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List of abbreviations

AIBD: Blaise Diagne International Airport

ANACIM: National Civil Aviation Agency of Meteorology

ANSD: National Agency for Statistics and Demography

PRA: Preliminary Risk Analysis

ARIA: Accident Research and Information Analysis

ASECNA: Agency for the Safety of Air Navigation in Africa and Madagascar

ASER : Senegalese Rural Electrification Agency

BARPI: Office of Industrial Risk and Pollution Analysis

BGRM: Geological and Mining Research Bureau

Construction: Buildings and Public Works

Fixed-term contract: Fixed-term contract

ECOWAS: Economic Community of West African States

CEM: Middle School

CETUD: Executive Council of Urban Transport of Dakar

CGEDD: General Council for the Environment and Sustainable Development

CGQA: Air Quality Management Center

CHST: Occupational Health and Safety Committee

UNCCD: United Nations Convention to Combat Desertification

CSS: Social Security Fund

BOD: Biochemical Oxygen Demand

DCPN: Pollution and Nuisance Prevention and Control Division

DEEC: Directorate of Environment and Classified Establishments

DEIE: Environmental Impact Assessment Division

DMT: Declaration of Workers' Movements

DNAA: Air Navigation and Aerodromes Department

DPC: Civil Protection Department

ESD: Hazard Study

PPE: Personal Protective Equipment

MSDS: Safety Data Sheet

FOD: Foreign Object Debris

GTDLI: Working Group on Flammable Liquid Deposits

HAAS: High Authority of Senegalese Airports

HSE: Health, Safety and Environment

IATA: International Air Transport Association

IC: Classified Installations

ICPE: Installations Classified for the Protection of the Environment

INERIS: National Institute for Industrial Environment and Risks

ARI: Acute Respiratory Infection

IREF: Regional Water and Forest Inspection

IRTSS : Regional Inspectorate of Labor and Social Security

JIG: Joint Inspection Group
LPD/SEDD): Environment and Sustainable Development Policy Letter

LPSGI: Sectoral Policy Letter on Internal Governance

MEDD: Ministry of Environment and Sustainable Development

MODECO: Mobilization and Concerted Planning for Waste Management and Environment in Ourossogui

ICAO: International Civil Aviation Organization

MDGs: Millennium Development Goals

ONAS: National Sanitation Office of Senegal

NGO: Non-Governmental Organization

PAN/LCD: National Action Programme to Combat Desertification

PAN/LCDGDT: National Action Programme to Combat Desertification and Sustainable Land Management

PAP: Priority Action Plan

IRAP: Action Plan for Industrial Redeployment

PAST: Sectoral Transport Adjustment Programme

GDP: Gross Domestic Product

PIC: Municipal Investment Plan

PNACC: National Climate Change Adaptation Plan

PNAE: National Environmental Action Plan

POI: Internal Operation Plan

PSE: Emerging Senegal Plan

PTIP: Three-year Public Investment Programme

RESA : Runway End Safety Area

RGPHAE: General Census of Population and Housing, Agriculture and Livestock

RIA: Armed Fire Hydrant

SARL: Limited Liability Company

EDS: Senegalese Waters

SES: Economic and Social Situation

SNDD: National Sustainable Development Strategy

SNDES: National Strategy for Economic and Social Development

SRAT: Regional Spatial Planning Schemes

SRSD: Regional Service of Statistics and Demography

SSLI: Rescue and Firefighting Service

UEMOA: West African Economic and Monetary Union

UNESCO: United Nations Educational, Scientific and Cultural Organization

ELV: Exposure Limit Value

EEZ: Exclusive Economic Zone

I. NON-TECHNICAL SUMMARY

I.1. INTRODUCTION

The purpose of this report is to present the results of the Environmental and Social Impact Assessment (ESIA) for the rehabilitation project of the Ourossogui-Matam airport in the Commune of Ourossogui, Ogo Department, Matam Region.

This study, commissioned by TRANSCON, identified and analysed the potential positive and negative impacts inherent in the implementation of the various activities on the biophysical and socio-economic environment in the project area, in accordance with the legal and regulatory provisions in force in Senegal relating to the environment. To this end, an Environmental and Social Management Plan (ESMP) has been drawn up, which mainly indicates the measures to eliminate and/or mitigate negative impacts and the methods for implementing environmental and social management.

I.2. PROJECT DESCRIPTION

TRANSCON Electronic Systems, which is responsible for the implementation of the rehabilitation works, is an independent private Czech company founded in 1990 and specialising in electronic and electrical equipment for airports. It operates with its equipment consisting of hardware and software, prototype workshops, production workshops, maintenance and transport services.

As part of the rehabilitation of the Ourossogui-Matam airport, various activities are planned. The renovation work will be carried out at various locations throughout the airport and will have an impact and risk of accidents.

Concerning the pavements, the construction of the runway, tarmac and taxiway is planned. These flexible pavements will have a wearing course of asphalt concrete. In the long term, 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 of 0.5 m diameter above.

As part of this project, a passenger terminal building with two (02) compartments will also be built. One will be a modular hangar with a surface area of 700 ^{m2} and the other, a hangar of 1100 ^{m2}. 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 other things, to:

- 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.

A modular hangar with a surface area of 400 ^{m2} and a height of 04 m as well as a fire-fighting hangar will also be built. This second hangar will consist of the parking hall for fire-fighting vehicles, fire-fighting equipment over an area of 400 ^{m2} and a height of 05 m as well as a control tower combined with the 21 m high technical unit.

Other equipment will also be installed, including a beaconing system with high-intensity halogen lights, navigation aids such as the DVOR dual band (Doppler VOR), a power plant with a 140 kVA generator set, a 1X400 kVA substation and current regulators.

I.3. POLITICAL, LEGAL AND INSTITUTIONAL CONTEXT

I.3.1. POLICY FRAMEWORK

Environmental protection has been a major concern for the Government of Senegal since the Earth Summit in Rio de Janeiro, Brazil, in June 1992. As a result, institutions and legal texts in the field of environmental protection in general and project impact assessment in particular have been set up.

This study will be governed on the one hand by the conventions, agreements and treaties ratified by Senegal and on the other hand by national regulations.

This project to rehabilitate The Ourossogui-Matam airport will be carried out in accordance with the policies, directives and strategies planned at both the national and international levels from the environmental, social, economic, security and other relevant policies.

I.3.2. LEGAL FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT

- **At the international level**

Taking into account the context, the characteristics of the area of influence and the nature of the project's activities, several international environmental conventions ratified by Senegal could be applicable to the project (United Nations Framework Convention on Climate Change (UNFCCC), Vienna Convention, Montreal Protocol, African Convention in Algiers, London Convention, etc.).

- **At the national level**

In relation to the context and activities of the project, the national legal framework is marked by several texts that deal with environmental and social aspects (Constitution of Senegal, Environmental Code and its implementing texts, Environmental Standards, Air Transport Regulations, etc.).

I.3.3. INSTITUTIONAL FRAMEWORK

The institutional analysis allows for the identification of structures that are interested in carrying out their responsibilities, functions and roles, in the actions that will be carried out within the framework of the rehabilitation of Matam airport.

The environmental and social management of the project will involve national, regional and local institutions and structures, as well as the technical services of the State and local authorities. The fields of intervention of these structures and institutions in terms of environmental protection will be diverse whatever the stage of implementation of the project may be.

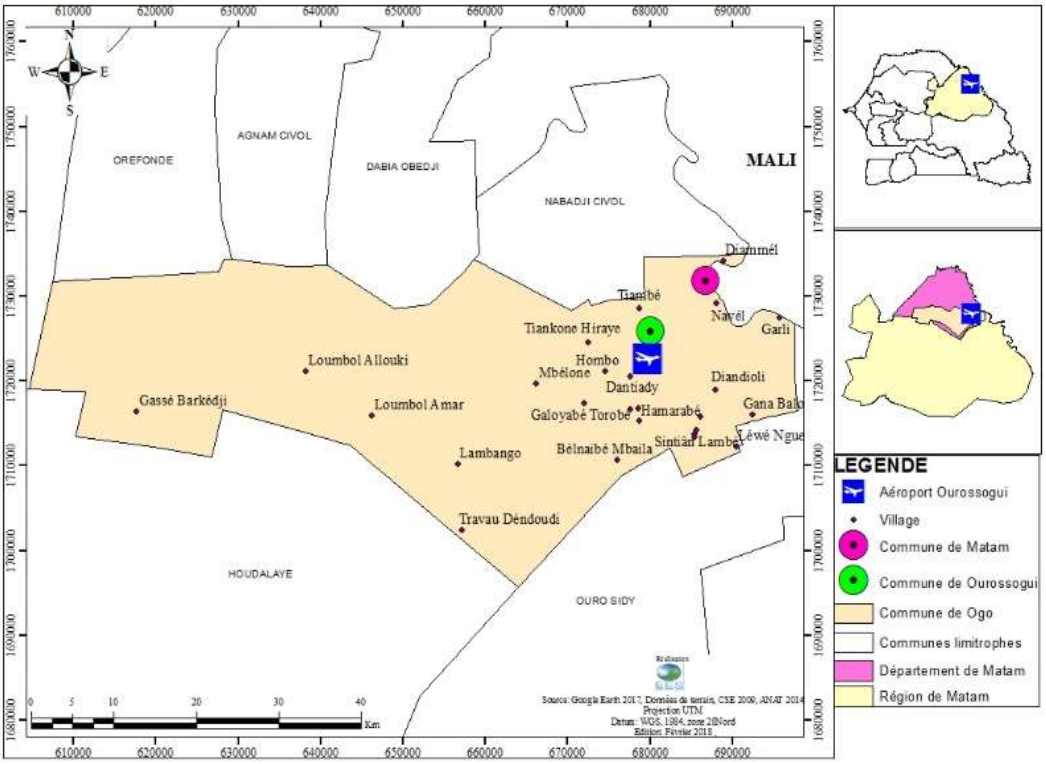
The environmental and social management of the project will be ensured at three (03) levels:

- at the national level through the DEEC, the National Technical Committee and the other national directorates and technical services involved in the management of the project;
- at the regional level through the Regional Environmental Monitoring Committee (CRSE);
- at the level of local authorities (Sub-prefect, Town Hall, municipal councils, etc.).

I.4. ENVIRONMENTAL AND SOCIAL SITUATION OF THE PROJECT AREA

I.4.1. PRESENTATION OF THE PHYSICAL ENVIRONMENT

The Matam airport site is located in the Commune of Ourossogui, Ogo Borough, Matam Department and Region of the same name.



Map 1: Location of the Ourossogui-Matam Airport

The Commune of Ourossogui is located in the Senegal-Mauritanian sedimentary basin and Ourossogui-Matam airport, in the Sahelian continental climate domain. The site area consists of four (04) soil types: hydromorphic, vertic (vertical movements), brown and hillside.

The climate of the project area is characterized by the alternation of a long dry season from November to June, marked by the predominance of the continental trade winds and a short rainy season from July to October dominated by monsoon flows.

The evolution of the curve of the monthly average wind speed is unimodal with a maximum in June (2.1 m/s) and a minimum in November (0.9 m/s). The normal speed from 1987 to 2016 is 1.3 m/s. The highest speeds are recorded from May to September (rainy season) and the lowest from October to April (dry season).

The average daily duration of sunstroke in Matam is quite constant. It varies on average between 07 h and 09 h/day.

The continental nature of the region and the influence of the Mauritanian desert, which is spreading its heat and dust waves, mean that Matam records fairly high temperatures throughout the year. The normal temperature from 1987 to 2016 is 30.6°C.

Rainfall in the area rarely exceeds 400 mm. The normal (cumulative rainfall from 1987 to 2016) is 397 mm.

I.4.2. PRESENTATION OF THE BIOLOGICAL ENVIRONMENT

The Commune of Ourossogui is located in the Sahelo-Sudanian biogeographical domain of the wooded savannah. The area is not very rich in plant resources. The Ourossogui-Matam airport site is marked by the presence of sparse vegetation, mainly composed of a species frequently found on degraded soils. The closest classified forest to the project site is Balel, located about 12 km away.

The faunal capital of the area is declining quite significantly due to several natural and human factors. The airport site is not of particular interest in terms of wildlife resources. However, its proximity to surface waters makes it an environmentally sensitive area because surface waters contribute to the physiological life of fauna and flora but also to the maintenance of biodiversity.

I.4.3. PRESENTATION OF THE HUMAN ENVIRONMENT

The population of the Commune of Ourossogui to host the Ourossogui-Matam airport rehabilitation project is estimated at 18,226 inhabitants in 2017, including 9,766 men and 8,460 women. The Commune covers an area of 15.25 km2 and has 10 administrative districts, including those of Aïnoumady I and II which are closest to the airport.

