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REVIEW AND AUTHORIZATION of the Environmental and Social Impact Assessment Document of Matam Regional Airport Rehabilitation Project

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I. INTRODUCTION

The subject of the authorization is "Environmental and Social Impact Assessment Document of Matam Regional Airport Rehabilitation Project" in Senegal.

Current state of the Airport is not acceptable from the point of air traffic safety, environmental requirements, capacity and technical parameters.

The renovation work will be carried out at various locations throughout the airport and should have an environmental impact and risk of accidents.

Considering the fact, it is rehabilitation project of existing airport, it is supposed the impacts on environmental components (e.g. air, water, soil, etc.) will be acceptable. It is likely that in number of impacts, current state will be improved.

ESIA Document has been elaborated according to legal acts and laws adopted on the environment protection of Senegal.

Considering that rehabilitation and operation of the airport will be associated with the potentially significant environmental and social impacts, project is classified as the B category project. Accordingly, an ESIA had to be worked out, in order to minimize the negative impact of the project on the significant region's natural and social environment.

The purpose of the authorization is to assess the accordance of the project with the Recommendation of the Council on Common Approaches for Officially Supported Export Credits and Environmental and Social Diligence (the "Common Approaches"), determining the evaluation procedure for the impact of export on the environment.

The results of the ESIA Document are also checked against the EHS Guidelines Environmental ("Health, and Safety General Guidelines") and the IFC Performance Standards ("Performance Standards of the International Financial Corporation").

If any discrepancies are found, the authorization should suggest a procedure for the necessary completion of the assessment, whose positive conclusion is a prerequisite for the conclusion of an insurance contract for the export being assessed.

The assessment has been elaborated in compliance with the regulations of the World Bank and the environment protection regulations applicable in the Senegal.

II. BASIC CHARACTERISTICS OF THE PROJECT

The planned activities will be divided into two main phases, which are the **civil engineering activities** related to the construction of pavements and buildings and the **airport equipment** consisting of the development and installation of equipment to provide the service.

As part of the rehabilitation of the Ourossogui-Matam airport, following construction activities are planned.

Concerning the **pavements, the construction** of the runway, tarmac and taxiway is planned. These pavements will have a wearing course of asphalt concrete. The following will be implemented:

- a 2200 m x 30 m track;
- a 110 m x 50 m tarmac;
- a 135 m x 18 m taxiway.

For security reasons, the airport right-of-way will be fenced off. The fence wall will be 2.50 m high and will be made of reinforced concrete elements with stainless steel concertina lines.

As part of this project, a passenger terminal building with two compartments will also be built. One will be a modular hangar with a surface area of 700 m^2 and the other, a hangar of 1100 m^2. Both will consist of a departure/arrival room and a VIP lounge.

This building will be equipped with smoke detectors, CO_2 extinguishers, offices, toilets, etc. In the terminal building, it is planned, among others:

- a conveyor (departure/arrival) at the airport with a check-in counter;
- offices for management, security and airlines;
- a compartment reserved for passenger information;
- detection equipment;
- luggage carts.

As an important part of **airport facilities**, the lighting of the airport runway, will be completed. TRANSCON will provide these lights with all the necessary equipment for their installation. The equipment and accessories required for lighting throughout the airport will be centralized in the power block, power plant and tarmac lighting system.

The dual band **navigation aid system** is an air navigation aid system that allows an aircraft pilot to determine its position and displacement relative to a ground station. It will be delivered and installed by TRANSCON.

In terms of **fire warning and extinguishing**, the project provides for the installation of light and sound alarms and smoke detectors in places where their installation is necessary. TRANSCON will equip the airport with two fire extinguishing vehicles, a 9,000-litre water tank and an 8,000-litre foaming agent reserve. The fire hangar managed by the ASECNA Fire Brigade on site will be equipped with the necessary fire-fighting equipment.

Evaluation

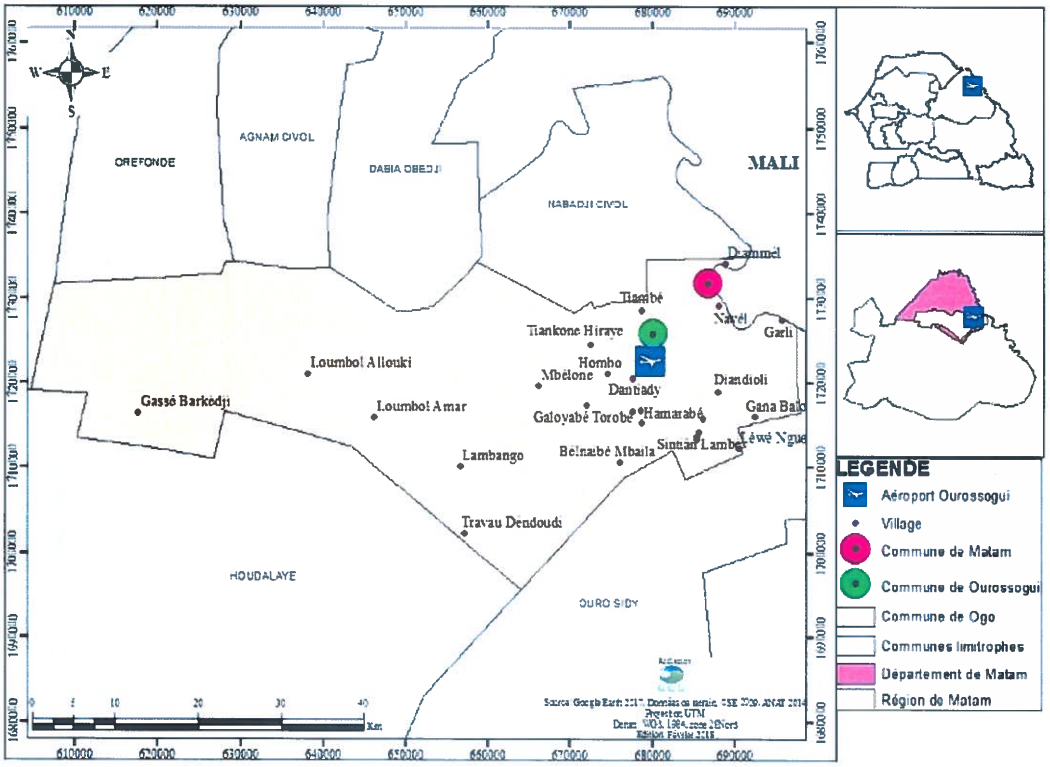
ESIA Document describes the main parts and activities of the project on about 17 pages. The description gives basic information and is divided in a number of sub-chapters. As for the potential environmental impacts, noise pollution, risks of water pollution and collision with animals (birds) were correctly identified as the most significant. However only description is done and quantification should be completed during next phase of project preparation.

III. INFORMATION ON INPUTS IN TERMS OF THE ENVIRONMENT

This part of authorization evaluates the completeness and correctness of the information in Chapter III. and V. of the ESIA Document.

III.1. SITE LOCATION

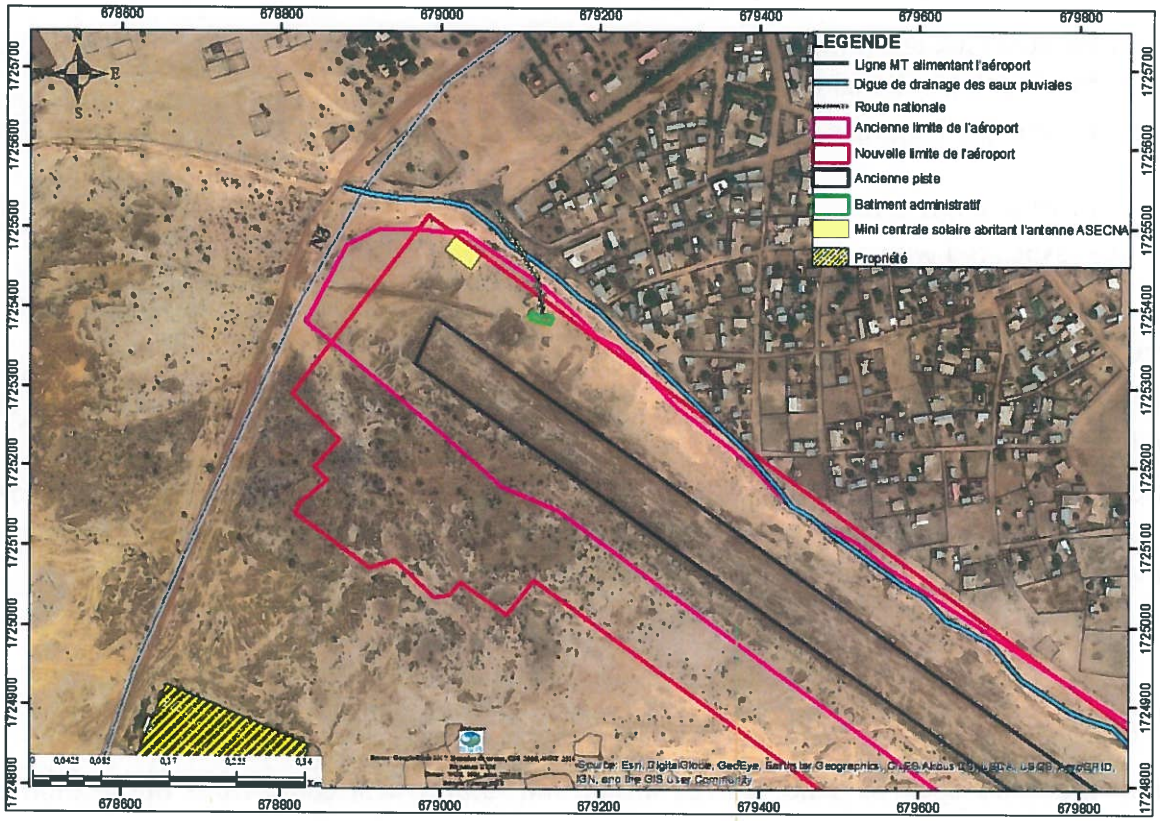
The airport is located in the north-east of Senegal, in the Commune of Ourossogui, Matam Department, and Matam Region.



