes	membre		Simbaya Ecole/C.Matoto
MMAHAWA	CAMARA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
MBALLIA	CAMARA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
MBALOU	DRAME	bureau des femmes	membre		Simbaya Ecole/C.Matoto
NAYA	BANGOURA	bureau des femmes	membre		Simbaya Ecole/C.Matoto
MACIRE	TRAORE	bureau des femmes	membre		Simbaya Ecole/C.Matoto
Sankoumba	GNAISSA	Société civile	Membre	621014959	Yimbaya Tannerie/C.Matoto
Elhadj Alhassane	BARRY	Société civile	Membre	621169655	Yimbaya Tannerie/C.Matoto
Elhadj mamoudou	KABA	Société civile	Membre	666872256	Yimbaya Tannerie/C.Matoto
Mohamed	CONDE	Société civile	Membre	662346230	Yimbaya Tannerie/C.Matoto
Salif	SOUMAH	Société civile	Membre		Yimbaya Tannerie/C.Matoto
Keletigui	KOUROUMA	Conseil des sages	Membre	620515208	Yimbaya Tannerie/C.Matoto
Ibrahima	SOUMAH	Conseil des sages	Muezzin		Yimbaya Tannerie/C.Matoto
Fatou	SYLLA	Société civile	Membre	621937634	Yimbaya Tannerie/C.Matoto

Aicha	DRAME	Bureau des femmes	Membre	666888733	Yimbaya Tannerie/C.Matoto
Mandé	CAMARA	Secteur	Chef de secteur II deviation	669047099	Yimbaya Tannerie/C.Matoto
Abdoulaye	DIALLO	Bureau de la jeunesse	Membre	620174740	Yimbaya Tannerie/C.Matoto
Abdoul Karim	BAH	Bureau de la jeunesse	President comite de base secteur 4	621192394	Yimbaya Tannerie/C.Matoto
Facinet	SOUMAH	Bureau du quartier	Conseiller	628477566	Yimbaya Tannerie/C.Matoto
Mamadouba	YELESSA	Société civile	Muezzin	662692010	Yimbaya Tannerie/C.Matoto
Alhassane	BANGOURA	Société civile	Membre	664399344	Yimbaya Tannerie/C.Matoto
Elhadj .Fodé	SOUMAH	Bureau du quartier	Chargé des affaires sociales	655254833	Yimbaya Tannerie/C.Matoto
Abdramane	YELESSA	Bureau du quartier	Chef de secteur wanicouri	655551972	Yimbaya Tannerie/C.Matoto
Elh.aboubacar	TOURE	Conseil des sages	Membre	622327517	Yimbaya Tannerie/C.Matoto
Elhadj mory	CISSE	Conseil des sages	Membre	655654131	Yimbaya Tannerie/C.Matoto
Thierno mamadou sanoussi	BAH	Bureau de quartier	Imam-Mosquée centrale	622044721	Yimbaya Tannerie/C.Matoto
Elhadj amadou	BARRY	Bureau du quartier	1er Imam mosquée centrale	662640067	Yimbaya Tannerie/C.Matoto
El.Mivaérou	SOUMAH	Conseil des sages	Membre	657614558	Yimbaya Tannerie/C.Matoto
El.Amadou oury	BAH	Conseil des sages	2e Imam	664439289	Yimbaya Tannerie/C.Matoto
Marissa	YANSANE	Société civile	Membre		Yimbaya Tannerie/C.Matoto
Lamine	KABA	Société civile	Membre	655783908	Yimbaya Tannerie/C.Matoto
Amadou diogo	SOW	société civile	Membre	628132531	Yimbaya Tannerie/C.Matoto
Ansoumane	CAMARA	Bureau du quartier	Chef secteur 3	664439643	Yimbaya Tannerie/C.Matoto
Alpha oumar	CAMARA	société civile	Membre	620174224	Yimbaya Tannerie/C.Matoto
Nabylaye moussa	BANGOURA	société civile	Membre	655312249	Yimbaya Tannerie/C.Matoto
Idrissa	NIAISSA	société civile	Membre	664425490	Yimbaya Tannerie/C.Matoto
ABDOULAYE	KOUROUMA	Directeur(fatim ecole)	directeur	622451601	DCE/C.Matoto
MAMADOU	SOUMAH	Directeur Kakandé	directeur	657890406	DCE/C.Matoto
IBRAHIMA SORY 2	DIALLO	Directeur(plateau)	directeur	664185226	DCE/C.Matoto
SEKOU	CAMARA	GS Tima	éleve		DCE/C.Matoto
MAMADOU ALIOU	BAH	GSFA Elhadj Moriba	éleve		DCE/C.Matoto
THIERNO OUSMANE	DIALLO	GS KAKANDE	éleve		DCE/C.Matoto
SALIMATOU	DIALLO	EP Abraham Lincol	éleve		DCE/C.Matoto
MOHAMED	TOUKARA	EP Abraham Lincol	directeur	628568074	DCE/C.Matoto
MOHAMED MINE	KAKAME	EP Abraham Lincol	éleve		DCE/C.Matoto