The Commune of Ourossogui is marked by the coexistence of formal education (teaching French, such as the primary school of Ourossogui I and the nursery school of the same name) and informal education relating to the teaching of the Koran, Arabic and literacy. Non-formal

education is represented by the Koranic school through the many "*Daaras*", Islamic institutes and literacy classes. The municipality has two (02) Islamic institutes and 72 "*Daaras*".

The population's access to water in the city of Ourossogui is based on the three (03) boreholes available in the municipality. The airport's electricity supply is provided by SENELEC.

Agriculture in the Commune of Ourossogui is essentially rainfed and is characterized by food crops such as millet, maize, sorghum and rice. Livestock farming occupies a prominent place in the economy of the Matam Region. Indeed, the importance of livestock is visible through its number and diversity.

In the Matam Region, fishing is practiced on the Senegal River, which borders the region. However, the processing of these products is a very timid activity in the area.

I.5. ANALYSIS OF VARIANTS

Several variants were studied to justify the reason for the project and to compare technological criteria in order to make the most optimal choice in terms of environmental, operational and safety.

The site variants have not been studied insofar as the project is concerned by the rehabilitation of Ourossogui-Matam airport, whose right-of-way is already clearly defined.

The analysis of the "no project" option highlighted the critical strategic and socio-economic importance of this project.

Concerning the demolition techniques of existing buildings, deconstruction is the best method because it will make it possible to combine increased safety with the control of noise and vibration pollution. This option thus makes it possible to preserve the safety of buildings that are not concerned and people working around the airport demolition site.

I.6. RESULTS OF THE PUBLIC CONSULTATIONS

Public consultation is a constituent element of the ESIA. Indeed, it encourages the free expression of the perception of a project by representatives of all categories of stakeholders (administrative authorities, State technical services and local populations).

The administrative authorities, local elected officials and technical services in the Matam region have all welcomed and extolled the airport's rehabilitation project.
According to almost all the parties consulted, it plays an extremely important economic role not only because of its geographical position but also because of the development of the tourism sector in recent years.
The various categories of actors met highlighted the existence of constraints related to the different phases of the airport's upgrading to standards. In addition, they believe that the advent of the renovated airport will generate new economic activities around the infrastructure.

The people of Aïnoumady I and II welcomed the firm's participatory approach, which is contrary to what was done when the current fence wall was erected. The presence of the airport

is welcomed, as is its rehabilitation. Nevertheless, people have expressed concerns about this project because they do not want to be displaced and are afraid that the works will negatively impact on the protection dike that protects them from flooding.

Recommendations to the promoter were made by all stakeholders met.

I.7. RESULTS OF THE IMPACT ANALYSIS

This section examines the major impacts related to the implementation of the project during the airport's rehabilitation and operational phases. Impact management measures are proposed for any component of the environment (physical, biological, human) impacted by the project.

Table 1: Measures to improve positive impacts

Component	Impact-causing activities	Potential impact	Additional measures
Improvement of impacts during the rehabilitation phase			
Socio-economic activities	Rehabilitation work	Direct job creation	• Recruit local workers as a priority • Set up a local recruitment committee • Paying decent wages to workers • Involve IWHSS in the declaration and identification of workers • Declare the opening of the site to the labor inspectorate • Ensure the protection of workers, especially day laborers, by declaring them to the Social Security Fund (CSS) • Ensure that social dialogue is respected on the site
		Indirect job creation Purchase of goods and services	• Develop and secure spaces around the airport • Define with the local populations the rules of good conduct for peaceful coexistence • Frame entrepreneurship ambitions around the airport perimeter • Raise awareness among workers, service providers and merchants of the importance of hygiene and safety instructions
		Business opportunities for SMEs	• Provide national companies with the opportunity to accelerate their development • Promote access by local companies to goods and services offers • Provide opportunities for national artisans for office and other furniture;; • Develop subcontracting in favor of local medium-sized companies
Improvement of impacts during the operating phase			
Socio-economic activities	**Airport Operations**	• Job creation • Purchases of goods and services	• Use local companies for outsourced services • Favor local companies for the purchase of goods and services • Focus on local employment • Fostering the female workforce
		Strengthening regional air services	• Rehabilitate and equip the airport with the most modern technologies • Revitalize and increase attractiveness of the services provided to passengers upon departure and arrival: waiting platform, passenger escort, cafeteria, wifi • Equip the airport with the latest version of hygiene equipment • Assign qualified personnel and specialists to the various workstations • Authorize and make available vehicles for shuttle service between the airport and

Component	Impact-causing activities	Potential impact	Additional measures
			travelers' final destinations
		Revitalising tourism and economic activities	• Create relaxation areas, dining areas for airport staff and airport users • Create tours and tourist itineraries • Initiate projects to develop and equip tourist sites in the Matam Region • Create agencies and train tourist guides • Develop the ground transportation network to facilitate access to the airport • Strengthen the security, safety and protection of airport space • Light up the surroundings of the airport for a better security of the area

Table 2: Mitigation measures for negative impacts

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
Mitigation of impacts during the rehabilitation phase			
Air quality	• Transport, storage and use of construction materials and equipment • Operation of construction machinery and	• Localized deterioration of air quality due to dust emissions • Emissions of pollutants • Olfactory nuisances	• Water the site soil and traffic lanes to minimize dust generation • Restrict the speed of vehicles and machinery in residential areas, sensitive areas and on the construction site • Cover construction site material transport trucks with tarpaulins • Implement demolition methods that minimize dust emissions • Reduce open sand storage to a strict minimum or cover it if necessary • Stop unused vehicles and equipment by avoiding the standby position such as idling

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
	vehicles ● Civil engineering works ● Demolition and reconstruction activities ● Waste generation		engines ● Ensure preventive and curative maintenance of exhaust emission equipment ● Ensure the control and maintenance of vehicles to minimize pollution related to combustion problems ● Inform and raise awareness among local populations
Soil	● Demolition activities, ● Civil engineering works ● Traffic and parking of vehicles and construction machinery ● Use of hazardous chemicals ● Waste generation	● Localized modification of the soil structure ● Erosion of the soil ● Soil waterproofing ● Soil compaction	● Conduct a soil survey ● Define heavy vehicle routes (work lanes) and work areas in such a way as to limit rolling surfaces and soil compaction ● Limit the site's footprint to the strictly necessary area ● Rehabilitate the site after the work
Soil, surface and groundwater	● Storage and handling of construction materials ● Use of hazardous chemicals ● Generation of solid and liquid waste	● Soil and surface water pollution ● Groundwater pollution ● Decrease in the rate and speed of infiltration of runoff water	● Provide a water drainage system before the rainy season to ensure that runoff water flows to 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 NS 05-061 on waste water before discharging effluents into the natural environment ● Limit spills and accidental leaks by: o the provision of anti-pollution kits o storage of oils and other hazardous products in sealed retention basins ● Collect solid and liquid waste according to a waste management plan in accordance with national and international regulatory provisions

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
			• Raise awareness and train staff on solid and liquid waste management • Limit the site's footprint to the strictly necessary area • Implement an HSE policy
Water resources used by the population	• Rehabilitation activities (civil engineering, soil watering, cleaning operation, etc.) • Health needs	• Decrease in resource • Increase in water requirements in the project area	• Collect and use rainwater to water the slopes if the work is carried out during the rainy season • Implement a rational water management policy • Repair in time any degradation that may cause water leakage • If necessary, use water tarpaulins in good condition to prevent water leaks. • Raise employee awareness of the importance of the resource and the need to preserve it
Fauna and flora	• Brushing • Excavation work • Use of hazardous chemicals • Presence and circulation of labor	• Loss of vegetation • Degradation or loss of wildlife habitat	• Limit the site's footprint to the strictly necessary area • Establish an effective system for the management of excavations and waste resulting from the work • Use machinery, vehicles and equipment that comply with noise emission standards • Prevent the wandering of animals inside the site • Implement an off-site reforestation plan and ensure follow-up, in collaboration with the Matam forest sector • Notify the IREF before any deforestation or clearing activity • Support community nature reserves in the project area • Avoid killing species encountered on site

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
Land use and allocation	Release of the site	• Loss of agricultural land and housing	• Implement support measures for affected populations • Comply with IFC Performance Standard 5 for involuntary displacement of economic activities • Compensate the impacted people • Secure and enhance these spaces for the airports concerned • Establish with the land registry the real boundaries of the airport and install a barbed wire fence
Living environment	Rehabilitation work	Noise pollution	• Use equipment and tools with low noise levels and respect the limit of 85 dB at 1 m • Carry out acoustic measurements in the noisiest areas and at property boundaries and implement corrective measures • Provide workers with adequate PPE to fight against noise pollution • Perform timely maintenance of pneumatic tools, machinery and equipment to keep the noise level generated at an acceptable level • Ensure that certain very noisy equipment such as site diesels and compressors are covered • Set up a screen wall towards residential areas, especially in the nearest neighborhoods
		Waste generation	• Set up a waste disposal center as soon as the rehabilitation 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 mixed waste is placed in storage in "all coming" bins or containers and disposed of in authorized landfills • Create a buffer zone between the airport and the houses • Raise staff awareness of waste management

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
		Traffic densification	• Inform stakeholders (municipalities, populations, AGEROUTE, etc.) about the date of the convoy (by radio, newspaper, telephone, mail) about 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 working order for technical inspection for transport to the site and suitable container platforms / doors • Limit speed to 30 km/h while considering the local populations and make drivers aware of the importance of respecting the rules of good conduct
Mitigation of impacts during the operating phase			
Air quality	• Operation of equipment • Operating activities • Increase in road traffic • Increase in air traffic	• Impaired air quality • Global warming	• Identify emission sources and implement an air quality management system • Work on measures to reduce polluting emissions • Assess air quality in the area of influence of the project in the operational phase • Ensure long-term monitoring of ambient air quality in the various sites identified as potential receptors • Create green spaces (grass) away from the track • Conduct off-site reforestation campaigns • Ensure compliance with the requirements of current standards in terms of emissions • Minimize dust emissions
Soil and water resources	• Maintenance and cleaning activities for aircraft, pavements, etc. • Waste generation • Leaks or accident spills	• Soil pollution • Contamination of runoff and groundwater	• Implement a stormwater management plan • Treat waters likely to be polluted by hydrocarbons • Comply with NS 05-061 Wastewater Standard before any effluent discharge • Establish procedures to respond to accidental spills or leaks • Sort and store waste in a sealed storage area • Regularly monitor solid and liquid waste that are likely to be polluting • Find approved channels for the transport, storage and disposal of waste in accordance with current standards • Implement a good HSE policy
Water resources used by the population	• Airport Operations	• Decrease in resource • Increase in water requirements in the project	• Collect and use rainwater in order to water green spaces (lawn, flowers) • Implement a rational water management policy • Put signs on toilets and sinks to raise awareness among employees and travelers about the importance of water conservation • Repair in time any failure that could cause a water leak

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
		area	• Favor preventive maintenance of pipes and water points (taps, flushes, washbasins, etc.) • Reuse treated wastewater if possible
Fauna and flora	• Noise generation • Light emission • Aircraft Overflight	• Wildlife Disruption • Collision between birds and aircraft	• Avoid the divagation of animals in the airport; • Create a buffer zone between the airport and natural areas • Avoid the development of vegetation in the airport and its surroundings • Ensure the reduction of engine noise through regular maintenance and technical visits • Develop an action plan to reduce aircraft noise pollution • Act on flight schedules and/or limit night flights • Use machinery, vehicles and equipment that comply with noise emission standards
Living environment	Airport Operations	Noise pollution	• Carry out regular acoustic measurements in the noisiest areas and on the property line and implement corrective measures • Provide workers with adequate PPE to fight against noise pollution • Act on flight scheduling and choose time slots that limit night flights; • Favor airlines that regularly renew their fleets • Encourage airlines to raise awareness and train their pilots in flight techniques to reduce noise emissions • Create a framework for functional consultation between airport managers, local populations, administrative and local authorities, certain technical services
		Waste generation	• Set up a solid waste management procedure and provide all companies on the platform with an area dedicated to the sorting of non-hazardous and hazardous waste • Optimize the recovery of different materials by sorting waste as much as possible at source • Place garbage cans and buckets within the airport and protect them from waste spills (lids, nets, screens, etc.) • Inform and raise awareness among staff of airport infrastructure assistance and

Impacted component	Impact-causing activity	Potential impact	Mitigation measure
			maintenance services about waste management ● Regularly empty septic tanks by an approved body ● Work to reduce waste at source and avoid landfilling of recoverable waste as much as possible
Water and energy consumption	Airport Operations	Excessive water and energy consumption	● Re-evaluate the files on the electrical energy needs of airports 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

I.8. RISK ASSESSMENT

The risk assessment was carried out in order to identify and characterize all the potential hazards that may be encountered on and around the project site in order to minimize the consequences.