The Commune of Ourossogui is located in the Senegal-Mauritanian sedimentary basin and Ourossogui-Matam airport, in the Sahelian continental climate domain.

The Ourossogui-Matam airport is located south of the city of Ourossogui and is limited:

- to the north and northeast by a rainwater drainage dike and houses in the city of Ourossogui;
- to the west by the N3 national road;
- to the south and southeast by a few unexploited crop fields, a Medium Voltage (MV) line and a rainwater drainage dike;
- to the southwest by a wild landfill and the Ourossogui ZAC;
- to the east by the ASECNA antenna, a MV line and natural vegetation.



Evaluation

The ESIA Document contains basic information on the site. Due to really small distance of residential zone is necessary to elaborate air and noise emission models in the next phase of project preparation.

Description of site location is supplemented with a number of maps and pictures.

III.1.2. WATER

Water requirements during the **construction phase** were not known and/or estimated during ESIA elaboration stage. However, it is likely that water supply during this phase will be provided through the ASUFOR network serving the current airport.

It is emphasized that only two boreholes have been identified in the Commune of Ourossogui and that they are far from meeting the needs of the population. To ensure water autonomy during the construction phase, it is therefore necessary to set up a borehole within the site.

The water supply system of the future **airport operation** should be provided by the ASUFOR network. Its capacities should allow to meet its needs, which will be increased after the airport rehabilitation is finished.

The best option to guarantee autonomy in water supply is proposed to dig new capacity borehole(s) during the construction phase.

Water requirements during the operating phase are:

- water for domestic use (drinking and sanitary);
- water for cleaning and maintenance activities;
- water for the fire-fighting system.

The installation of a large capacity reserve sized according to needs is important to avoid any inconvenience associated with a possible interruption of the water supply.

Evaluation

The sources of water supply and consumption, both in construction and operational phases are identified. However, the volume of consumption is missing.

It is supposed that the water will be supplied from the ASUFOR network. It is necessary to verify the capacity, eventually to extent it, and to assess potential negative impacts to all drinking water sources in the region. It should be completed during next stage of project preparation.

III.1.3. RAW MATERIALS, NATURAL RESOURCES, ENERGY

Construction materials such as sand, gravel, basalt and laterite will come from the authorized quarries closest to the site. They will be transported to the site by road via trucks. The necessary quantities were not known in the ESIA phase.

The contracting company must draw up a notice of environmental and social clauses on the site, which will serve as a code of good practice in the execution of the work.

Major road construction projects are under way in the Matam area with the AGEROUTE concessionaire, who also fears competition for the supply of backfill materials at the quarries closest to the area. Coordination and communication with this structure is strongly recommended for the proper conduct of the work but also to establish the responsibility for the rehabilitation of the quarry at the end of the work.

Evaluation

It is obvious that the project demands appropriate volumes of materials, which will have been transported and moved in the construction site.

We recommend to elaborate more precise information about sources and particularly the amounts of the raw materials and natural resources which are to be necessary for the construction and operation of the project. It is necessary information for noise and air emission studies. Missing information should be completed during next stage of project preparation.

III.1.4. TRANSPORT

In ESIA is nearly no information regarding land transport relevant to construction and or operation of airport.

Evaluation

It is most likely that number and intensity of road traffic in the area of rehabilitated airport will increase. We recommend to complete information on number of trucks, kilometres and air emissions after rehabilitation and compare it with situation before construction. It is necessary to propose and keep appropriate mitigation measures.

IV. INFORMATION ON OUTPUTS INTO THE ENVIRONMENT

This part of authorization evaluates the completeness and correctness of the information given in the chapter 3.

IV.1. LIQUID WASTE MANAGEMENT

Liquid waste (water) in the construction phase is mainly water from sanitary facilities, machine washing water, cloudy water containing cement or oil. In case of rain, by leaching process, runoff water can be loaded with suspended solids.
When in contact with cement, mortar and fresh concrete they become alkaline (pH above 9). In addition, these waters may be mixed with hydrocarbons (from construction machinery and equipment) or contain dissolved substances and toxic metals.

During the operating phase, wastewater can come from a variety of sources:

- sanitary facilities;
- the emptying of aircraft toilets;
- technical workshops.

Currently the ONAS (national concessionaire) sewerage network does not cover the airport area. However, there are still possibilities to connect to it while respecting the limit values at the connection point. In any case, TRANSCON must propose an autonomous management system for these liquid discharges.

For surface water drainage, it is recommended to design a separate sewer system to discharge runoff water from the airport platform taking into account the constraints imposed by the outlets and the drainage constraints. The maintenance of this network must also be ensured in order to guarantee its hydraulic and purification performance for a long time.

IV.2. SOLID WASTE MANAGEMENT

During the **construction phase**, the waste will be generated by the various activities of the airport rehabilitation site. Good waste management practices, namely the principle of collection, sorting, recycling and disposal by appropriate means, will be applied.

The ESIA recommends that the demolition should be carried out according to the deconstruction principle, which makes it possible to separate the different categories of materials, remove hazardous waste and recover certain elements. According to this approach, the buildings to be demolished are not considered as future waste but as resources of materials to be recovered. The ultimate objective is to reduce the quantities of waste produced at source and to promote its recovery and recycling in order to limit landfilling.
The deconstruction is organized in three phases: decontamination, dismantling of the materials used in the finishing work (non-hazardous waste) and finally the removal of the structure (inert waste).

The construction waste can be classified into three categories:

- **mineral or inert waste**: concrete, bricks, tiles, rubble, glass, excavation materials (topsoil);
- **non-hazardous waste**: plastics, PVC, scrap metal, natural wood, paper, cardboard, various packaging, pallets, etc;
- **hazardous waste**: soil polluted by hydrocarbons, tar and associated products, electrical and electronic waste, household appliances, computer equipment, light bulbs, neon lights, waste hydrocarbons and oils, paints, varnishes, solvents, batteries.

For each type of waste, appropriate recovery methods will be proposed: reuse, material recovery or energy recovery. In the absence of possible recovery, the waste has to be landfilled or incinerated in a cement plant. The table below is a summary of the various types of waste produced and proposed recovery methods.

Table 1: Construction site waste and method of recovery

Type of waste	Valuation method
Excavation materials and excavated material	Reuse on site
Pavement demolition materials	Recycling possible in hot or cold bound form, reuse on site
Concrete, tiles, rubble, cement	Recycling in bound form with hydraulic binder, recycling in unbound form, on-site reuse
Glass	Recycling possible with a specialized transportation
Packaging, pallets	Reuse, recycling, energy recovery
Natural wood, wood residues	Composting, energy recovery
Plastics, PVC	Recycling with a specialized buyer
Paints, varnishes, solvents	Incineration in cement works
Bulbs, neon lights, batteries	Recycling possible with a specialized transferee
Waste hydrocarbons, waste oils	Incineration in cement works
Scrap metal	Recycling with specialized structures
Electrical appliances, household appliances, electronics	Reuse where possible or disassembly into spare parts to be recycled

During the **operational phase**, the airport activity includes several entities on the same site. Each company produces a different type of waste. The waste produced according to the nature of the activities of the airport entities is summarized in the table below.

Table 2: The different types of waste produced during the operational phase

Types of activities	Types of waste
Industrial activities (maintenance, workshops)	- packaging waste (including a significant proportion of soiled packaging), - more special waste such as oils, solvents, - electrical waste (cables, different types of lighting, etc.), - toxic waste in dispersed quantities (DTQD).
Customer Services	- waste similar to that of industrial activities (vehicle rental companies), - food waste, - paper (newspapers...), - unbleached packaging waste (cardboard boxes, glass bottles, cans, etc.) for restaurants and shops,
Administration	- paper waste,
Ground assistance	- food waste, oils and packaging,
Works	- inert waste, - non-hazardous industrial waste (HIW), - packaging waste, - special industrial waste.