Alseny	Condé	GS Tima	Directeur	669644811	DCE/C.Matoto
Kadiatou	Mosquée	titia publique	Cnseur	628706371	DCE/C.Matoto
Mdou Rassoul	Diallo	Titi II	éleve		DCE/C.Matoto
Fta Djaraye	DIALLO	Titi II	éleve		DCE/C.Matoto
Fanta	keita	F.Ayimbaya Tanerie	éleve		DCE/C.Matoto
Kany	keita	F.Ayimbaya Tanerie	éleve		DCE/C.Matoto
Souleymane	Sano	GS Plateau	éleve		DCE/C.Matoto
Mawa	Bangoura	GS le plateau	éleve		DCE/C.Matoto
Mariama	Diallo	GS le plateau	éleve		DCE/C.Matoto
Moussa	Camara	GS Fatim	éleve		DCE/C.Matoto
Fatoumata	keita	Gsfatim	éleve		DCE/C.Matoto
Morlaye	Keita	Complexe scolaire mandaw	ensegnant		DCE/C.Matoto
Alphha mayatou	Bah	Complexe scolaire mandaw	éleve		DCE/C.Matoto
Nagnouma	Mara	Tima	éleve		DCE/C.Matoto
Hadja Bintou	Bah	GS Tima	éleve		DCE/C.Matoto
Fatoumata	Sylla	Gs le Kkandé	éleve		DCE/C.Matoto
Fatoumata	Condé	GSE Mandaw	éleve		DCE/C.Matoto
Adama	Diaby	GSE Mandaw	éleve		DCE/C.Matoto
Cheick	Bangoura	GSE Mandaw	éleve		DCE/C.Matoto
Dantouma	Millimono	Hadiama lamara	éleve		DCE/C.Matoto
Sia Mousou	KAMANO	Espoir	éleve		DCE/C.Matoto
Moussa	CAMARA	Espoir	éleve		DCE/C.Matoto
Sékouba	Condé	Espoir	conseiller		DCE/C.Matoto
Ahmed	DIALLO	Espoir	Secretaire general		DCE/C.Matoto
Aboubacar	SACKO	Espoir	Directeur		DCE/C.Matoto
N joffa	SOUMAH	F.A.H.m;g	directeur		DCE/C.Matoto
Ibrahima	Condé	Etat civil matoto	Administrateur civil		DCE/C.Matoto
Kassim	Condé	EP/FA Yimbaya	Adjoint		DCE/C.Matoto
Saeydouba	BANGOURA	EP/FA Yimbaya tanerie	directeur		DCE/C.Matoto
Alimatou	Sylla	Hadja m'mah CAMARA	éleve		DCE/C.Matoto
Mabinty	YATARA	Hadja m'mah CAMARA	éleve		DCE/C.Matoto

Souleymane coker	Bangoura	DCE Matoto	Chef Section		DCE/C.Matoto
Catherine	LOUA	DCS Matoto	Directrice	664363429	DCS/C.Matoto
Dougo	Goépogui	DCS Matoto	CSPLM-Surveillance	622931362	DCS/C.Matoto
Dounamou	Togba	DCS Matoto	PFR-Communication		DCS/C.Matoto
Oumou Kesso	barry	DCS Matoto	Chargee SPC	628968140	DCS/C.Matoto
Mathieu Antoine	Lamah	DCS Matoto	PEC malnutrition	664243051	DCS/C.Matoto
Kessery	Goumou	DCS Matoto	Statisticien-Regulateur	623765009	DCS/C.Matoto
Macire	Camara	DCS Matoto	DCS	664427604	DCS/C.Matoto
Salematou	Toure	DCS Matoto	Chargee de la nutrition	621600447	DCS/C.Matoto
Naby laye Moussa	soumah	DCS Matoto	Statisticien	624828347	DCS/C.Matoto
Henry	Loua	DCS Matoto	Regulateur	620393493	DCS/C.Matoto
SEKOU OUMAR	SOUMAH	Marche tannerie	administrateur adjoint	621650904	Marché de Yimbaya Tannerie/C.Matoto
MARIAMA	BAH	Marche tannerie	VP Femmes	664755242	Marché de Yimbaya Tannerie/C.Matoto
SORYBA	SOUMAH	Marche tannerie	Charge des affaires sociales	664664323	Marché de Yimbaya Tannerie/C.Matoto
KERFALLA	SOUMAH	Marche tannerie	Charge de la defense	666395926	Marché de Yimbaya Tannerie/C.Matoto
BINTOU	KOULIBALY	Marche tannerie	Charge de l`organisation	628527938	Marché de Yimbaya Tannerie/C.Matoto
ABOUBACAR	NDIAYE	Marche tannerie	Secretaire administratif	624351663	Marché de Yimbaya Tannerie/C.Matoto
ABDOULAYE SAID	CAMARA	ANAMEG	Medecin	655673315	Centre médical ANAMEG/C.Matoto
KEDJAN	CAMARA	ANAMEG	Infirmier	628350664	Centre médical ANAMEG/C.Matoto
GADEI	KOLIE	ANAMEG	Infirmier	666760599	Centre médical ANAMEG/C.Matoto
ALMAMY DAOUDA	CAMARA	ANAMEG	Enseignant	621395847	Centre médical ANAMEG/C.Matoto
Alhassane	BALDE	CM BERNAY FOTOBA	MEDECIN	654030503	Centre médical Bernay Fotoba/C.Matoto