After a preliminary analysis of technological risks, no feared events that could lead to a major risk were detected. The only probable cases of accidents identified would mostly come from malicious intent, human error or defects in materials or processes. The consequences of these accidents are in short: injuries, fire, material damage, professional risks, etc.

Despite the absence of feared events considered critical, prevention, intervention and consequence control measures have been proposed to deal with possible dangerous events and reduce the severity of the accident. These safety instructions, if applied, will make it possible to reduce considerably if not avoid the occurrence of these accidents and the seriousness of the associated phenomena.

I.9. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The Environmental and Social Management Plan (ESMP) aims to ensure the correct and timely implementation of all measures to mitigate negative impacts and improve positive ones.

The ESMP relies on the regulatory measures in force concerning this project to establish guidelines that the promoter is required to comply with in order to comply with Senegalese legislation.

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

I.9.1. MONITORING PLAN

Environmental monitoring is concerned with the rehabilitation and operational phases of the airport. Its purpose is to ensure that the measures concerning the administrative, regulatory and environmental aspects recommended in the ESIA and ESMP are applied. The table below summarizes these different measures.

Table 3: Summary of monitoring measures

Components of the system	Recommended action	Implementation timescales	Cost[1]
Noise	• Check the sound power level of noisy equipment • Check the noise level at the airport property limits	From the beginning of the work and during operation	2 000 000 000 FCFA (purchase of measuring equipment)

[1] This cost is indicative and serves as a basis for determining the expenses to be incurred in connection with the environmental and social management of the project

Waste products	• Collect and dispose of waste • Find an agreement with approved companies for waste disposal	From the beginning of the work and during operation	To be defined
Air quality	• Measure the concentrations of the main air and fine particulate pollutants	Before the work and during operation	1 500 000 FCFA per measurement campaign
Sewage water	• Set up a pre-treatment system • Take samples and analyze them	During the construction phase and during operation	300 000 FCFA per sample
Water (use and consumption) and energy	• Install counters	During the construction phase and during operation	Rates by ASUFOR, SENELEC
Local employment	• Monitor recruitment at the local level	Before the start of the work	No specific cost
Loss of agricultural land	• Ensure compensation for losses	Before the start of the work	To be defined with CDREI

I.9.2. MONITORING PLAN

Environmental monitoring makes it possible to assess the relevance and effectiveness of the measures implemented for environmental management. The observations made during the monitoring will make it possible to readjust, redefine if necessary the mitigation measures, and also to revise certain provisions taken concerning the management of environmental impacts, taking into account new developments on the site (if necessary) and the evolution of techniques.

Table 4: Summary of monitoring actions

Component	Type of follow-up	Monitoring location	Monitoring method/indicator	Frequency
Noise	• Noise measurement by integrating sound level meter • Noise mapping	On site and within property boundaries	• Number of measurements performed • Noise measurement results • Number of noise protection devices installed	Monthly
Waste products	• Level of implementation of the waste management plan	On the site	• Quantity and type of waste generated • Volume of waste disposed of per day • Waste tracking forms	Weekly

Air quality	• Concentration measurement by diffusion tubes • Measurement of air quality at the edge of the runway, where reactor thrust is at its highest • Measurement of concentrations of key air pollutants	On site and in the vicinity of the airport	• Results of concentration measurements • Difference between the measurement results and the ELVs of the NS 05 062 Standard	Quarterly
Sewage water	• Sampling and analysis of pre-treated water	At the point of release	• Quantity of pretreated wastewater • Final processing report	Before wastewater discharge
Water and energy	• Installation of the meters	On the site	• Quantity of water consumed • Energy consumed	Bi-weekly
Local employment	• Monitoring of local recruitment	IHSS/City	• Number of local employees • Number of fixed-term and permanent contracts	Bi-weekly
Loss of agricultural land	• Monitoring of compensation payments	Prefecture	• Report of payment of indemnities • Number of persons compensated	-

II.INTRODUCTION

The purpose of this report is to present the results of the Environmental and Social Impact Assessment (ESIA) of the rehabilitation project of the Ourossogui-Matam airport located in the Commune of Ourossogui, Ogo Department, Matam Region.

This study, commissioned by TRANSCON, identified and analyzed the potential positive and negative impacts inherent in the implementation of the various activities on the biophysical and socio-economic environment in the project area, in accordance with the legal and regulatory provisions in force in Senegal relating to the environment. To this end, an Environmental and Social Management Plan (ESMP) has been drawn up, which mainly indicates the measures to eliminate and/or mitigate negative impacts and the methods for implementing environmental and social management. This ESMP is accompanied by an environmental monitoring and surveillance plan with costs, indicators, actors involved, etc.

II.1. BACKGROUND AND JUSTIFICATION OF THE STUDY

Senegal has always considered the development of transport infrastructure as a pillar of economic and social development. Integrated into the country's planning tools, the sector is considered a major source of wealth creation. Thus, the Senegal Emerging PES Plan (recast of the DRSPII and the SCA and other planning tools) takes into account the transport sector in its AXIS I (structural transformation of the economy and growth) where it aims to regenerate Senegal as a top destination by optimizing its potential to make the country a tourist hub.

Also, the diagnosis of the air transport sector identified the failure to take into account the regional dimension (decentralization of infrastructures) as the weak link in the system. As a result, new sector strategies have been developed, including upgrading targeted airports to ICAO and IATA standards as part of this project.

The Ourossogui-Matam airport, which will house the project, is the only airport infrastructure in the Matam region with multiple constraints, mainly: non-functional lateral runway in winter, insecurity linked to the wandering of animals, irregular traffic, lack of an airport terminal, etc. (ANSD/SES, Matam 2009).

The implementation of this airport rehabilitation project would contribute to the region's economic recovery in terms of market development in the mining, leisure and tourism and agriculture sectors, opening up the area, creating jobs and wealth for the community, whose poverty rate is estimated at 49.3% (source SES Matam 2009).

Indeed, the Matam region is full of assets and potential that reinforce this hypothesis, including among others:

- the exploitation of Dendory phosphate deposits (estimated at 40.5 million tonnes), agriculture and livestock activities;
- natural, cultural and tourist potential: classified forests, wildlife and agro-sylvo-pastoral reserves, cultural diversities and ancestral traditions, historical sites, a very rich colonial

past, hotels and restaurants, tourist information centers, the Thilogne festival, etc. Tourism is estimated to represent 6.5% of the country's GDP in 2014, i.e. 165.4 billion CFA francs for personal travel and 43.6% billion CFA francs for business travel (source BCAO : Balance of payments and international investment position of Senegal 2014). According to the Minister of Tourism and Air Transport, Senegal expects to receive 200,000 tourists in 2018 compared to 150,000 in 2016: Maïmouna Ndoye Seck, Senegalese economic newspaper);

- the impact of emigration and its organizational dynamism (CFAF 42 billion/year);
- the border limits with Mauritania;
- etc.

However, although the project is in perfect symbiosis with the strategic development orientations of the transport sector, it is important to take into consideration the natural environment surrounding the project (rich and varied ecosystems, wildlife and agro-sylvo-pastoral reserves, classified forests) etc.

II.2. OBJECTIVES OF THE ESIA

The objective of this ESIA is to ensure that environmental aspects are taken into account in the implementation of the project to rehabilitate and operate the Ourossogui-Matam airport. The ESIA identifies and analyses all the impacts of this airport on all components of the environment and on the health of workers and populations. It made it possible to:

- indicate the regulatory obligations to be respected during the development and operation phases of the airport;
- describe the receiving environment of the project;
- identify the potential environmental impacts (positive and negative) associated with the plant's development and operation activities on the environmental components in the project area;
- ensure the efficient use of resources;
- provide strategies to improve social aspects;
- identify and implement appropriate measures to eliminate, reduce, or compensate for major negative impacts through an ESMP;
- provide guidance and recommendations to assist in making appropriate decisions;
- propose measures to avoid serious and irreversible damage to the environment;
- provide guidance and recommendations to protect the health and safety of populations and workers.

The ESIA also made it possible to:

- propose a possible design change to reduce environmental impacts;
- identify feasible alternatives that take into account the preservation of environmental components.

Finally, it aims to inform and engage individuals and communities likely to be potentially affected in order to make them conscious actors by involving them now in the reflection on the preservation of their environment.

II.3. METHODOLOGY FOR CONDUCTING THE ESIA

The impact assessment was guided by the requirements of the Senegalese Environmental Code and related texts, making it possible to identify and assess, to the best of current knowledge, the project's impacts on its environment. It also takes into account regulatory requirements expressed in sector codes, where applicable to the project.

In practice, the ESIA is carried out in four (04) main steps:

STEP 1: Assessment launch workshop

- Development of maps of the project site and its immediate vicinity in collaboration with the promoter;
- Identification of stakeholders (local authorities, government representatives, village groups, populations, etc.);
- Collection of documents relevant to the study from interested parties;
- Data analysis and preparation for the site visit.

STEP 2: Site visit

- Visit of the site that will house the project in Matam by the EES team;
- Identification of existing sensitive areas;
- Information gathering and further investigations;
- Public consultation of the technical services of the State and the populations living near the site.

STEP 3: Drafting the interim report

- Identification and evaluation of impacts;
- Carrying out the hazard study and the preliminary risk study;
- Development of the ESMP;
- Discussions with the promoter on the content of the report.

STEP 4: Final Report

- Validation of the interim report with the promoter;
- Correction and issuance of the final report.

II.3.1. COLLECTION OF BASIC DATA

The collection was carried out through meetings with the promoter to obtain basic data relating to the project (technical, legal, financial plans and other documents), documentary research, site investigations, consultations and interviews with the main actors likely to be involved.

The documentary research consisted mainly in collecting information on the biophysical and socio-economic characteristics of the project's area of influence, as well as the political, legislative and regulatory framework governing the environment and the airport sector in Senegal. All the documents consulted are included in the bibliography which will be annexed to the report.

Subsequently, field visits were made to the site and its area of influence. These visits enabled the consultant to identify the proposed site, assess and define the study area, verify and validate

the information collected during the documentary research, collect other relevant information on biophysical and socio-economic characteristics and assess the environmental and social sensitivity of the above-mentioned areas.

Group and individual interviews were conducted with the actors involved, as well as the relevant technical services of the State in order to pass on information about the project and collect opinions, fears, recommendations and expectations (see list of persons met in Annex 3).

Taking into account the results obtained during the stakeholder consultation meetings enabled the consultant to identify the sensitive points in relation to the various study benchmarks.

II.3.2. PROCESSING, DATA ANALYSIS AND REPORT WRITING

This step consists of processing, analyzing and synthesizing all the information collected in the previous step. Thus, an environmental analysis was carried out to identify and evaluate positive and negative changes in the project on the biophysical and human environment.

II.4. STRUCTURE OF THE ESIA

The presentation of this impact assessment will be as follows:

- Chapter 1: Non-Technical Summary (NTS)
- Chapter 2: Introduction
- Chapter 3: Project Description
- Chapter 4: Political, legal and institutional framework
- Chapter 5: Description of the initial environment
- Chapter 6: Analysis of variants
- Chapter 7: Public Consultation
- Chapter 8: Analysis of Potential Environmental Impacts of the Project
- Chapter 9: Risk Assessment
- Chapter 10: Environmental and Social Management Plan
- Chapter 11: Conclusion
- Chapter 12: Annexes.

II.5. PRESENTATION OF THE FIRM

EES Sarl is a consulting engineering and design firm for industry, local authorities, development organizations, administration, etc.

The firm is very oriented towards environmental assessments, training and, in general, everything related to the Health, Safety, and Environment (HSE).

It has the ministerial approval n°2147 of 18/02/2013 of the Ministry in charge of the Environment as well as that of the Directorate of Civil Protection for the realization of Hazard Studies (EDD) and Internal Operation Plan (POI). EES has carried out several activities validated by DEEC with the participation of DPC.

EES is a pool of high-level multidisciplinary experts in the fields of energy, chemistry, petrochemistry, agribusiness, food industry, pharmaceuticals and construction. The areas of intervention of EES are the diagnosis of emissions and immissions, Engineering and consulting, Quality, Environment, Health and Safety, Training and Assistance.

II.6. COMPOSITION OF THE TEAM

The ESIA of the Ourossogui-Matam airport rehabilitation and operation project is carried out by the EES firm, whose multidisciplinary team is presented in the following table.