The airport managers must provide all companies on the platform with an area dedicated to the sorting of non-hazardous and hazardous waste.

A management system will be implemented that takes into account:

- compliance with regulations;
- waste reduction at source and;
- material recovery (recycling, reuse) and energy recovery (incineration with energy recovery).

This regulatory-based system formally prohibits burning waste, abandoning it or discharging it into wastewater systems. It will not allow the mixing of waste (e. g. hazardous and non-hazardous) or the landfilling of recoverable waste.

Evaluation

The Waste Water and Waste Management chapter (III.8. of ESIA) contains an appropriate description of the expected types of waste and their disposal methods during construction phase. However, the expected amount of the waste is not determined and should be completed.

It is recommended to propose an autonomous management system for liquid discharges.

The suggested mitigation measures and procedures of re-use, treatment and/or disposal comply with environment protection laws and can be evaluated as sufficient. Hazardous Waste Management, including monitoring should be implemented.

Waste Management Plan for the operational phase should be elaborated and completed.

IV.3. AIR EMISSIONS

Aircraft and their daily activities

The combustion of fuel in an aircraft engine releases carbon dioxide (CO_2), water vapor (H_2O), nitrogen oxides (NO_x), carbon monoxide (CO), unburnt hydrocarbons (HC), sulphur oxides (SO_x) and soot particles. Studies have shown that air traffic contributes also to the formation of ozone (O_3), which is not produced directly by aircraft operation but is a secondary pollutant.

The amount of emissions during taxiing, take-off, climbing, descending and landing activities of the aircrafts on the runway are a function of the density of air traffic. Number of landing/taking-off should be completed.

Other sources of air pollution have been identified at the airport area, including:

- the power plant operating thanks to a diesel-powered generator;
- road traffic in and around the airport with private vehicles;
- taxis, buses and coaches, light commercial vehicles, trucks;
- painting of vehicles and buildings.

Table 3: Pollutants emitted in the airport area and their sources

Sources		Main pollutants emitted
Air traffic	Aircraft movement Engine tests Operation of auxiliary power units	Nitrogen oxides (NO_x); Carbon monoxide (CO); Unburned hydrocarbons (HC); Sulphur dioxides (SO_2); Smoke
Land traffic	Service vehicles Employee transportation Passenger transport	Nitrogen oxides (NO_x); Carbon monoxide (CO); Unburned hydrocarbons (HC); Sulphur dioxides (SO_2); Smoke; Lead (Pb), depending on fuel
Energy	Oil-fired power plant	Nitrogen oxides (NO_x); Unburned hydrocarbons (HC); Carbon monoxide (CO); Sulphur dioxides (SO_2); Smoke
Maintenance	Painting; Other operations	Volatile organic compounds (VOCs)

In ESIA is recommended to set up an air quality management system. The system should include: identification sources of emissions in the area, the airport share on air pollution in the area. In addition, mitigation measures to ensure compliance with the limits have to be proposed.

Evaluation

It is supposed total amount of emissions relevant with Airport construction and operation is not significant. Nevertheless, any quantification should be elaborated and assessed during next stage of project preparation.

IV.4. NOISE POLLUTION

Noise generated by the operation of aircraft is the main source of discomfort felt by staff and people living near the infrastructure.

It is generated by three main sources:

- aerodynamic noise caused by air friction on the aircraft. This type of noise is observed during the approach and landing phases, which cause turbulent air flows in addition to the noise caused by the landing gear and speed brakes, producing a loud humming sound;
- noise generated by turbojet engines that produce a roar during take-off when operating at full power;
- rotating parts that also generate noise. The higher the speed of rotation of the propellers, the higher the sound emitted becomes and therefore annoying.

ESIA states that noise control is a major issue to be taken into account in airport management by developing an action plan to reduce aircraft noise pollution. In addition, the study recommends the development of a Noise Exposure Plan (NEP) to protect people from excessive noise pollution.

It is underlined that noise emissions can only be effectively reduced with the co-operation of aircraft manufacturers, and airlines, who should regularly renew their fleets and raise awareness and train their pilots in techniques to reduce noise emissions. The airlines should reduce night flights as much as possible.

Construction works should preferably be carried out during daytime. Noise in the construction area will be temporary and periodic.

Evaluation

It is supposed the standard construction machines and vehicles will be used for the construction of the Airport, mainly during daytime. Noise in the construction period will be temporary, few months as a maximum (should be specify).

Aircrafts that are considered to serve the Airport and their acoustic performance have to be specified during next step of project preparation.

Due to very short distance of residential areas from the Airport area (only 10th of meters), it is requested, to propose and implement effective mitigation measures with the goal to keep noise limits.

As a part of project documentation, we recommend to elaborate Noise study both for construction and operation phase.

V. INFORMATION ON THE CURRENT CONDITION OF THE ENVIRONMENT IN THE AREA OF THE PROJECT

The information evaluated in this part corresponds to the chapter "V. Description of the environmental and social conditions in the project area".

The Matam airport site is located in the Commune of Ourossogui, Matam Department and Matam Region. The Matam Region, located in the north-east of Senegal, covers an area of 29,616 km².

The airport is located south of the city of Ourossogui and is limited:

- to the N and NE by a rainwater drainage dike and houses in the city of Ourossogui;
- to the W by the N3 national road;
- to the S and SE by a few unexploited crop fields, a Medium Voltage (MV) line and a rainwater drainage dike;
- to the SW by a wild landfill and the Ourossogui ZAC;
- to the E by the ASECNA antenna, a MV line and natural vegetation.

The Ourossogui-Matam airport is accessible by the N3 national road.

The area of influence corresponds to the space on which the potential impacts (dust, noise, releases into the natural environment, etc.) of a project can be perceived.

The airport is marked in its north/north-eastern part by the presence of a drainage dike designed for rainwater drainage, part of which is located inside the airport fence. In addition, unauthorized garbage dumps have been identified within the airport.

The components of the current airport are:

- administrative building with a VIP lounge;
- mini solar power plant providing power supply for the ASECNA antenna;
- unmaintained lateral runway with two Stop Extensions (PA) of 100 m each;
- two ASECNA transmission antennas located outside the airport fence;
- a medium-voltage power line supplying the airport;
- a fence wall that has collapsed in places; this encourages animals to wander inside the airport.

Description of the environmental conditions (on 10 pages) contains following:

- Geographical location
- Location and land use of areas of influence
- Physical environment – Geology, Relief, Water resources, Morpho-pedological characteristics of the area
- Climate
- Biological environment – Flora, Protected areas, Protected species, Wildlife and avifauna

Evaluation

The chapter contains all necessary information for the evaluation of current environment and possibility to rehabilitate and operate proposed project.

As more important environmental parameters of the area, the water resources and wetlands are to be identified. Due to the proximity of the airport to these surface waters, the airport area could be evaluated as an environmentally sensitive.

It is supposed the impacts on other environmental components will be less significant.

VI. EVALUATION OF ENVIRONMENTAL IMPACTS

The information evaluated in this chapter corresponds to chapter VIII. of ESIA Document – "Environmental and Social Impact Analysis".

This chapter presents the assessment of the positive and negative impacts that the Matam Regional Airport rehabilitation project will have on the human, biophysical and socio-economic environment.

The issues covered in this ESIA section are the identification of direct, indirect, temporary and permanent impacts of the project on the environment as well as the identification of socio-economic impacts, and mitigation or enhancement measures depending on the nature of the impact.

The environmental management and monitoring plan to minimize residual impacts and ensure effective monitoring of the components likely to be affected is presented in Chapter X of ESIA.

VI.1 REHABILITATION PHASE

In this section, all impacts related to the project during the rehabilitation phase are studied in detail. Mitigation measures are proposed for each environmental component (physical, biological, human) impacted by the project.

VI.1.1. IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

During the rehabilitation/construction phase the activities likely to have an impact on the physical environment of the area are the activities of a construction site, such as the installation of equipment, civil engineering works (earthworks, levelling, backfilling), construction works, waste generation, etc. These activities are likely to lead to:

- secondary dust emissions from the transport and storage of building materials;
- exhaust emissions from the operation of construction machinery and vehicles;
- risks of contamination of the soil, subsoil and water resources through discharges, accidental oil spills or the use of hazardous chemicals, but also through poor waste management;
- soil degradation following civil engineering work and site installation;
- the modification of the surface and groundwater flow regime due to civil engineering works (levelling, earthworks, backfilling, etc.).

Air quality impacts

Air quality will be affected by emissions of pollutants and especially dust from demolition and reconstruction activities, vehicles and construction machinery.

If the loads of materials (sand, gravel, etc.) are not covered, trucks risk losing part of the materials throughout their journey. In addition, the airport is located near the dwellings of the Aïnoumady I and II districts where the first dwellings are located within the airport wall.

In Ourossogui, the main dust emissions occur during the dry season between November and June. These would be greatly increased if the work were to take place during this period.

Exhaust emissions will come from the operation and use of machinery, vehicles, site generators, concrete plants, etc. This equipment burns diesel oil and emits CO, CO_2, SO_x, NO_x, etc.

However, these quantities of pollutants released are expected to be relatively small and over a short period of time. Thus, the **significance of the impact is considered low**.

Mitigation measures

In order to reduce or compensate impacts on air quality during the rehabilitation phase, the study recommends the following mitigation measures:

- to sprinkle the site soil and traffic lanes to minimize dust generation;
- limit the speed of trucks to 30 km/h at the houses and on the construction site;
- cover with tarpaulins the trucks transporting materials (rubble, sand, etc.) on site;
- implement demolition methods that minimize dust emissions
- reduce open sand storage to a strict minimum or cover it if necessary;
- ensure rigorous planning of work periods according to the seasons (if possible);
- stop unused vehicles and equipment by avoiding the standby position such as idling engine;
- ensure preventive and curative maintenance of exhaust emission equipment;
- inform and raise awareness among local populations.

Climate impacts

During the operation of construction site machinery, equipment and vehicles as well as the use of trucks to transport construction materials will lead to greenhouse gas (GHG) emissions such as CO_2. In addition, the preparation of the land, will require localized deforestation within the airport site.

However, these emissions will not have significant impacts on climate change due to their low magnitude. The **importance** of the impact of rehabilitation works on the climate **is considered low**.

Mitigation measures

The ESIA recommends the following measures be taken into account:

- define the desired technical specifications for construction machinery, in line with international exhaust gas standards;
- stop unused vehicles and equipment;
- carry out regular and complete maintenance and roadworthiness tests on vehicles and construction machinery to minimize pollution due to poor combustion;
- comply with national and international standards in terms of GHG emissions.

With the implementation of the above recommendations, during the rehabilitation phase, the residual effects on the climate will be very small.

Impacts on soils and water resources

The airport's rehabilitation works are likely to alter the quality of the soil, surface water and, consequently, groundwater. These potential impacts are presented below.

Modification of local topography and soil destruction

Excavation, grading and excavation work on the site will change the soil profile and local topography. This modification will disrupt the natural runoff of stormwater. The airport is located on the sloping plateau from west to east. Such situation favors intense runoff and therefore water erosion and gullying. This gully is most noticeable southeast of the airport.

Construction work could also reverse the natural horizons of the soil by creating embankments and excavated material that can disrupt the pedogenetic process and impoverish the soil.

However, this work will be limited to the site's right-of-way and will be carried out over a short period of time. Thus, the **significance** of the impact of preparation activities **is considered low** on the modification of local topography and soil destruction.

Waterproofing, compaction and soil compaction

During rehabilitation works, some civil engineering operations such as compaction and/or paving can lead to waterproofing and compaction of soils that will no longer be able to properly perform their environmental functions.

The construction of access roads, the use and parking of heavy machinery, backfilling activities and the construction of foundations could cause the soil to settle.

As a result, the work may change the speed and infiltration rate of runoff and the recharge rate of groundwater. Thus, stagnation and/or runoff of water is accentuated, leading to flooding and/or water erosion of the soil.

However, rehabilitation works that only concern a limited area will be carried out over a relatively short period of time (10 months). Thus, the **significance of the impact is considered low**.

Pollution of soil, surface and groundwater

The site preparation work as well as the airport rehabilitation work represent a risk of contamination of the soil, surface and groundwater. The storage and handling of fuels, lubricating oils, used oils, chemicals, etc., used in the operation and maintenance of equipment, machinery and construction vehicles can lead to accidental spills or leaks that can contaminate the soil, runoff and groundwater by infiltration.

The Senegal River is located about 9 km from the airport site. In addition, no floodplains or ponds have been identified in or around the airport. However, the presence of a rainwater drainage dike is noted to the north and northeast of the airport. Contamination of this dike could lead to soil and water pollution.

In addition, the risk of soil and water pollution is present off-site through the transport of raw materials during rehabilitation work, refueling and other substances. Thus, the **significance** of the impact **is considered to be average over a short period of time**.

By generating waste

Construction works are sources for generating solid and liquid waste (liquid effluents, packaging, cable reels, empty containers, used spare parts for machinery, etc.). Poor waste management at the construction site can lead to the dissolution of liquid waste and leaching of solid waste that could contaminate soils, surface water and groundwater through infiltration.

However, construction site waste is generally inert waste that is generated over a short period of time. Thus, the significance of the impact is considered to be average.

Mitigation measures

- conduct a soil survey;
- define heavy vehicle routes and areas in order to limit rolling surfaces and soil compaction;
- limit the site's footprint to the strictly necessary area;
- rehabilitate the site after the work;
- provide a water drainage system before the rainy season to ensure that runoff water flows to the natural circuits;
- ensure that no vehicle maintenance is carried out on site;
- ensure that vehicles and construction machinery have a proper technical inspection;
- take into account the NS 05-061 standard on waste water before any discharge of effluents into the natural environment;
- limit spills and accidental leaks by:
  - the provision of anti-pollution kits;
  - the storage of oils and other hazardous products in sealed retention basins;
- raise awareness and train staff on solid and liquid waste management;
- respect the safety distances from dwellings and installations of sanitation facilities for water drainage;
- implement an HSE policy.

With the implementation of these recommendations, the **significance of these impacts on land and water resources will be very low.**

Impacts on water resources used by populations

The airport preparation and rehabilitation works will lead to increased water consumption (for civil engineering, soil watering, cleaning operations, workers' needs, etc.) over a short period of time.

Water requirements during the rehabilitation phase are not yet estimated. The water supply will probably be provided by one of four boreholes of the Commune of Ourossogui.

The Commune of Ourossogui is facing **recurrent water shortages**, so during the airport's rehabilitation work, the water requirements for the works could compete with those of the population. That is why, during this phase, water must be used rationally.

Mitigation measures

- collect and use rainwater for watering the slopes;
- implement a rational water management policy;
- put up signs at the level of toilets and sinks to make employees and visitors aware of the importance of water saving;
- repair in time any degradation that may cause water leakage,
- use water tarpaulins in good condition if necessary, to prevent water leaks;
- raise employee awareness of the importance of the resource and the need to preserve it.

Impacts on flora and fauna

It should be emphasized that the vegetation identified on the site serves as a shelter, a nesting box, a resting place but also as a feeding station through its seeds, fruits and insects living there.

However, assessed site is poor in vegetation and is marked by the presence of sparse vegetation mainly composed of the species *Calotropis procera* (Paftann) frequently found on degraded soils.

Rehabilitation work will generate noise that will impact wildlife. It means that a risk of temporary disturbance of terrestrial fauna and bird life in the vicinity will exist. In addition, during this phase, several types of waste (excavated material, waste oils, plant debris, construction site waste, etc.) will be generated on site. Plant species, small mammals and reptiles (rodents, lizards, salamanders, varanos, snakes, etc.) can be very sensitive to certain pollutants. A risk of small fauna (small reptiles or rodents) falling into open excavations during foundations can also be noted during the work.

However, given the short duration of the work and the poverty of the project area in terms of flora and fauna resources, the **significance of the impact is considered very low**.

Mitigation measures

- limit the site's footprint to the strictly necessary area;
- establish an effective system for the management of excavations and waste;
- avoid the accidental or deliberate introduction of alien species during the work and establish a monitoring plan for these species;
- prevent the animals from wandering around the site;
- implement an off-site reforestation plan and monitor it, in collaboration with the Matam forest sector.

VI.2. IMPACTS DURING THE OPERATIONAL PHASE

Impacts on the atmospheric environment

Air quality deterioration and air pollution will be mainly due to airside emissions and exhaust pipe emissions from the different types of vehicles circulating on the site. These emissions will mainly

come from aircraft and their daily activities (take-off, landing, etc.), fuel combustion (Jet A1 or AVGAS), support vehicles, the power plant powered by a diesel generator and increased road traffic in and around the airport.

The main pollutants emitted will be NO_x, CO, CO_2, SO_x, SO_2. CO_2 is the main product of the combustion of all fossil fuels and is directly related to its carbon content.

In the troposphere, nitrogen peroxide decomposes in the presence of O_3 (Ozone) and forms NO_2 and NO whose mixture forms nitrogen oxides (NO_x). NO_x contributes directly to climate change caused by greenhouse gases.

Thus, the operation of the airport will lead to greenhouse gas (GHG) emissions. They thus contribute to the greenhouse effect and the increase in their concentration in the Earth's atmosphere is one of the complex factors of global warming.