Table 5: Team of experts

First Name and Last Name	Title	Tasks in the ESIA
Serigne M. DIOP	Industrial pollution expert, certified environmentalist	ESIA Coordinators
Abdourahim BA	Industrial Engineer	
Seynabou DIATTA	Geographer/Environmentalist	Responsible for describing the physical and biological environment
Ndeye Marie LETTE	Geotechnical/HSE Engineer	In charge of the hazard study/risk assessment
Fatimata SAMBA	HSE Engineer	Responsible for the project description and public consultation
Mbaye SARR	Socio-economist	In charge of public consultation, political and legal framework
Mourtalla DIOP	Socio-economist	Responsible for socio-economic and human expertise
Ndèye Fatou MBOW	HSE Engineer	
Yacine DIOP	Socio-economist	

III. PROJECT DESCRIPTION

III.1. PRESENTATION OF THE PROMOTER

TRANSCON Electronic Systems is an independent Czech private company founded in 1990 and specializing in electronic and electrical equipment for airports.

The company operates with its equipment consisting of hardware and software, prototype workshops, production workshops, maintenance and transport services.

The development, manufacture and maintenance of the equipment are certified in accordance with the CSN quality control system in ISO 9001 version 2009.

TRANSCON therefore offers "turnkey" equipment for airports, i.e. project, development, production, installation, training and non-stop maintenance.

III.2. PROJECT ORGANIZATION

The Ministry of Air Transport and Airport Infrastructure Development (MTADIA) has signed a commercial contract with the Czech company TRANSCON for the rehabilitation of five (05) regional airports (Saint Louis, Matam, Ziguinchor, Tambacounda and Kédougou) for a period of 47 months. The amount of financing amounts to 100 billion CFA francs.

The first step consists in the rehabilitation of Ourossogui-Matam (Matam) airport, which is the subject of this study and then that of Saint-Louis. The rehabilitation of the airports of Kédougou, Tambacounda and Ziguinchor will then be undertaken.

Under the terms of the contract, TRANSCON is responsible for the rehabilitation and equipment of these airports. It will also be responsible for supporting the Ministry in its operating activities for a period of two years. However, the operation of the airports, including Ourossogui-Matam, is the responsibility of the Senegalese Government through its supervisory ministry (MTADIA).

This project to rehabilitate the Ourossogui-Matam airport will require the demolition of existing structures and the installation of new facilities and infrastructure to ensure adequate air traffic.

III.3. PROJECT LOCATION

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

III.4. DESCRIPTION OF THE CURRENT STATE OF THE AIRPORT

III.4.1. IDENTIFICATION OF COMPONENTS

The airport consists of the following elements:

- an administrative building with a VIP lounge;
- a mini solar power plant;
- a lateral track with two (02) Stop Extensions (PA) of 100 m each;

- two (02) ASECNA transmission antennas, one of which is non-functional;
- a dilapidated and destroyed fence in places, which favors the permanent divagation of domestic animals (cows, goats, donkeys);
- a protective dike identified to the east, part of which is inside the airport;
- a medium-voltage power line within the site.

It should be noted that the airport operates from 07:00 to 19:00 because the infrastructure is not marked and has one to two flights per week. Aircraft fly on sight due to the lack of navigational aids equipment.

In addition, there is no fire-fighting system (no water supply or hydrant).

III.5. PRESENTATION OF THE ACTIVITIES AND EQUIPMENT PLANNED BY THE PROJECT

As part of this rehabilitation, various activities are planned. The renovation work will be carried out at various locations throughout the airport and will have an impact on the biophysical and human environment.
The planned activities can 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.

III.5.1. DEMOLITION AND CONSTRUCTION ACTIVITIES

III.5.1.1. EARTHWORKS

Earthmoving operations include clearing, backfilling and transporting materials. These earthworks activities concern the areas necessary for the construction of the runway, RESA, tarmac and inner and outer strips from the runway axis. It will be done with machines like:

- the excavator for digging holes or foundations, which can also be used in demolition operations;
- the loader for transporting or moving a good quantity of material from one point to another;
- the bulldozer for scraping the ground for levelling the ground or for extracting materials from the ground like the scraper.

The backfill materials will come from the quarries closest to the site and will be transported by trucks.
The excavation, backfilling and pickling operations will generate waste, most of which will be soil, plant debris and asphalt mix. These activities will also generate nuisances such as noise and dust emissions.
The activity should be carried out with great care to avoid the risk of accidents.

III.5.1.2. DEMOLITION OF STRUCTURES

As part of this rehabilitation project, the demolition of the passenger terminal and VIP lounge is planned.

This demolition can be done using mechanical equipment equipped with demolition tools such as buckets, hydraulic excavators, etc. This activity will generate dust and noise in addition to the waste, most of which is composed of rubble and scrap metal.
Preliminary studies and site preparation are necessary in order to carry out activities safely while preserving other structures that are not concerned and the health of workers and residents on the site.

III.5.1.3. PAVEMENT CONSTRUCTION

As far as pavements are concerned, this project includes the construction of the runway, tarmac and taxiway. They will be flexible and have a wearing course of asphalt concrete. In the long term, the following will be implemented:

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

On both sides of the runway, a 7.5 m wide shoulder with lateritic material will be provided.

The construction of these pavements will require the laying of their wearing course, followed by the application of a binder course and a new wearing course composed of asphalt concrete.

A service road that is 5,580.50 m long and 4 m wide will also be built, including the installation of drainage channels along its entire length.

The 6049 ^{m2} access road to the car park and platforms will also be built with a bituminous concrete layer on the surface; this will require excavation, backfilling, supply and installation of different materials for the different layers of the pavement. The access road will be 4m wide.

This work will require a fairly substantial supply of materials on site, will mobilize manpower and will be at the origin of the generation of noise, dust and waste. The risk of pollution is also present because of the possibility of seepage of engine oils, fuel spills and water from machine washing.

This exercise must be carried out in complete safety in order to comply with the requirements of the specifications in order to give the right bearing capacity to these different platforms but also to avoid the risks of accidents and pollution.

III.5.1.4. FENCING OF THE AIRPORT RIGHT-OF-WAY

For security reasons, the airport right-of-way will be fenced off. The installation of the 5820 m long fence wall requires civil engineering work for the earthworks, the foundation of the wall and the elevation. It will be 2.50 m high with reinforced concrete components.

Above the fence wall and emergency exits, stainless steel concertina lines with a diameter of 0.5 m will be installed, which are mechanical deterrent devices to ensure the protection of the establishment.

Between the end of the runway and the fence wall or the first buildings, it is necessary to have a minimum distance of 150 m on either side of the runway axis. In order to meet this requirement, the boundary of the fence wall will be extended beyond the current boundary.

The gate, made of stainless steel, will be double-winged with emergency exits. Ideally, it should open from the outside to allow easy evacuation in case of panic.

III.5.1.5. CONSTRUCTION OF BUILDINGS

- **Passenger terminal building**

The passenger terminal will be built in two compartments, one of which will be a modular hangar with an area of 700 m^2 with a VIP lounge and a start/finish room and the other compartment will be a hangar with an area of 1100 m^2 with a start/finish room and a VIP lounge.

This building will be equipped with, among other things, Schneider MTN5470-2119 smoke detectors, 30 m hydrants with a D25, CO_2 extinguishers, offices, toilets, etc. In the terminal, the following are also planned:

- a conveyor (departure/arrival) at the airport with a check-in counter;
- offices for management, security, airlines;
- a compartment reserved for passenger information;
- detection equipment: RTG HI SCAN 6046si, RTG HI SCAN 7555si, liquid detectors ;
- luggage carts.

- **Hall for service vehicles**

A modular hangar with a surface area of 400 m^2 and a height of 4 m will also be built for parking service vehicles and airport equipment.

- **Modular fire-fighting hangar**

The fire hangar consisting of the parking hall for fire fighting vehicles and equipment will be built over an area of 400 m^2 and a height of 5 m.

- **Control tower**

The control tower combined with the technical block will have a total height of 21 m and will include several modules with electronic equipment for control and monitoring, office furniture and sanitary equipment, etc. The equipment planned includes: consoles for operators, weather station with automatic indoor systems for measuring cloud base, ceilometer, transmitter-receiver system, recording system, glass insulating glasses inclined at a specified angle to prevent sun reflection and pilot glare.
The construction of these buildings will require several expert assessments, which will lead to a co-activity on the site. It will also generate noise, dust and construction site waste that will have to be sorted, recycled if necessary or sent to the municipality's landfills.
It is also essential to set up a planning of the various activities on the site in order to avoid accidents.

III.5.2.AIRPORT FACILITIES

III.5.2.1. BEACONING

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.

The lighting of the airport runway, which is the essential tool for the safety of the aircraft and their passengers, will be of the high-density halogen type (approach lighting, PAPI, flash, RTILS) on the runway edges, end of runway and threshold as well as on the edges of the taxiway and stop lines. 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 entire lighting system includes, among other things, a diesel emergency generator, a constant current regulator, apron headlamps with reflectors, etc.

The monitoring and remote control device for beaconing (lighting) includes an airport control and monitoring system with all the necessary equipment integrated. This control and monitoring system has a range of 10 km and allows remote maintenance supervision.

III.5.2.2. NAVIGATION AIDS DEVICES

The DVOR (Doppler VOR) 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. The package includes the complete design of the procedure and flight verification as well as the complete power supply and cabling with the necessary civil engineering work for the antenna foundations.
The remote maintenance control device consists of 3 RS232 interfaces for connection to the modem and provides event log, alarm log, self-diagnosis and historical data which are all fully electronic.
The DVOR must be installed in a location that is free of obstacles within a 400 m radius.

III.5.2.3. FIRE WARNING AND EXTINGUISHING DEVICE

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 (02) 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 following fire-fighting equipment:

- 2-piece fire hydrants;
- special storage drums for fire-fighting foam (200% capacity inside fire-fighting vehicles);

- electrical distribution cable for permanent vehicles (charging system);
- shelves for storing fire hoses (inside the storage room);
- maintenance tools, spare parts (for vehicles and fire-fighting equipment), exit scissors, oxygen masks inside the working room;
- 04 fire protection suits;
- special coatings on walls near vehicles.

III.5.2.4. AMBULANCE

The project involves the acquisition of an ambulance for the airport. This medical assistance vehicle will be equipped with an alarm system consisting of two flashing lights, a radio antenna and fixed sanitary equipment.

III.5.2.5. SANITARY VEHICLE

A ZODIAC Truck TST 1820 medical vehicle will be made available to the airport for aircraft emptying needs. It will be equipped with a waste tank with a capacity of 1800 liters and a rinsing and disinfection liquid tank with a capacity of 200 liters. The waste will be sucked by a pump at a flow rate of 55 liters per minute.

III.5.2.6. DRINKING WATER TANK

A 1800-litre Zodiac-type drinking water storage tank is planned by the project.

III.5.2.7. PATROL CARS

Skoda Yeti patrol cars are planned as part of this project. They will allow the airport to be traversed throughout its right-of-way in order to detect any anomaly and secure the site.

III.5.2.8. AIRCRAFT DIMENSIONING AND AIRPORT REFERENCE CODE

The reference code of an airport is defined in Annex 14 to the Convention on International Civil Aviation and includes two elements related to the performance characteristics and dimensions of the aircraft authorized to use that airport or the dimensioning aircraft. The dimensioning aircraft is determined by the Civil Aviation Authority and in the case of the project, it is the Fokker 100 whose characteristics are presented in the table below.

Table 6: Characteristics of the reference aircraft

Aircraft type	Wingspan	Height	Take-off distance
Fokker 100	28,08 m	8,51 m	1855 m

❖ **Determination of the reference code**

As described above, this code is based on two (02) elements.

The first element is a number based on the reference distance of the aircraft defined as the minimum length. It is indicated in the flight manual provided by the manufacturer.

The second element of the reference code is a letter based on the maximum values of the maximum spans and outside widths of the main landing gears of the aircraft for which the airport is intended. The following table is used to determine the aerodrome reference code.

Table 7: Aerodrome Reference Codes

Code elements 1		Code elements 2		
Code number	Aircraft reference distance	Code letter	Wingspan	Overall width of the main gear
1	Less than 800m	A	Less than 15m	Less than 4.5 m
2	800m to 1200m excluded	B	15m to 24m excluded	4.5 m to 6 m excluded
3	1200 m to 1800 m excluded	**C**	**24 m to 36 m excluded**	6 m to 9 m excluded
4	**1800 m and more**	D	36 m to 52 m excluded	9 m to 14 m excluded
		E	52 m to 65m excluded	9 m to 14m excluded
		F	65 m to 80 m excluded	9 m to 16 m excluded

The analysis of the table shows that the Matam airport after the upgrade work will be of category 4C.

III.6. AIRPORT OPERATIONS

The airport's role is to ensure and control take-off, landing, taxiing and passenger departures and arrivals.

During the operational phase, the planned activities revolve around airport assistance.

III.6.1. AIRPORT ASSISTANCE ACTIVITIES

Airport assistance includes assistance to the aircraft and passengers.

In accordance with Ministerial Order No. 3483 MATA-ANACS-DTA-DTAR dated 17 April 2008, the provision of airport handling services requires an approval issued by the Ministry of Civil Aviation (MTADIA) and an operating license granted by the National Civil Aviation Agency of Senegal which has merged with ANACIM.
Thus, the services provided at an airport cover the following activities[2]:

- ground administrative assistance and supervision;
- passenger" assistance;
- luggage" assistance;
- assistance "ramp operation";
- assistance "cleaning and service of the aircraft";
- online maintenance" assistance;

[2] Ministerial Order No. 3483 MATA-ANACS-DTA-DTAR dated 17 April 2008

- assistance in "flight operations and crew administration";
- ground transport" assistance;
- "sales service" assistance.

Among the activities of these service providers, we can mention the following headings.

III.6.2. CLEANING AND SAFE SEARCH OF AIRCRAFT

Between flight arrivals and departures, aircraft cleaning can be carried out by airport service providers.
This cleaning process includes many tasks that can be summarized as collecting the waste found on the aircraft floor, vacuuming carpets, changing the headrests on each seat, repositioning seat belts, cleaning shelves and portholes, etc.
Internal training of staff on good practices, health and safety rules to be applied is required for the correct performance of these tasks.
A security search may be carried out in parallel with the cleaning operations. To this end, the agents in charge of cleaning operations must be trained in the control and application of security rules. The staff dedicated to this purpose will then be made aware of the national regulations in terms of excavations and the risks of critical situations and the action to be taken in the event of the discovery of a prohibited object in the cabin.

III.6.3. MAINTENANCE OF AIRPORT INFRASTRUCTURE

These activities include the cleaning and maintenance of airport pavements (runway, taxiway and tarmac), buildings (airports and administrative buildings) and roads (access and service roads).
Night beaconing and the various networks must be regularly maintained.

III.6.4. AIRPORT SECURITY AND SAFETY

The drafting of a security program leading to the establishment of an airport security system is essential.
Airport access controls must be regulated. They concern the following areas:

- airport access;
- access to the terminal building;
- access to airline operating buildings and airport services;
- access to the dressing rooms of diplomatic entities and State authorities;
- etc.

These controls will be facilitated by the installation of surveillance equipment (cameras, X-rays for hand luggage, hold baggage, metal detectors, hand detectors, explosive detectors, etc.).

In addition, airport security requires rigorous screening and inspection of passengers, baggage and personnel. It also handles passport, passenger ticket and cabin baggage gauge control for airlines.

In addition, it is recommended to provide several emergency exits in order to evacuate users in the event of an emergency.

A focus is placed on the strict control and inspection of passengers and baggage to prevent explosive devices, weapons or dangerous goods from being loaded onto aircraft.

With regard to airport security, an airport fire brigade called the **Rescue and Firefighting Service (SSLI)** is being set up. Its main task will be to respond as quickly as possible to aircraft-related incidents or accidents and to provide rescue, evacuation and first aid.

To carry out its mission successfully, this service must be equipped with emergency resources adapted to the risks it must defend. As part of the project, it will be equipped with two (02) fire-extinguishing vehicles, each equipped with a 9000-litre water tank and 800 l of foaming agent.

As part of the fight against animal and particularly avian risk, a **service for the prevention of animal risk** must be set up. This service will contribute to flight safety and reduce the risk of collision between aircraft and animals (especially birds) during take-off or landing. To do this, the service officers will have to rely on various frightening techniques (based on pyrotechnics, acoustics, laser flare, rifle, etc.) in order to make the site hostile to the use of animal species.

III.7. RESOURCES REQUIRED TO CARRY OUT THE PROJECT

III.7.1. LAND ACQUISITION AND SECURITY

The airport's land base is an ASECNA land title. However, it should be noted that the airport's right-of-way is occupied by the populations and that even its flight cone (north side) is inhabited with some buildings in R+1.

The urgency consists in the acquisition of an updated cadastral plan by the competent services in order to define the exact limits of the airport and to see the modalities of movement of the populations settled within the defined perimeter.

III.7.2. HUMAN RESOURCES MANAGEMENT (JOBS)

The number of staff required for the construction and operation phases has not yet been defined. However, it should be pointed out that these recruitments should be mainly local, especially for the rehabilitation phase.

For operations, staff are already in place for the current operation of the airport. These personnel will have to undergo capacity building to ensure that they are up to date with the new technologies that will be installed after the works.

In addition, the start of operations will undoubtedly lead to the recruitment of new profiles needed to develop new functionalities for the airport. In this particular case, it is advisable, for equal competence, to give priority to the local population.

Where possible, it is also recommended for certain expertise to train the local population and recruit them for these positions.

At the level of airport hubs, there is a wide range of professions listed below:

- operating agent;
- chief aircraft;
- airport security agent;
- aircraft cleaning agent;
- tractor baggage handler;
- baggage handler sorting correspondence;
- loader driver ;
- employee of food services;
- sorter handler ;
- guide for travelers with reduced mobility;
- etc.

III.7.3. TRANSPORT OF MATERIALS AND EQUIPMENT

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 cannot be estimated at this stage of the project.

Nevertheless, with regard to resource management, the shuttle service for trucks and construction machinery, the emission of pollutants and noise pollution, management measures will have to be taken.

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.

III.7.4. WATER REQUIREMENTS FOR THE PROJECT

III.7.4.1. WATER NEEDS IN THE CONSTRUCTION PHASE

Water requirements during the construction phase are not yet estimated at this planning stage of the rehabilitation works. However, it is likely that water supply during this phase will be provided through the ASUFOR network serving the current airport.

It should be noted that only two (02) 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.

III.7.4.2. WATER REQUIREMENTS IN THE OPERATIONAL PHASE

The water supply system of the future airport can still be provided by the ASUFOR network if its capacities allow it to meet its needs, which will be increased after the works with the intensification of activities and increased traffic.

However, the best option to guarantee autonomy in water supply remains the creation of a borehole during the construction phase.

Water requirements during the operating phase are linked to several uses, which 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.

III.7.5. ENERGY REQUIREMENTS

The power supply source will be the SENELEC network which provides the electricity supply for the current airport.

A power plant will be installed for emergency power supply and night lighting of the tarmac. The system includes a 140 kVA diesel generator set and a 1x400 KVA substation and current regulators.

III.7.6. CHEMICALS MANAGEMENT

The operation of the airport does not require the use of chemicals in addition to infrastructure maintenance products, engine oil and lubricants for power tools.

No chemicals will be stored on site other than those required for office maintenance. These products will be supplied regularly. A small quantity will be stored for the needs of the daily household.

III.8. WASTE MANAGEMENT

III.8.1. LIQUID WASTE MANAGEMENT

The liquid waste in the construction phase is, for the most part, water from sanitary facilities, machine washing water and turbid 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.

It should be noted that the ONAS sanitation network (national concessionaire) does not exist in the area; although a project to create a water treatment plant has been developed for the Matam Region. Under these conditions, 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.

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.

III.8.2. SOLID WASTE MANAGEMENT

III.8.2.1. CONSTRUCTION SITE WASTE MANAGEMENT

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

It is important to note in this part that the work on the site will begin with the demolition of the buildings mentioned above.

The study recommends that this demolition should be carried out according to the principle of deconstruction. This deconstruction 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 thus 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).

From this perspective, two main types of waste are identified during the construction phase. These are waste from the demolition of existing buildings and pavement and construction waste (structural and finishing waste).

The waste thus produced may be classified into three (03) 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, waste electrical and electronic equipment, household appliances, computer equipment, light bulbs, neon lights, waste hydrocarbons and oils, paints, varnishes, solvents, batteries, batteries.

For each type of waste, the possible recovery methods are reuse, material recovery or energy recovery. In the absence of possible recovery, the waste is considered to be final and must be landfilled or incinerated in a cement plant.

The table below is a summary of the various types of waste produced and their proposed recovery method.

Table 8: 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 transferee
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, batteries, 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

III.8.2.2. WASTE MANAGEMENT IN THE OPERATIONAL PHASE

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 these airport entities is summarized in the table below.

Table 9: The different types of waste produced during the operating 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).

Types of activities	Types of waste
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,
Administrations and managers	- paper waste,
Ground assistance	- food waste, oils and packaging,
Works	- inert waste, - non-hazardous industrial waste (HIW), - packaging waste, - special industrial waste.

The principles of good waste management involve the sorting of waste at source by its producers.

To this end, 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.

III.9. SOURCES OF NUISANCE

The nuisances identified in the framework of this project are related to air and noise pollution during the construction and operation of the airport.

III.9.1. AIR POLLUTION

During the operational phase, pollutant emissions contribute to the deterioration of air quality in the airport area. Several activities are at the origin of this air pollution.

- **Aircraft and their daily activities**

The combustion of fuel (Jet A1 or Avgaz) in an aircraft engine releases carbon dioxide (CO_2), water vapor (H2O), nitrogen oxides (NOx), carbon monoxide (CO), unburnt hydrocarbons (HC), sulphur oxides (SOx) and soot particles.

Studies have shown that air traffic contributes to the formation of ozone (O3), which is not produced directly by aircraft operation but is a secondary pollutant.

The emissions identified during taxiing, take-off, climbing, descending and landing activities of the aircraft on the runway are a function of the density of air traffic. The figure below

summarizes the daily activities of the aircraft and the percentage of maximum engine thrust during each activity.

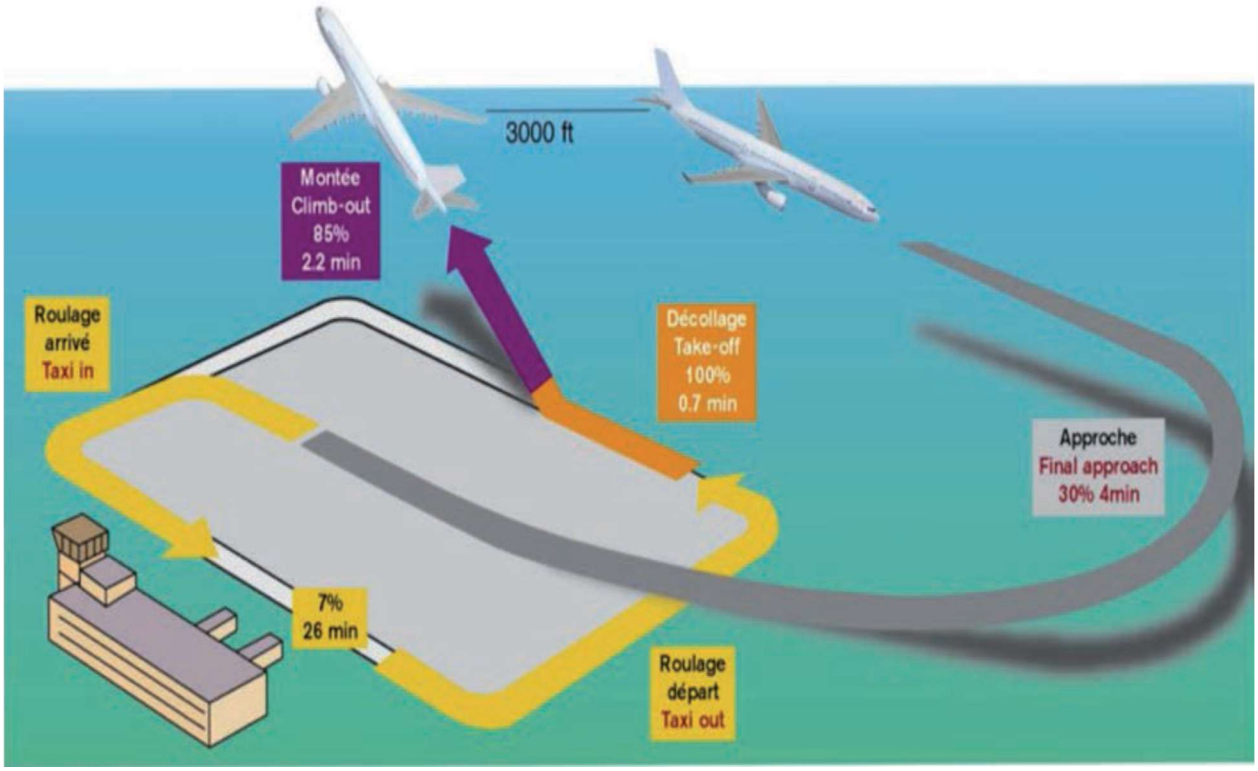


Figure 1: Daily aircraft activities

Source: Air Quality Assessment around an Aerodrome - Technical Guide

The operation of the auxiliary power engine (APU), a small turbine powered by the fuel of the aircraft used, is also a source of air pollution. It provides both electrical energy and high-temperature compressed air when aircraft start up.