Considering all these factors, the **significance** of the impact **can be considered as average** on air quality and climate change.

Mitigation measures

- identify emission sources and implement an air quality management system;
- to propose measures to reduce polluting emissions;
- assess air quality in the area of influence of the project in the operating phase;
- ensure long-term monitoring of ambient air quality at the potential receptors;
- ensure the use of good quality fuel during the operating phase;
- create green spaces far from the track;
- conduct off-site reforestation campaigns;
- ensure compliance with the requirements of the standards in force.

Impacts on soil quality, surface and groundwater resources

The most significant impacts on land and water during operational phase relate to pollution in case of accidental leaks of certain chemicals, poor waste management, maintenance and cleaning activities. Poor management of the "airport waste" can lead to the dissolution of liquid waste and leaching of solid waste that could contaminate soil, surface water and groundwater through infiltration.
However, since there is no fuel or oil storage tank at the airport and no activities such as unloading or refueling will take place there, the **significance of the impact is considered to be average**.

Mitigation measures

- collect runoff water according to its origin and control its quality before any discharge;
- implement a stormwater management plan;
- treat water likely to be polluted by hydrocarbons;
- comply with NS 05-061 Wastewater Standard before any effluent discharge;

- recycle treated wastewater if possible;
- use retention basins or sealed containment basins for chemical storage;
- implement an inspection and maintenance program for the various installations;
- implement response procedures in the event of an accidental spill or leak;
- sort and then store the waste in a sealed storage area;
- find approved channels for the transport, storage and disposal of waste.

With the application of these mitigation measures, the **significance** of the impact on soils, surface and groundwater **could be considered low**.

Impacts on water resources used by populations

During operational phase, the water will be used mainly for domestic use (drinking and sanitation), cleaning and maintenance activities and for the fire-fighting system. Water requirements during the operation phase are not yet estimated. The water supply will probably be provided by one of the boreholes in the Commune of Ourossogui. However, there is recurrent water shortages in the area. Thus, water use must be rational.

Mitigation measures

- collect and use rainwater for watering green spaces;
- implement a rational water management policy;
- repair in time any failure that could cause a water leak;
- promote preventive maintenance of pipes and water points (taps, flushes, washbasins, etc.).

Impacts on flora and fauna

During the operational phase, the main potential impacts on flora and fauna will be related to the generation of noise due to the operation of aircraft, ground handling and transport vehicles. There are also potential nuisances for wildlife and birds from the lighting of the airport and its surroundings.

Very frequent is the risk of collisions particularly with birds. Collisions can cause injury or even death to the animal on the other side it can cause an aircraft crash.

However, in the project area, there are only few places where these birds can take refuge and the water bodies used for watering are a little far from the site. Thus, the **significance of the impact is considered low.**

Mitigation measures

- avoid the divagation of animals in the airport;
- set up a buffer zone between the airport and the natural areas;
- take into account noise control in airport management;
- develop an action plan to reduce aircraft noise pollution;

- influence flight schedules and/or limit night flights, since noise levels are higher at night than during the day.

VI.2. IMPACTS ON THE SOCIO-ECONOMIC ENVIRONMENT

VI.2.1. POSITIVE IMPACTS

During the **rehabilitation phase** of the airport, positive externalities will be produced through the recruitment of manpower, the development of small businesses, the purchase of goods and services, cultural mixing and possibly the discovery of archaeological objects.

Direct job creation

Demolition, reconstruction and redevelopment activities of the airport will result in the recruitment of unskilled personnel. A qualified workforce will also be recruited for tasks requiring specialization. The participation of local labor in the work will improve the standard of living.

The recruitment of staff, particularly local staff, contributes on a large scale to reducing unemployment. Thus, the significance of the impact is considered **moderate**.

Bonus measures

- recruit local workers as a priority;
- pay decent wages to workers;
- involve IWHSS in the declaration and identification of workers;
- declare the opening of the site to the labor inspectorate;

Indirect job creation

The rehabilitation phase of the airport also induces indirect jobs through the development of small activities such as catering, trade in manufactured goods, everyday food, etc.

In addition, urban and peri-urban transport will be more developed with the movement of staff and labor. The significance of the impact is considered to be **average**.

Bonus measure

The ESIA recommends following measures to improve the impact:

- develop and secure spaces around the airport to allow the installation of these activities;
- define with the local populations the rules of good conduct for peaceful coexistence with the security and access requirements of the airport area;
- manage entrepreneurship ambitions around the airport;

Business opportunities for SMEs

The contracting company for the airport rehabilitation contract is of Czech origin, however, it will use local companies to carry out the structural and ancillary works and provide other services. This constitutes a business opportunity for national entrepreneurship with public works and other local

structures specializing in the supply of building materials on renovation sites. Thus, the significance of the impact is considered **high**.

Bonus measures

- promote access by local companies to goods and services: local rental of construction machinery and vehicles for demolition, rubble removal, transport of workers, construction materials, equipment, etc.;
- offer, for office furniture and other amenities, the opportunity for national craftsmen;
- develop subcontracting so that local SMEs can gain experience.

During the **operational phase** the activities of the Matam Regional Airport will generate positive impacts detailed below.

Job creation

The airport's operating activities will generate jobs that will require both proven qualifications and unskilled jobs.

Thus, from security to administration, jobs will be created. In addition, The Matam airport will outsource airport assistance services, from reception to disposal of waste. The **significance of the impact is considered high.**

Bonus measures

- involve the local community in staff recruitment procedures;
- promote local employment if the profile presents itself and ensure the continuous training of recruits to upgrade them;
- develop a modern social policy for staff;
- promote the female workforce;
- develop maintenance and security training specific to safety, hygiene and health standards for local companies wishing to operate at the airport.

Strengthening regional air services

In order to strengthen Senegal's position as a reference point in air transport and to increase regional connectivity, the regional air hub project was initiated. The objectives of this project are to bring regional airports up to standard, increase air transport density and open up inland regions.

The rehabilitation of the Matam airport will contribute, on one hand, to strengthening the region's service but also to the creation of viable economic centers. This will stimulate their development throughout Senegal. Based on these impacts, **significance is considered very high.**

Bonus measures

- rehabilitate and equip the Matam airport with the most modern technologies;

- revitalize and make the services provided to passengers on departure and arrival more enjoyable;
- assign qualified personnel and specialists to the various workstations;
- authorize and make available shuttle vehicles between the airport and passengers' final destinations;
- create a healthy atmosphere of cohabitation with service providers in the airport area.

Revitalizing tourism and economic activities

The rehabilitation of Matam airport will be a new springboard for the discovery of the region, which is a land of cultures and history for tourists from all over the world.

Thus, the relaunch of airport activities will allow new economic activities through the revitalization of the hotel and catering sub-sectors, the purchase of goods and services, job creation, etc. It will also contribute to the diversification of destinations in the interior of the country. As a result, the significance of the impact is considered **very high**.

Bonus measures

- create relaxation areas for users of the airport area;
- create tours and tourist itineraries;
- initiate development and equipment projects for tourist sites in the Matam region;
- develop the ground transportation network to facilitate access to the airport;
- strengthen the security, safety and protection of space.

VI.2.2. NEGATIVE IMPACTS

During the **rehabilitation phase** of the airport, following impacts may occur:

Noise pollution

The rehabilitation works will generate noise and dust, especially during demolition activities but also during reconstruction. The noisy equipment could be:

- mobile equipment (transport trucks, loaders, excavators, bulldozers, etc.);
- fixed equipment (concrete mixers, drills, compressors, small machinery, generators, etc.).

However, it should be noted that the demolition of existing buildings and reconstruction will be limited to the site of the current airport and are far from the first dwellings. The impact is considered to be of **moderate importance**.

Mitigation measures

- use equipment and tools with low noise levels and comply with the limit of 85 dB at 1 m;
- regularly carry out acoustic measurements in the noisiest areas and at property boundaries and implement corrective measures;
- Provide workers with PPE adapted to their workstation to combat noise pollution;

- timely maintenance of pneumatic tools, machinery and equipment to keep the noise level generated at an acceptable level;
- ensure that very noisy equipment such as site diesels and compressors are covered;
- install a screen wall towards residential areas, particularly in the nearest neighborhoods.

Waste generation

The rehabilitation phase will start with the demolition of existing buildings. This first phase will be an important source of waste and debris production that must be managed effectively.

In addition, site preparation work and operations associated with the installation of the new pavement and access and service roads, the reconstruction of buildings and the installation of airport equipment and facilities will produce a very large volume of excavated material, rubble and various types of waste (packaging, green waste, metals, etc.).

For the effective management of these various types of waste, a waste management system will be set up. It will respect good waste management practices, namely the principles of collection, sorting, recycling and disposal. The hazardous waste management, especially their recovery and treatment, will be carried out with the local specialized companies in accordance with the regulations in force.

The impact will then be of **short duration and medium importance**.

Mitigation measures

- set up a waste disposal center as soon as the site opens;
- ensure that waste is not abandoned, released into the natural environment or burned in the open air;
- draw up a waste tracking form for so-called hazardous waste;
- collect separately and recover waste as much as possible;
- ensure that the mixed waste is stored in "all coming" bin(s) or container(s) and disposed of in authorized landfills.

Increase in traffic intensity

The rehabilitation of the airport will require a considerable contribution of building materials and equipment. The latter will be transported to the site by dump trucks. In addition, there are the vehicles used for the movement of personnel and those used by TRANSCON to transport the equipment and material to be set up for the renovation of the infrastructure. All these aspects will increase traffic in this area and therefore the risk of accidents, but also noise and pollution levels.

TRANSCON will implement a communication plan that integrates all stakeholders and take all necessary measures to minimize the inconvenience associated with this increase in traffic. The **impact will then be of medium importance**.

Mitigation measures

- inform stakeholders (municipalities, populations, AGEROUTE...) on the date of the convoy (by radio, newspaper, mail) on the routes, risks and measures to be taken to avoid accidents;
- inform the DPC and use a professional escort between Dakar and the site;

- use trucks in good technical state for transport to the site;

Loss of housing for residents of surrounding neighborhoods (Aïnoumady 1, 2) and rainfed farmland

The release of the indirect area of influence by an involuntary displacement of human installations located in the immediate environment of the site is inevitable for an upgrading of the infrastructure which must establish an Aeronautical Services Plan (ASP). Indeed, Annex 14 of the Convention on the International Civil Aviation Organization (ICAO) stipulates that "airports must have an obstacle-free airspace so that aircraft can approach and take off safely and that this volume of space must also be defined so that it can be protected, in order to ensure the growth or even the very existence of the airport".

Thus, the release of the right-of-way will lead to the loss of housing but also to the loss of rainfed land and therefore income for the populations who used this land.

The study recommends that all necessary measures be taken to comply with ICAO texts to ensure the safety of persons and aircraft. To this end, a Resettlement Action Plan (RAP) will be developed and implemented for the care of Persons Affected by the Project (PAP).

Although the area concerned is not very large, the **impact on land is still major**.

Mitigation measures

- set up measures to support the populations affected by relocation;
- compensate affected populations before work begins;
- comply with IFC Performance Standard 5 for involuntary movement of people and economic activities;
- secure and enhance these spaces for the airports concerned;
- establish with the land registry the actual airport boundaries and install a barbed wire fence (different from the fence wall provided by the project).

Operational phase

The main environmental components impacted during **airport operations** are air quality, noise pollution, waste generation and water and energy consumption; the first aspect is addressed in the chapter on impacts on the physical environment.

Noise pollution

Noise generated by the operation of aircraft is the main source of discomfort felt by workers and residents of the airport. It is produced by three sources:

- aerodynamic noise caused by air friction on the aircraft. This type of noise is observed during the approach and landing phases, which cause turbulent air flows in addition to the noise caused by the landing gear and speed brakes, producing a loud snoring;

- engine noise generated by turbojet engines that produce a roar during take-off;
- rotating parts of the aircrafts, the higher the speed of rotation of the propellers, the higher the sound emitted becomes and therefore annoying.

In ESIA is pointed out that noise control is a major issue to be taken into account in airport management by drawing up an action plan to reduce aircraft noise pollution. The runway at the Matam airport **is less than 85 meters** from the nearest residential areas. This will inevitably expose the populations concerned to the noise pollution generated by the operation of the airport.

It is supposed, the implementation of the action plan will significantly reduce this impact, nevertheless it will still be of **great importance**.

Mitigation measures

- to elaborate noise study, which part will be acoustic measurements in chosen points and at property boundaries and proposal of corrective measures implementation;
- provide workers with adequate PPE to fight against noise pollution;
- act on flight scheduling and choose time slots that limit night flights;
- create a framework for functional cooperation between airport managers, local populations, local authorities, and certain technical services to resolve environmental concerns.

Generation of solid and liquid waste

Each company which operate at the airport produces a different type of waste. This waste can be classified into two main categories, **non-hazardous** waste such as inert waste, non-hazardous industrial waste, commercial packaging waste, etc. and **hazardous waste** represented by hazardous industrial waste such as waste oils, batteries, neon lights, soiled packaging, etc.

At the same time, the companies generate **wastewater**, which will mainly come from sanitary facilities and kitchens, emptying aircraft toilets, washing and repairing airport commercial vehicles and technical workshops.

As described in ESIA, affected regions have a deficit in sanitation and waste collection systems. Therefore, the central and local authorities of the airport will have to introduce very stringent hygiene and sanitation measures in order to familiarize workers and users with best practices in the field of waste management. It will be a matter of setting up a regular collection system for all generated solid waste, sorting it and working together with the Commune of Ourossogui or with approved service providers for its disposal.

The same will apply to sanitary wastewater, which will be collected in septic tanks regularly removed by authorized local service providers. For other types of wastewater, TRANSCON must propose an autonomous management system for these liquid discharges that is adapted and sized according to the nature and quantity of the liquid effluents to be treated.

The living environment (noise and waste) is a fundamental value. The value of this environmental component will be considered high and the **impact significant**.

*Mitigation measures (*except those listed in previous chapters)

- place garbage cans and skips within the airport and protect them from flying waste (lids, nets, screens, etc.);
- inform and raise awareness of waste management among staff in airport infrastructure assistance and maintenance services;
- carry out chemical, biological and other analyses of waste water.

Water and energy consumption

The water supply for the future airport will probably be provided by the ASUFOR network. The rehabilitation of the airport will result in increased water consumption levels.

Thus, TRANSCON will ensure the adequate resizing of the internal network and this new situation must be taken into account in local water policy in order to minimize its impacts.

The power supply source will be the SENELEC network. A power plant will be installed for emergency power supply and night lighting of the tarmac.

The rehabilitation of the airport will be accompanied by an increase in its electrical energy needs. TRANSCON will work to submit a request for a power increase, in order to effectively take this aspect into account at the level of the electricity grid concessionaire, who has provided assurance that the project's needs will be met.

Mitigation measures

- reassess the airport's electrical energy requirements files that will be shared with SENELEC's distribution department;
- set up a water storage device equipped with a booster for an autonomy of 3 to 4 days;
- choose water-saving equipment and install specific meters to monitor water consumption and detect any discrepancies;
- disinfect the network set up in the airport before it is put into service with concentrated bleach.

VI.3. IMPACTS ON HEALTH, SAFETY AND SECURITY

The operations relating to the **rehabilitation phase** of The Ourossogui-Matam airport will have an impact on the hygiene, health and safety of workers and the populations around the site.

Impacts on hygiene

The health needs of workers, their restoration, the washing water of certain or equipment, as well as rubble and scrap metal from demolition can affect hygiene on and around the site. Similarly, poor waste management, poor health conditions for employees, lack of staff awareness and waste management procedures may affect hygiene on and around the site.

Hygiene is essential for the well-being at work, health and safety on the site, but is not an issue of environmental impact assessment.

Taking these aspects into account will make it possible to limit the **impact, which will be of little importance.**

Mitigation measures

- raise awareness among workers on the importance of hygiene preservation;
- set up visible signage to facilitate the collection and sorting of waste;
- carry out appropriate treatment for the disposal of hazardous waste containing toxic and harmful substances (empty paint pots, hydrocarbons, batteries, accumulators, etc.);
- establish strict hygiene rules to be respected by any person working on the site;
- guarantee access to toilets for workers of all categories;
- set up one or more drinking water points accessible to all;

Health Impacts

The health status of construction workers deteriorates throughout their working lives due to poor working conditions, strenuous work and physical constraints. The most important risk factors for the health of construction workers are:

- the noise;
- carrying heavy loads;
- exposure to chemicals;
- harsh climatic and environmental conditions;
- the vibrations of the tools used;
- work-related fatigue.

Workers are exposed to risks of occupational deafness related to noise exposure. Driving vehicles on site, working in a very noisy environment, using noisy machinery can affect hearing.

The vibrations of the tools used can adversely affect the health of workers.

Demolition activities of concrete structures are subject to the risk of dust and fiber inhalation. The hazardous chemical agents contained in the mixture as well as the ambient temperature are risk factors that can affect workers' health.

Air quality will be temporarily affected by the emission of dust and exhaust gases produced by demolition and construction activities. Inhalation of dust and breathing in air contaminated with harmful particles can create respiratory problems.

Given the environment of the construction site (nearby dwellings), populations can also suffer from noise, dust pollution and deterioration of air quality.

Even if the working environment is not a subject of EIA, it is important issue of the project and main issues and mitigation measures are covered in this authorization.