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, heavy goods vehicles;
- painting of vehicles and buildings.

The table below is a summary of the pollutants and their sources at the airport during operation.

Table 10: 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 (NOx) Carbon monoxide (CO) Unburned hydrocarbons (HC) Sulphur dioxides (SO2) Smoke

Sources		Main pollutants emitted
Land traffic	Service vehicles Employee transportation Passenger transport	Nitrogen oxides (NOx) Carbon monoxide (CO) Unburned hydrocarbons (HC) Sulphur dioxides (SO2) Smoke Lead (Pb), depending on fuel
Energy	Oil-fired power plant	Nitrogen oxides (NOx) Unburned hydrocarbons (HC) Carbon monoxide (CO) Nitrogen oxides (NOx) Unburned hydrocarbons (HC) Sulphur dioxides (SO2) Smoke
Maintenance	Painting Other operations	Volatile organic compounds (VOCs)

It should be recalled that the airport manager must set up an air quality management system by first identifying the sources of emissions and then the airport's involvement in air pollution in the area. In addition, it must work on measures to reduce its polluting emissions and ensure compliance with the requirements of the standards in force.

III.9.2. NOISE POLLUTION

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

It is produced by three (03) 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.
- engine 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.

It should be noted 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) in order not to expose people to noise pollution.

It should be noted that the control of noise risks can only be effective with the assistance of aircraft manufacturers, who can act to improve the acoustic performance of aircraft, and airlines, who can work to regularly renew their fleets and raise awareness and train their pilots in techniques to reduce noise emissions. Knowing that noise levels are higher at night than during the day, these airlines will also be able to influence flight scheduling and choose slots that limit night flights.

III.10. ICPE CLASSIFICATION OF THE FACILITIES REQUIRED FOR THE PROJECT

The airport's rehabilitation involves earthworks, demolition and reconstruction. With regard to the Senegalese nomenclature on BPIs, the activities and substances targeted by the project are summarized in the table below:

Table 11: Administrative classification of the rehabilitation work at Ourossogui-Matam airport

Heading	Title	Characteristics of the project	Classification scheme and type of EIA
A 1705	**Construction of an aerodrome or airstrip** Regardless of the size	The project consists of airport reconstruction and runway extension and widening work.	A
A 1005	**Asphalt mixing plant for road materials** Whatever the capacity	Road and pavement construction work will require such equipment	A
A2201	**Center for the collection and sorting of waste destined for disposal** Whatever the capacity	The waste will be collected, sorted and sent to a dedicated place for this purpose	A
A 1402	**Electricity production and distribution by combustion - thermal power plants, generators, etc.)** If the maximum thermal power is greater than 50 kW less than 500 kW	A power plant will be installed with a 112 kW generator set	D

The analysis of the table above shows that under Senegalese legislation on BPIs (see Environmental Code), the rehabilitation and operation of The Ourossogui-Matam airport is classified in category I. The project is therefore subject to **authorization and its implementation requires a thorough impact assessment beforehand.**

III.11. PROJECT IMPLEMENTATION SCHEDULE

The duration of the work is estimated at 18 months from the start date of the work. The table above is a summary of the different stages of the project and their duration.

Table 12: Duration of the different phases of the worksite

Phase of the work	Duration (in days)
Earthworks	90
Demolition of structures	10
Roadway	45
Day beaconing (marking)	7
Service road	100
Fencing of the airport right-of-way	100
Access road	22
Buildings	100
Beaconing	100
Navigation	30
Ground service	22

IV.POLITICAL, LEGAL AND INSTITUTIONAL FRAMEWORK

The challenges associated with the construction of air transport infrastructure are economic, social, environmental and legal. The rehabilitation program for The Ourossogui-Matam airport is part of a political, institutional and legal framework that takes into account the protection of the environment, housing and the well-being of the population. This framework is presented in this chapter.

IV.1. POLICY FRAMEWORK

Environmental protection has been a major concern for the Government of Senegal since the Earth Summit in Rio de Janeiro, Brazil, in June 1992. As a result, institutions and legal texts in the field of environmental protection in general and project impact assessment in particular have been set up.

It is also within this framework that it has signed or ratified several international legal instruments aimed at protecting the environment and committed the entire government to putting them into practice.

Policies, programs, legislation, regulations and standards for environmental protection and economic and social development have also been adopted.

This study will be governed on the one hand by the conventions, agreements and treaties ratified by Senegal and on the other hand by national regulations.

This project to rehabilitate The Ourossogui-Matam airport will be carried out in accordance with the policies, directives and strategies planned at both the national and international levels in the environmental, social, economic, security and all other areas that apply to this project.

IV.1.1. AIRPORT TRANSPORT POLICY (ATP)

In Senegal, air transport plays an important role in economic and social development. The development of this sector requires the development of sectoral policies underpinned by massive investments in infrastructure and services. Thus, the government has put in place an integrated strategy, accompanied by structural reforms, aimed in particular at increasing the quality of transport services in order to support the accessibility and mobility of goods and people under the best possible conditions and, beyond that, socio-economic development and the preservation of the environment.

IV.1.2. TRANSPORT SECTOR POLICY LETTER (TSPL)

This policy is implemented through the Transport Sector Adjustment Program (PAST), which aims to reduce transport costs, privatize the sector and ensure the administrative and financial autonomy of transport organizations. In this perspective for domestic air transport, it will be improved through the establishment of a network of secondary aerodromes in line with international standards.

This network should facilitate the implementation of a dynamic domestic air transport policy, at competitive prices, which will significantly improve population movements. The rehabilitation of The Ourossogui-Matam airport is an implementation of this perspective. However, this project must take into account environmental concerns as indicated in the sectoral transport policy letter.

IV.1.3. EMERGING SENEGAL PLAN (PSE)

The PES is the medium- and long-term reference for economic and social policy with the aim of promoting economic growth with a strong impact on human development. Hence the vision of **"a Senegal emerging in 2035, with a society based on solidarity and the rule of law".** For the implementation of the PES, in addition to major reforms to be carried out, 27 flagship projects driving activities and jobs have been identified.

In this context, the PES aims to improve the business environment and competitiveness by making significant progress in the field of energy, road, rail, port and airport infrastructure.

The transport sector plays an important role in the PES with the establishment of a regional air hub. The objective "is to make Dakar a reference air platform to serve Senegal's ambitions to become a hub of services (medical, tourism, regional headquarters of companies and international institutions, education and training) with the commissioning of the AIBD and the rehabilitation of regional airports by 2018. The aim is to increase capacity to 6 million passengers by 2020 and 10 million by 2035. »

The rehabilitation of airports, including Ourossogui-Matam, is part of the "sub-regional air hub project", which is one of the PES projects in the field of transport.

IV.1.4. THREE-YEAR PUBLIC INVESTMENT PROGRAM (PTIP) 2016-2018

The projects and programs identified under the PES are programmed in the rolling three-year public investment program (PTIP), which can be reviewed annually. This program is a document that highlights the strategic axes of the economic and social policy defined within the framework of the Senegal Emerging Plan (PSE). The 2016-2018 PPTIP is the main milestone in the implementation of the Priority Action Plan (PAP) of the Emerging Senegal Plan (PSE). It makes it possible to align programmed investments with the sectoral objectives and lines of action as well as the Millennium Development Goals (MDGs). The PWIP gives an important place to the sustainable management of the environment and natural resources by focusing on the following areas:

- mitigation of the effects of climate change on ecosystems;
- capacity building in environmental and natural resource management, promotion of the green economy and creation of green jobs;
- improving ecosystem resilience to the effects of climate change
- conservation and enhancement of biodiversity.

The PITP takes into account the projects set up in the air transport sector. The implementation of the government's policy in this area is reflected, among other things, in a dynamic of reforms promoting the construction of airport infrastructure equipped with the latest generation of air navigation equipment with the completion of the AIBD's work and the rehabilitation of regional airports, including Matam.

IV.1.5. ACT III OF DECENTRALIZATION

It is built around the following vision: "to build, within the framework of a consensual and forward-looking dialogue, the renewal of the modernization of the State, through a decentralization that is coherent in its principles and effective in its implementation". The aim is to implement a coherent spatial planning policy, with a global vision of development, taking into account equity and solidarity, particularly in the treatment of cities, rural, cross-border and eco-geographical areas.

The rehabilitation of regional airports, including Ourossogui-Matam airport, is part of the State's decentralization policy.

IV.1.6. STRATEGIC FRAMEWORK AND ENVIRONMENTAL POLICIES

The strategic and environmental policy texts applicable to the project are developed in the following table.

Table 13: Strategic Framework and Environmental Policies

Political texts	Content and objectives of the text	Application in the context of the project
Environment and sustainable development		
Environment and Sustainable Development Sectoral Policy Letter (LPS/EDD) (2016-2020)	The objective of the LPS/EDD is to "create a national momentum for improving the management of the environment and natural resources, integrating the principles of sustainable development into policies and strengthening people's resilience to climate change". The Letter provided for two strategic axes, namely the management of the environment and natural resources and the promotion of sustainable development. Strategic objective 2 focuses on the integration of sustainable development principles into public policies, management of the living environment, promotion of livelihoods, resilience of vulnerable groups and production and consumption patterns.	Currently, environmental protection is a concern of the Government of Senegal. This explains why, within the framework of the objectives of the HPA/SEDD, it is requested that the projects targeted in all sectors such as transport develop in a sustainable manner, taking into account, in particular, the integration of the environment and sustainable development.
National Sustainable Development Strategy (2015)	According to the World Commission on Environment and Development, in the 1987 Brundtland Report, *Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. By 2020, Senegal's institutional, economic and social actors will adopt the principles of sustainable development and reflect this paradigm in their modes of action. The objective is to "create an environment conducive to reconciling the need for strong and sustained growth with the preservation of ecological, social and territorial balances. » It is divided into six major axes or orientations, including the promotion of balanced and harmonious development (axis 3) and the strengthening of measures and actions that can contribute to the achievement of the Millennium Development Goals (MDGs), axis 6.	The promotion of balanced and harmonious development referred to in Axis 3 requires the construction of infrastructure in the various regions. This project to rehabilitate The Ourossogui-Matam airport is in line with this sustainable development policy because it will improve air transport in this region. However, this project will have to be carried out in accordance with the objectives of the NSDS in relation to environmental policy while ensuring the proper management of natural resources.
National Environmental Action Plan	National Environmental Action Plan (NEAP) adopted in September 1997, constitutes a strategic framework that allows the Senegalese State to identify environmental priorities and define the basis for effective planning and management systems for natural resources and the environment. The NWSEP implementation system includes a series of measures based on seven major axes: (i) poverty alleviation, (ii) population policy and	To comply with this environmental policy, the promoter in the different phases of the project must take into account the measures put in place by PNAE in terms of natural resources and environmental management.

	environmental management, (iii) women, youth and environment, (iv) health and environment, (v) environmental education and communication information, (vi) decentralized environmental management and financing of local initiatives, and (vii) environment and sub regional and regional cooperation.	
Biodiversity and ecosystem		
National Action Programme to Combat Desertification and Sustainable Land Management	In order to take into account measures for the adoption and scaling up of sustainable land management actions in order to contribute effectively to the implementation of the UNCCD, the State of Senegal has updated the NAP/CD which has become the NAP/CDG TDG. The overall objective is to combat land degradation, ensure the improvement of ecosystem resilience and the living conditions of populations.	Construction work is a source of solid and liquid waste. The rehabilitation of the airport must be carried out in accordance with the objectives of this program to avoid land degradation.
National Strategy and Action Plan for the Conservation of Biodiversity	The national strategy aims to preserve the achievements of biodiversity conservation in Senegal while involving the populations and the various stakeholders in sustainable management by integrating it into their production activities (agriculture, livestock, fisheries, etc.).	The rehabilitation of the airport and the creation of an access runway will require clearing work. The promoter must comply with the requirements of this policy by implementing measures to preserve the natural resources of the project area.
Spatial planning		
National Spatial Planning Plan	It is a forward-looking document for 2021 based on the "sustainable and harmonious development" scenario and aims both at the optimal exploitation of resources and potential where they are located, decentralization and the search for a better balance between regions. The specific objectives are to: • promote a network of hierarchical and well-distributed development poles; • develop networks of communication infrastructure and public facilities that are structuring and properly distributed throughout the national territory; • promote the rational management of natural resources and the living environment; • to develop the national economy in a sustainable way through its various sectors.	This project is in line with this spatial planning policy because it will expand the air transport sector with the establishment of airports in a local community.
Regional Spatial Planning Schemes (SRAT)	They are variations of the strategic orientations of the National Spatial Planning Plan at the regional level. The main objectives of the Regional Spatial Planning Scheme are to:	The rehabilitation of The Ourossogui-Matam airport will contribute to the economic development of the Region and strengthen the air transport sector.

	• promote human settlements; • strengthen basic socio-economic infrastructure and facilities; • develop communication networks; • improve the territorial framework; • develop regional economic activities; • strengthen environmental management.	
Climate Change		
Contribution Planned Determined at the National Level (SCOND) of Senegal to be integrated into the strategic and environmental policy framework	It is a strategic document setting out the specific commitments to reduce greenhouse gas (GHG) emissions for Senegal by 2035 under the Paris Climate Agreement in 2015. In view of the country's strong dependence on climate change and in line with its tradition of international cooperation, the Government of Senegal intends to contribute to the collective effort through the implementation of GHG emission mitigation and adaptation measures in its sectors of activity.	In accordance with this SCONDS, construction activities must not be a source of greenhouse gas emissions.
Others	Senegal's Forest Policy (PFS) (2005-2025); The Sectoral Policy Letter on Internal Governance (LPSGI); The national sanitation strategy; The national sanitation strategy.	The implementation of the project must, while ensuring the preservation of the environment and the living environment, comply with the guidelines established by these strategies and policies.

IV.2. INSTITUTIONAL FRAMEWORK

The institutional analysis allows the identification of structures that are interested in their responsibilities, functions and roles, through the actions that will be carried out as part of the rehabilitation of Ourossogui-Matam airport.

The environmental and social management of the project will involve national, regional and local institutions and structures. Note the technical services of the State and local authorities. The fields of intervention of these structures and institutions in terms of environmental protection will be diverse, at all stages of project implementation.

These interventions will take the form of environmental compliance monitoring and verification, assistance and support in the implementation of measures to remove, reduce and compensate for the project's harmful impacts on the environment.

The environmental and social management of the project will be ensured at three levels:

- at the national level: through the DEEC, the National Technical Committee and the other national directorates and technical services involved in the management of the project;
- at the regional level through the Regional Environmental Monitoring Committee (CRSE);
- at the local level (administrative authorities: Deputy Prefect, local elected officials: Town Hall, municipal councils and the population).

IV.2.1. AT THE NATIONAL LEVEL

IV.2.1.1. MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT (MEDD)

At the national level, environmental management is the responsibility of the Ministry of Environment and Sustainable Development (MEDD), which is responsible for developing and implementing environmental policy. The Directorate of Environment and Classified Establishments (DEEC) is the structure of the MEDD mainly involved in the implementation of this project.

The MEDD will ensure the project's environmental compliance before issuing the operating permit. To carry out the tasks assigned to it, the MEDD relies on the technical departments.

IV.2.1.1.1. Directorate of Environment and Classified Establishments (DEEC)

The DEEC plays an important role in the implementation of the Senegalese government's development policy. Under the authority of the MEDD, it is responsible for the implementation of the Government's policy in the field of the environment, in particular the protection of nature and human beings against pollution and nuisance.

To implement the State's environmental policy, DEEC's mission is to:

- the prevention and control of pollution and nuisances;
- the follow-up of the actions of the various services and organizations working in the field of the Environment;
- the preparation of legal texts concerning the Environment;
- the monitoring of agreements related to its missions;
- the integration of the environmental dimension into development policies, programs and projects through environmental assessment;
- the control of the installation classified for environmental protection;
- coastal management.

In the conduct and monitoring of ESIA procedures, the MEDD relies on the Directorate of Environment and Classified Establishments (DEEC) and the Technical Committee. In the field of ESIAs, the mission of the EDEC is to ensure the application of the provisions relating to ESIAs. It prepares opinions and decisions on ESIAs for the Ministry responsible.

In this context, she:

- validates the specifications or terms of reference specifying the content of the environmental assessment;
- assesses the admissibility of studies;
- ensures the control and monitoring of measures taken to protect the environment.

DEEC also has decentralized services at the regional level to ensure close monitoring of environmental issues (the Regional Divisions of Environment and Classified Establishments (DREEC). Its various missions are divided between the following divisions and structures:

- Environmental Impact Assessment Division (EIAD);
- Classified Installations Division (CID);
- Division of Pollution and Nuisance Prevention and Control (DPCPN) ;
- Coastal Management Division (DGL);
- Administrative and Financial Division (DAF);
- Sustainable Development Unit;
- Planning and Monitoring and Evaluation Unit;
- Legal Affairs Unit;
- Communication Unit ;
- Air Quality Management Center;
- Basel Convention Regional Center;
- Environmental Emergency Management Center;
- Fourteen (14) regional divisions throughout the country.

The Impact Assessment Division (DEIE), Classified Facilities Division (DIC), Pollution and Nuisance Prevention and Control Division (PCPD), Legal Affairs Unit, Air Quality

Management Center (AQMC) and Environmental Emergency Management Center (EMC) are more involved in this study.

The DEEC, through its various structures, ensures the monitoring of the implementation of this project (from the project opinion to the issuance of the environmental compliance certificate).

IV.2.1.1.2. Technical Committee

It was established by Ministerial Order No. 009469 of 28 November 2001 and supports the MEDD in the validation of impact study reports. It brings together all the technical services of the State in addition to local authorities and certain associations. Its secretariat is provided by the DEEC and the presidency changes according to the nature of the project.

The technical committee will participate in the validation of the Environmental and Social Impact Assessment report and in the monitoring of the implementation of the environmental and social measures of this project in relation to the DEEC.

IV.2.1.2. MINISTRY OF TOURISM AND AIR TRANSPORT

In Senegal, the civil aviation sector is placed under the supervision of the Ministry of Tourism and Air Transport, which defines the specific missions of the various structures that make up the sector. The services of the Ministry involved in the management of this project are presented below.

IV.2.1.2.1. National Agency of Civil Aviation and Meteorology of Senegal (ANACIM)

The strengthening of air transport safety and security requires the control of meteorology, which is an element of the security system both at airport platforms and on the routes used by aircraft. It is in this context that ANACIM was set up. ANACIM is the primary contact for the International Civil Aviation Organization (ICAO) in Senegal. It is responsible for promoting, regulating and controlling all activities that can contribute to the development of civil aviation. It is the competent authority for civil aviation in Senegal.

ANACIM's objective is to offer operators in Senegal an environment that meets international requirements with relevant regulations, efficient administration and modern and appropriate infrastructure. It also actively participates in the development of the national economy and in improving the safety, security, efficiency and regularity of international air transport.

The role and responsibility of ANACIM through its directorates such as Air Navigation and Aerodromes (DNAA) in this project, whether in the rehabilitation and operation phase, is to:

- assess the state of play of airports;
- validate the companies' offers;
- validate the work schedule before starting the work;
- validate the work;
- issue the decree launching the Ourossogui-Matam airport. If necessary, the decree is also issued by ANACIM;
- inspect the work in the construction and operation phase.

IV.2.1.2.2. Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA)

It provides air traffic control, air navigation services, aircraft guidance, technical and traffic messages, flight information and data collection, and weather forecasting and transmission.

IV.2.1.2.3. Senegalese Aerodrome Agency

It was launched by the Government of Senegal by Decree No. 2008-460 of 09 May 2008. Its role is to ensure, in conjunction with ANACIM and HAAS, that safety requirements are integrated into the design and construction of new installations and modifications to existing installations. It is also responsible for the maintenance of these facilities.

IV.2.1.2.4. Special Airport Police Station

The Special Airport Police Station is responsible for protecting the public and regulated areas of the passenger terminal from acts of unlawful interference. It also controls access to regulated areas within its area of competence.

Its main tasks revolve around the inspection and screening of passengers and their cabin baggage, surveillance and regular patrols. To this end, it shall maintain or restore order and the proper functioning of traffic in the airport area.

IV.2.1.2.5. Mobile Intervention Group

The Mobile Intervention Grouping (MIG) unit at the airport is attached to HAALSS. It is responsible for controlling access to the check-in, sorting and baggage dispute areas, as well as access control to the "Arrival" area. Thus, any person accessing the airline baggage dispute area or the checked baggage sorting area from the passenger terminal undergoes a security check carried out by elements of this unit. The baggage that this person carries will also be inspected and screened.

The main purpose of this formality is to maintain the level of security, but also to prevent the occurrence of illegal acts or the introduction of prohibited items into these areas.

IV.2.1.2.6. Security and Document Control Companies

They are approved by the National Agency of Civil Aviation and Meteorology of Senegal after having completed the administrative formalities.

In accordance with the provisions of the specifications, they perform, among other tasks:

- the control of travel documents before passengers access check-in counters;
- monitoring checked baggage and cargo after screening and escorting them to aircraft for loading;
- escorting baggage from the aircraft to the carpets in the baggage delivery area;
- the guard of the aircraft security perimeter;
- the additional security check on the persons authorized to access on board.

There are four (04) such companies, namely: AMARANTE INTERNATIONAL, EAS, SPR, SEN SICASS.

IV.2.1.2.7. Support groups

These are the Air Force Task Group, the Air Force Support Group and the Explosive Ordnance Disposal Unit. The first two groups are located in Ouakam, the explosive ordnance disposal unit is located at Camp LEMONIER. They contribute to the protection of civil aviation against acts of unlawful interference. As such, they provide assistance in the following areas, among others:

- detection and removal of explosive devices;
- armed intervention upon request in case of emergency.

In short, all the services detailed above have tasks to perform. And in the exercise of their missions they are led to lend their experience and expertise. Thus, they all have a single objective: to ensure air transport security.

IV.2.1.3. OTHER STRUCTURES INVOLVED IN PROJECT MANAGEMENT

At the national and regional level, the other institutions that will be involved in this project and their roles are presented in the following table.

Table 14: Other structures involved in project management

Entities	Sub-entities	Areas of involvement in this project
National Services		
Ministry of the Interior	Civil Protection Department	It is responsible for the prevention of risks of all kinds, as well as the protection of people, property and the environment against all disasters and catastrophes. In this respect, it proceeds, among other things, to: • the drafting of texts governing the field of civil protection; • the general design of contingency plans; • the identification and mobilization of additional plans to be implemented in the event of a disaster, for logistical support to relief teams; • the organization of preventive visits, the monitoring of the application of the security requirements of the establishments involved. The CPD must ensure that an adequate and sufficient security system is in place during the commissioning of the airport.
Ministry of Environment and Sustainable Development (MEDD)	National Climate Change Committee	This Committee was set up in 2003 by Order No. 1.220 of 7 March 2003 of the Ministry of the Environment. In the framework of this project as in all national, subregional and regional projects relating to the priority areas referred to in Article 3 of this Decree, plays a role of information, awareness raising, training and facilitation in the design, financing, implementation, validation and monitoring of the various activities identified in the context of the implementation of greenhouse gas (GHG) reduction and adaptation measures as well as the fight against the negative impacts of climate change.
Ministry of Hydraulics and Sanitation	Sanitation Department; Senegalese National Sanitation Office (ONAS)	Ensure compliance of wastewater management strategies by ensuring compliance with regulations
Primature	Directorate of Land Use Monitoring and Control	Its mission is to prevent and combat irregular occupations and constructions as well as to manage the related litigation. In this case it is in charge of: • monitoring and controlling land use in urban areas and agglomerations as well as on-site interventions; • the verification of land use; • assistance to local authorities for the control of irregular occupations and constructions;

Entities	Sub-entities	Areas of involvement in this project
		• the recording of land use offences. As part of this project, this department is responsible for verifying the land use of the airport site.
Ministry of Urban Renewal, Housing and Living Environment	Directorate of Urban Planning and Architecture (DUA)	This department is responsible for the study, design and implementation of urban plans and schemes as well as urban plans, urban development and subdivision plans, the preparation of urban planning and architectural regulations, and the monitoring of travel and relocation operations. Obtaining these urban plans will allow the developer to have information on past and future projects closest to the site. In the case of construction of buildings, the developer must file a building permit in accordance with the provisions of the Urban Planning Code.
Ministry of the Economy, Finance and Planning	Directorate of land registry	It is responsible for all matters relating to land development and land registry. As such, it is responsible for land organization, land registry management, evaluation and census review. The Land registry Department must prepare the cadastral plan at the request of the developer.
Ministry of Health and Social Action	National Hygiene Service	It ensures that hygiene measures are applied at the airport.
	Public Hygiene Department	It is responsible for monitoring the implementation of the hygiene and sanitation policy. It has decentralized services and sworn officials to control the effectiveness of the application of the provisions of the hygiene code. As part of this project, the Matam Regional Hygiene Service is responsible for monitoring the implementation of hygiene measures at site level.
Ministry of Local Governance, Development and Land Use Planning	National Agency for Spatial Planning (ANAT)	It ensures the coherence of development policies and programs at the national level. ANAT must inform about the land use of the site, and the development of the project area. In addition, it provides the consultant with all available planning documents for the areas concerned by the project (e.g. PLDs).