The environmental value is considered high with a moderate degree of disturbance and a **moderate impact significance.**

Mitigation measures

- favor wet working processes;
- use a dust collection device and suction devices at source;
- choose machines that are less noisy;
- favor remote-controlled machines (distance from the noise source);
- provide vehicles and machinery with soundproof cabins;
- periodically maintain and check equipment;
- avoid as much as possible the use of manual handling with the risk of injury;
- train workers in load handling techniques;
- use visual warning devices instead of audible warning devices;

Safety Impacts

During demolition work, workers are exposed to noise, electrical risks, and risks of fire and explosion. From the high floor or from a staircase, stepladder or scaffolding, the worker is exposed to the risk of falling from a height. A failure or instability of the support platforms is also a source of fall.

The use or storage of gas cylinders (torch), dismantling or working near the kerosene storage area exposes workers to the risk of fire and explosion.

The environmental value is high and the **significance of the impact is high**.

Mitigation measures

- implement a traffic plan;
- appoint an HSE manager in charge of supervision and prevention against occupational risks;
- require or have a diagnosis carried out before work;
- identify and detect networks before intervention;
- materialize the electrical risk in situ;
- respect the safety distances if it is not possible to switch off the power supply, for example for reasons of continuity of service;
- issue mandatory electrical authorizations to workers requiring them and give them the prescription booklet and specific PPE;
- set up secure access (ladders, temporary stairs, etc.);
- use individual rolling platforms for work up to 4 metres high and regularly check the working platforms;
- set up collective protection and wear appropriate personal fall protection devices;
- keep the site clean and properly organize the depots;
- regulate access to the site and place hazard symbols, protective markers and prohibition and warning signs in all areas where there is a danger;

- provide space for customs, police and health services.

An airport operation induces aspects related to the hygiene, health and safety of all persons who use it and of the populations living in its immediate environment.

Impacts on hygiene

The absence of procedures for managing the cleanliness of premises, toilets and employees' comfort can have an impact on the hygiene of the premises and the surrounding area.

The uncontrolled management of the waste, the unhealthy conditions in the premises, the lack of comfort of employees (lack of changing rooms, refectory, etc.) can have an impact on the hygiene.

The environmental value is high. However, its degree of disruption remains low and the **significance of the impact moderate.**

Mitigation measures

Besides measures proposed for rehabilitation phase, the following measures should be implemented:

- establish a reliable sanitation system to prevent the discharge of wastewater or contaminated water into the natural environment;
- set up a rainwater collection system;
- keep workplaces, gathering places, equipment, furniture clean;
- ensure the permanent healthiness of the premises and sanitary facilities;
- contract with specialized cleaning services in good standing to manage the site's sanitation.

Health Impacts

Depending on the position and working conditions, the workers are exposed to the screen, noise, exhaust gases from aircraft and car engines, and awkward postures.

Airside personnel are exposed to high noise levels that can affect hearing. Workers, depending on the position held, may be exposed to high noise from the movements of aircraft, ground service vehicles and other noisy installations. They are also exposed to exhaust gases from aircraft and car engines that can cause them breathing problems.

Working on or near high-voltage active components exposes the employee to electrical risks. Noise and air pollution induced by aircraft activities can affect the health of local populations.

Failure to comply with health checks exposes the population, travelers and crew members to diseases because travelers will come from all walks of life. If the appropriate vaccines are not taken by travelers, those carrying a contagious disease may carry the disease, contaminating workers, the population, etc.

The environmental value is high and the **importance of the impact is high.**

Mitigation measures

- require the wearing of personal acoustic protection devices;
- develop a noise map and a noise exposure plan;
- encourage shift work to allow team rotation to reduce the risk of cumulative noise exposure;
- carry out the pre-recruitment medical check-up and periodic check-ups every six months;
- provide first aid kits;
- carry out risk assessment at each workstation;
- require passenger health screening;
- provide the health control services with adequate means to carry out their work.

Impact on safety

Carrying heavy loads, repetitive movements, handling operations, aircraft service operations can cause sprains, TMS, etc. Coactivity in the movement area leads to accident risks. Collisions with ground or moving service vehicles or aircraft are possible and can cause injuries.

The animal hazard and the presence of FOD on the runway can also pose safety problems. The presence of domestic animals on the runway and taxiways can lead to collisions between aircraft and animals and damage the aircraft or even cause its structural failure. The presence of birds increases the likelihood of a collision with an aircraft. The suction of the FODs by the aircraft's engines causes destruction of the aircraft and can cause accidents.

The urbanization of the immediate environment of the site can affect the safety of the site and activities. The establishment of landfills in the vicinity of the airport, the planting of vegetation, agricultural activities (fields, orchards...) create environments conducive to the frequentation and reproduction of birds which are risk factors for the activity. They promote accidents through incursions into sensitive parts of the aircraft or by collision.

Aircraft failures can be catastrophic for populations if there is a crash. The take-off and landing phases are the most at risk and can lead to runway overruns and collisions that affect safety.

Safety and security at the airport must be greatly increased to avoid the risk of a terrorist attack.

The environmental value is high and the degree of disturbance high; this leads to a **very high impact significance.**

Mitigation measures

- install safety signage;
- mark pavements to facilitate traffic and avoid the risk of collision;
- delineate safety areas in high-risk areas;
- train and certify all workers with access to apron operations;
- develop an emergency plan;
- provide the customs, police, hygiene brigade installed in the airport and the inspection bodies with the latest generation equipment to carry out their work properly;
- have sufficient equipment for firefighting;

- have a synoptic table in the emergency room of the rescue and fire-fighting service;
- provide a daily cleaning system for the movement area;
- work with local authorities to prevent the establishment of structures that can attract birds (landfill, retention basin, agricultural operation, livestock, landscaped green space, etc.) into the airport environment;
- prohibit access to the land for livestock;
- create a high fence topped with barbed wire, the ends of which are turned outwards;
- use scaring techniques (chemicals, audio or visual means) to keep birds away;
- implement a plan to combat bird and animal diseases;
- establish strict baggage security standards.

VI.4. ASSESSMENT OF CUMULATIVE IMPACTS

In the analysis of possible cumulative impacts, the following projects will be considered:

- the Ourossogui solar power plant (SENSOL SA);
- the agricultural domain of SIPA;
- the Ourossogui ZAC.

VI.4.1. Description of future and ongoing programms or projects

Ourossogui Solar Power Plant

The solar power plant project, located to the south-east of the current airport and with a capacity of 15MWp, will be built in the Commune of Ourossogui, on a 50-hectare land title registered in the name of the State of Senegal. SENSOL SA, project promoter and the Municipality of Ourossogui have signed an agreement for the provision of land. The project will be composed, among other elements, of a park of photovoltaic panels connected in series (nearly 35,000) to form chains, then in parallel, of approximately 105 trackers. This solar power plant project could have an impact on the operation of the airport, in particular through the solar reflection of these installations, which could become significant because of their glass coating and surface area.

SIPA's agricultural domain

The airport estate is limited to the south-east by a SIPA (Agricultural Production Intensification Company). SIPAs are community-based projects aimed at addressing the scarcity of rainfall and reduced harvests, but also at creating jobs for young people.
The Ourossogui SIPA, which was to be enhanced by the development of market gardening and a goat farm, is currently struggling to start its activities.

Ourossogui Joint Development Zone

A Concerted Development Zone (ZAC) is an initiative of the State or local authority which consists of the development (general earthworks, roads, drinking water supply, electricity, rainwater drainage, etc.) and the preliminary equipment of land bases, most often under national domain, and their availability to users (housing cooperatives, property developers, individuals).

Pre-project implementation studies and supervision of the servicing works of the Ourossogui BIA are still ongoing and data are still not available for the exact location of the project in relation to the airport. However, according to the regional urban planners of Matam, the latter is located about **30 meters** south of the current boundary of Ourossogui-Matam airport.

VI.4.2. Cumulative impacts identified

Job creation

The implementation of these projects in the area will generate many jobs that will benefit especially young people. In addition to the jobs that will be created, business opportunities must be seized for subcontractors and those who supply construction materials.
These employment opportunities offered by proposed projects will help to reduce the unemployment rate and improve the living conditions of local populations and all those affected.

Valuation of the field

These projects will offer the locality of Ourossogui greater visibility, especially in terms of business opportunities for investors. These projects will be favorable to the municipality because their development in the area rhymes with the payment of municipal taxes, job creation and creation of resources and wealth for the emergence of the country.
However, these new investments must be supervised, meet environmental requirements and development policies and, above all, be compatible with existing projects so as not to damage the environment and cause inconvenience to the population.

Increase in traffic

The rehabilitation and operation of The Ourossogui-Matam airport requires a significant flow of vehicles for the transport of equipment and the movement of airport users.
The personal vehicles of the inhabitants of the future ZAC and the transport vehicles (employees, inputs, agricultural products, etc.) of SIPA will contribute significantly to an increase in traffic in the area. Increase of the emission of pollutants from vehicle exhaust gases and the generation of noise should be quantified during next step of project preparation. There will also be a risk of traffic accidents. However, these accidents can be minimized by respecting the regulatory distances between roads and first homes, the installation of signs and compliance with the code of conduct.

Disruption of fauna and flora

The rehabilitation of the airport will lead to the clearing and deforestation of some remaining species. Similar activities will take place during the construction of the solar power plant and will probably be repeated for implementing the ZAC project.
In addition to this deforestation in an area where biodiversity must be preserved, there are also losses of habitats and wildlife species. This impacts on flora and wildlife habitats contributes to the degradation of the natural ecosystem.
A reforestation campaign should be essential for any project requiring the felling of trees or having a negative impact on fauna and flora.

In addition, the area required for the development of these projects, which will now be secured, will significantly reduce the livestock grazing areas in this part of Ourossogui, which is an agro-pastoral area.

Soil, surface and groundwater

The rehabilitation of the airport, the construction of the power plant and the establishment of the ZAC are likely to affect the quality of the soil, surface water and, consequently, groundwater. Indeed, the activities related to this work represent a risk of contamination for the above-mentioned environmental components, in particular through the generation of waste (liquid effluents, packaging, cable reels, empty containers, used machine spare parts, used oils, etc.).
During the operating phase of these infrastructures, several types of solid waste will be produced. This waste could be a source of pollution of soil, surface water and groundwater.
An HSE policy should be put in place at the level of each entity that includes the implementation of an effective waste management plan based on good waste management practices, namely the principle of collection, sorting, recycling and disposal by appropriate means.

VI.5. EMERGENCY SITUATIONS DURING CONSTRUCTION AND OPERATION PHASES AND EXPECTED IMPACT

Risk assessment of potential hazards, accidents and dangers both in construction and operational phases has been made very detailed in chapter IX. of ESIA study. On more than 40 pages the methodology, description of processes and equipment, identification of potential hazard, risk prevention and control measures are covered. All risk sources are defined and prevention methods and control measures are proposed in chapter IX.7.

Possible emergency situations include:

- weather conditions;
- proximity of residential zone (only tens of metres);
- risks due to the reflective effect of photovoltaic panels of the solar power plant;
- foreign objects inside the airport area;
- failures in electrical installations;
- human errors;
- aircraft crash and collisions;
- fire/explosion;
- kerosene and oil spill/leaks;
- danger of birds for air traffic;

It is possible to summarize that all possible risks were identified and effective mitigation and other measures were proposed.

VI.6. CONCLUSIONS AND RECOMMENDATIONS

"Transcon company" is planning to rehabilitate Matam Regional Airport in eastern Senegal.

Current state of the Airport is not acceptable in terms of both air traffic safety, capacity and technical parameters and environmental requirements.

The rehabilitation work will be carried out at various locations throughout the airport and should have an environmental impact and risk of accidents.

Considering the fact, it is rehabilitation project of existing airport, and increase of air traffic intensity will not be significant (+ only a few landings/take-offs per week) it is supposed the impacts on residential zone and environmental components (e.g. air, water, soil, etc.) will be acceptable. It is also supposed that in number of issues, current state will be improved.

The planned activities will be divided into two main phases, which are the **civil engineering activities** related to the demolition, construction of pavements and buildings and the **airport equipment** consisting of the development and installation of equipment to provide the service.

As part of the rehabilitation of the Matam airport, following construction activities are planned. The most important planned **construction** is to be: the runway, tarmac and taxiway. The following will be implemented:

- a 2200 m x 30 m track;
- a 110 m x 50 m tarmac;
- a 135 m x 18 m taxiway.

Necessary terminal, service and control buildings and hangars are going to be built. New fence around the airport has to be installed.

As for the **airport equipment** the following will be installed:
The daytime marking of the runways will be done by:

- white retro-reflective paint for track axes, track numbers and markings;
- yellow retro-reflective paint for taxiway and tarmac;
- white non-reflective paint for continuous runway edge lines.

Dual band navigation aid system that allows an aircraft pilot to determine its position and displacement relative to a ground station.

In terms of **fire warning and extinguishing**, the project provides for the installation of light and sound alarms and smoke detectors. The airport will be equipped with two fire extinguishing vehicles. The fire hangar will be equipped with necessary fire-fighting equipment:

- 2-piece fire hydrants;
- special storage drums for fire-fighting foam (200% capacity inside fire-fighting vehicles);
- maintenance tools, spare parts, exit scissors, oxygen masks inside the working room;
- special coatings on walls near vehicles.

The other necessary airport equipment are as follows:

- ambulance;
- sanitary vehicle;
- drinking water tanks;
- patrol cars.

As a key tool of environmental protection, the Environmental and Social Management Plan (ESMP) will be implemented. It aims to ensure the correct and timely implementation of all measures to mitigate negative impacts and improve positive ones.

The objectives of the ESMP include the following:

- ensure that project activities are undertaken in compliance with all legal and regulatory requirements;
- ensure that the environmental issues of the project are well understood by the promoter and implemented both in the construction and operational phases.

The ESMP will be reviewed as required to ensure its relevance and effectiveness. The proposed amendments will be discussed with the appropriate government authorities.

This ESMP will include:

- measures to mitigate and improve impacts;
- the project's environmental monitoring and follow-up plan with monitoring indicators;
- the timetable for the execution of the various operations;
- social support measures;
- the institutional arrangements for implementation;
- the information, awareness and communication program;
- the actors involved in the implementation of the ESMP and their responsibilities;
- the estimated cost of the recommended measures.

VII. DEFINITE FINAL EVALUATION OF ACCEPTABILITY OR NON-ACCEPTABILITY OF THE PROJECT'S ENVIRONMENTAL IMPACT

Final evaluation of the project's major environmental impact is summarized in the table below.

Environment component	Evaluation	Recommendation
Noise	conditionally satisfactory	The residential zone is just behind the airport fence. Fortunately, the air traffic intensity after rehabilitation will be still low (only few take-offs and landings per week). Carrying out the proposed mitigation measures, should ensure the noise limits are met. It is recommended to elaborate the noise study during next step of project preparation.
Waste	satisfactory	Set up a solid waste management procedure and provide all waste producers with an area to the sorting of non-hazardous and hazardous waste. Optimize the recovery of the various materials by sorting waste as much as possible at source. Work to reduce waste at source and avoid landfilling of recoverable waste as much as possible. Carry out chemical, biological and other analyses of waste water. To elaborate quantification of waste during next step of project preparation.
Ambient Air Quality	satisfactory	To identify emission sources and implement an air quality management system. To propose measures to reduce polluting emissions. Ensure long-term monitoring of ambient air quality at the various sites in residential zone identified as potential receptors.
Surface and Ground Water	satisfactory	To provide a water drainage system before the rainy season to ensure that runoff water flows to the natural circuits. To implement a stormwater management plan. Ensure that no vehicle maintenance is carried out on site. Ensure that vehicles and construction machinery are in proper technical condition. To keep the standard on waste water before any discharge of effluents into the natural environment. To storage of oils and other hazardous products in sealed retention basins.
Soil	satisfactory	Rehabilitation works will be carried out over a relatively short period of time. The most significant impacts on soil during operational phase relate to pollution in case of accidental leaks of certain chemicals, poor waste management, maintenance and cleaning activities. The storage and handling of fuels, lubricating oils, used oils, chemicals, etc., used in the operation can lead to accidental spills or leaks that can contaminate the soil, runoff and groundwater by infiltration. Mitigation measures proposed in ESIA should be carried out.
Fauna and Flora	satisfactory, very low impacts	Impacts on flora are supposed to be non – significant. Potential collisions with avian fauna can cause injury or even death to the animal. Mitigation measures proposed in ESIA are appropriate and should be carried out.
Health and safety impacts	conditionally satisfactory, have to be improved	ESIA evaluate H&S impacts particularly for staff and passengers. The subject of EIA is predominantly impact assessment on residential zone (inhabitants). Nevertheless, in case of Matam airport, all in ESIA evaluated possible H&S impacts should be solved. Safety and security at the airport must be increased. Carrying out the proposed mitigation measures, should resolve existing shortcomings and risks.
Socio-Economic Impact	satisfactory	Positive socio-economic impacts of the project prevail the negative ones. Appropriate mitigation measures for negative impacts - noise, waste production, increase of traffic, loss of housing are proposed.
General evaluation	**conditionally satisfactory**	**We recommend to complete missing quantifications. To implement proposed mitigation measures and where relevant to propose additional measures.**

If all above-mentioned recommendations are implemented within the next stage of project preparation, the "Matam Regional Airport Rehabilitation Project" **is acceptable as regards its environmental and social impacts.**

VIII. ASSESSMENT AUTHORIZATION ELABORATED BY

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IX. DATE OF ELABORATION

January 2019

X. SIGNATURE OF PERSON WHO ELABORATED THE ASSESSMENT

Vladimír Rimmel, MSc.