IV.2.1.3.1. At regional and local level

Table 15: Regional and local services concerned

Regional and local services		
Ministry of Environment and Sustainable Development (MEDD)	Regional Divisions of Environment and Classified Establishments (DREEC)	It is responsible for carrying out the actions, activities and missions of the Environment Department and the Classified Establishments at the regional level. Its organization and functioning are defined by a memorandum from the Director of Environment and Classified Establishments. The DRECC also validates the terms of reference and organizes the technical committee and the public hearing in the regions. The DRECC provides the secretariat and coordinates the activities of the regional environmental monitoring committee. It must support local communities in building the capacity of stakeholders in environmental and social assessment.
Ministry of Local Governance, Development and Land Use Planning	Regional Development Agencies (ARD)	In the monitoring of projects such as this one, one of the ARD's missions is to: • facilitate the integration of general and specific environmental requirements (including possible management plans and standard specifications) into tender documents (DAO/DRP) and contracts of the companies in charge of the works; • ensure the strict application of environmental and social measures by the actors concerned.
Regional Environmental and Social Monitoring Committees (CRSE)		The regional committee for the environmental and social monitoring of local development projects was set up at the regional level (within the framework of the PNDL) to take better account of decentralisation and local development processes. They are made up of the technical services (Environment, Water and Forestry, Community Development, etc.) of the Region. In the implementation of this project, as in any other project, CRSEs must participate in the validation of the ESIA report and verify the integration of ESMP measures and other environmental and social clauses in the tender and work documents.
Ministry of Health and Social Action	Regional Hygiene Service (SRH)	As part of the activities of this project, this service is involved in monitoring the implementation of hygiene measures at site level, etc.
Department of Environment and Sustainable Development (	Regional Water and Forest Inspections (IREF) ;	Present in each region, the IREF is the technical transmission link between the central level and the decentralized entities of the DEFCCS. Each Regional Service is responsible for: • representing the DEFCCS at the regional level;

		• developing regional forest programs for forest protection and management, hunting and protected area management; • carrying out the forestry program and enforce forestry and hunting regulations; • carrying out forest police and hunting actions and prosecutions in accordance with the regulations in force. In implementing the project, the Matam IREF will ensure the protection of plant species and compliance with the provisions of the Forest Code before construction work begins.
Network concession companies	EDS ; SOUNDS ; SONATEL ; ONAS.	For the implementation of the project, the promoter must coordinate with those companies that have facilities on the right-of-way of the public road and that may be involved in the implementation of the airport works.
Local authorities	Matam Department and Ourossogui Commune	Act No. 2013-10 of 28 December 2013 on the General Code of Local Authorities, known as "Act III of Decentralization", made it possible in the context of the project area: • to close down the local authority region; to set up departments as local authorities; • to proceed with full communalization by establishing rural communities as communes; • to divide the nine areas of competence hitherto transferred between the two orders of local authorities, the department and the municipality. Local authorities play an important role in the economic and social development of their entity and also in the field of the environment and the management of natural resources. The Matam County Council and the Ourossogui Municipal Council must be informed of the project. In accordance with the provisions of the General Code of Local Authorities and in relation to the project, they must ensure the protection of the environment of the Commune of Ourossogui. To do this, the following measures must be taken: • prevent or remove pollution and nuisances; • ensure the protection of green spaces; • contribute to the beautification of the municipality. The Municipality of Ourossogui must also be involved in recruiting the necessary manpower to carry out the project if necessary. Local authorities, being members of CRSES, are also involved in monitoring the application of the measures in the Environmental and Social Management Plan (ESMP).

IV.3. LEGAL FRAMEWORK FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT

The legal framework applicable to this project includes national texts supplemented by international conventions ratified by Senegal.

IV.3.1. AT THE INTERNATIONAL LEVEL

Taking into account the context, the characteristics of the area of influence and the nature of the project's activities, several international environmental conventions ratified by Senegal could be applicable to the project. The following table presents the main ones.

Table 16: International conventions applicable to this project

Texts	Regulated areas	Application in the context of the project
Civil aviation texts and conventions		
Chicago Convention of 07 December 1944 on International Civil Aviation and its Annexes 2, 6, 9, 10, 11, 13, 14, and 17	The objectives of this agreement are to: work for the future development of international civil aviation to help create and preserve bonds and understanding between the nations and peoples of the world; avoid any misunderstanding between nations and peoples and promote among them the cooperation on which world peace depends; promote the safe and orderly development of international civil aviation; develop international air transport services that can be established on the basis of equal opportunities and operated in a sound and economical manner; minimize the environmental effects of civil aviation activities and improve the environmental performance of aviation.	This project is in line with the objectives of this convention and must be carried out in accordance with its provisions
Convention on Offences and Certain Other Acts Committed on Board Aircraft, signed at Tokyo on 14 September 1963 and entered into force on 4 December 1969	This Convention concerns civil aviation safety and applies: • to offences; • acts which, whether or not constituting offences, may endanger or compromise the safety of the aircraft or persons or property on board, and good order and discipline on board.	Airport security must be ensured in accordance with the provisions of this Convention

Texts	Regulated areas	Application in the context of the project
Convention for the Suppression of Unlawful Seizure of Aircraft, signed at The Hague on 16 December 1970 and entered into force on 14 October	It concerns hijackings of aircraft	Airport security must be ensured in accordance with the provisions of this Convention
Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation, signed at Montreal on 23 September 1971 and entered into force on 26 January 1973	Concerns acts of sabotage committed against aviation, such as bomb attacks in aircraft in flight.	
Convention on the Physical Protection of Nuclear Material, signed at Vienna on 26 October 1979 and entered into force on 8 February 1987	Aims at the illicit procurement and use of nuclear materials	These materials must not be used in this project.
Protocol for the Suppression of Unlawful Acts of Violence at Aerodromes Serving International Civil Aviation, supplementary to the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation, signed at Montreal on 24 February 1988 and entered into force on 6 August 1989, which amplifies and supplements the Montreal Convention on the Safety of Civil Aviation	Concerns the repression of acts of violence in aerodromes and the repression of all unlawful acts against the safety of civil aviation	Airport security must be ensured in accordance with the provisions of this Convention

Texts	Regulated areas	Application in the context of the project
Convention on the Marking of Plastic Explosives for the Purpose of Detection, signed at Montreal on 1 March 1991 and entered into force on 21 June 1998	Provides for the chemical marking of targeted explosives to facilitate their detection, for example to combat aircraft sabotage.	The promoter must comply with the provisions of this agreement to ensure airport security
Combating climate change and protecting the ozone layer		
United Nations Framework Convention on Climate Change (UNFCCC) signed by Senegal in June 1992 and ratified on 14 June 1994	Management and adaptation to climate change. Stabilize greenhouse gas concentrations to avoid dangerous disruptions to the climate system.	Construction activities (clearing, use of products containing VOCs, etc.) and equipment (generators, machinery, etc.) can generate greenhouse gases (CO_2) that are linked to climate change. The promoter must take into account the objectives of these agreements to avoid greenhouse gas emissions and contribute to the achievement of sustainable development objectives
Kyoto Protocol to the United Nations Framework Convention on Climate Change signed on 11/12/1997 and ratified on 20/07/2001	Combating climate change by reducing carbon dioxide emissions	
Paris Agreement on Climate Change	Aims to strengthen the global response to the threat of climate change, in the context of sustainable development and poverty reduction	
Montreal Protocol on Substances that Deplete the Ozone Layer, which entered into force on 1 January 1989	Preservation of stratospheric ozone. Regulation of activities that may cause damage to the ozone layer	The project must take into account the provisions of this protocol during the construction and operation phase, ensuring that these emissions comply with the provisions of this protocol.
Law No. 2003-07 of 28 May 2003 authorizing the President of the Republic to ratify the Amendment to the Montreal Protocol to the Vienna Convention on the Protection of the Ozone Layer in Beijing (People's Republic of China) in December 1999		

Texts	Regulated areas	Application in the context of the project
Vienna Convention for the Protection of the Ozone Layer adopted in Vienna on 22 March 1985, ratified on 19 March 1993.	Protect human health and the environment from the adverse effects of ozone layer degradation and regulate emissions of depleting substances.	
Management of natural resources and protection of fauna and flora		
African Convention on the Conservation of Nature and Natural Resources, Maputo, Mozambique, adopted in Algiers on 15 March 1968, ratified by Senegal in 1971. **Law No. 71-66 of 30 November 1971 authorizing the President of the Republic to ratify the African Convention on the Conservation of Nature and Natural Resources, adopted in Algiers on 15 March 1968.**	To improve environmental protection, promote the conservation and sustainable use of natural resources, and harmonize and coordinate policies in these areas with a view to putting in place development policies and programmes that are environmentally and economically sound and socially acceptable	There will be clearing work to free the site's right-of-way. During the execution of this work, the promoter must comply with this agreement.
International Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, signed in Paris on 14 June 1994 and ratified on 14 June 1995. **Act No. 95-09 of 7 April 1995 authorizing the President of the Republic to accede to the International Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, signed in Paris on 14 June 1994**	Combat desertification and mitigate the effects of drought in countries seriously affected by it.	The project will impact some plant species through tree cutting. In order to comply with the objectives of this Convention, these activities must not be a source of degradation of natural resources such as vegetation and soils

Texts	Regulated areas	Application in the context of the project
United Nations Convention on Biological Diversity, signed in June 1992 and ratified on 14 June 1994 **Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising out of Their Use in Relation to the Convention on Biological Diversity (2010)**	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilization of genetic resources.	The project must not destroy neighboring biodiversity either by pollution or by the discharge of waste.
Cultural Heritage		
Convention concerning the Protection of the World Cultural and Natural Heritage adopted in Paris on 16 November 1972. **Law No. 75-110 of 20 December 1975 authorizing the President of the Republic to ratify the Convention for the Protection of the World Cultural and Natural Heritage adopted in Paris on 16 November 1972**	This convention specifies the conditions under which cultural heritage must be protected	The site is not a cultural heritage, but if remains are found, the national procedure must be followed.
Human Rights		
African Charter on Human and Peoples' Rights adopted in Nairobi on 23 September 1981	Article 24 which enshrines the right of peoples to a healthy environment	The project must respect the right of the population to live in a healthy environment.
Chemicals management		
Stockholm Convention on Persistent Organic Pollutants (POPs) - 22 May 2001	Management of products containing persistent organic pollutants.	If the products to be used contain such waste, their disposal must be ensured in

Texts	Regulated areas	Application in the context of the project
Act No. 2003-08 of 28 May 2003 authorizing the President of the Republic to ratify the Convention on Persistent Organic Pollutants, adopted in Stockholm, Sweden, on 22 May 2001	Protect human health and the environment from persistent organic pollutants.	order to protect the health of the population.
Health, Safety and Hygiene		
ILO Convention No. 120 concerning Hygiene in Trade and Offices, ratified by Senegal in 1966.	Hygiene at work and in infrastructures. This agreement regulates hygiene in certain infrastructures.	Occupational health and safety are cross-cutting to all project activities.
Convention No. 14 on weekly rest in industrial establishments of 17 November 1921 **Convention No. 18 on Occupational Diseases of 10 June 1925** **Convention No. 100 on Equal Remuneration for Men and Women Workers for Work of Equal Value, adopted at Geneva on 29 June 1951**	Health, Safety and Hygiene	

IV.3.2. COMMUNITY LEGAL FRAMEWORK

Regulation No. 01/2007/CM/UEMOA adopting the Community Civil Aviation Code of the WAEMU Member States requires the members of the Union to set up a civil aviation authority with financial and management autonomy and legal personality.

Regulation No. 11 on civil aviation security in WAEMU Member States and the summary report of the 2011 Dakar Summit on Civil Aviation Security in Africa are also applicable to this project.

IV.3.3. NATIONAL LEGAL FRAMEWORK

In relation to the context and activities of the project, the national legal framework is marked by several texts that deal with environmental and social aspects.

IV.3.3.1. CONSTITUTION OF SENEGAL

The Senegalese Constitution, adopted on 22 January 2001 and revised on 20 March 2016 by referendum, introduced important environmental provisions that must be taken into account in the various phases of the project's implementation.

Thus, article 25.1 provides that "Natural resources belong to the people". They are used to improve their living conditions.

The exploitation and management of natural resources must be transparent and in such a way as to generate economic growth, promote the well-being of the population in general and be environmentally sustainable. The State and local authorities have an obligation to ensure the preservation of land assets".

Article 25-2 guarantees the right to a healthy environment and obliges public authorities to preserve, restore essential ecological processes, provide for the responsible management of species and ecosystems, preserve the diversity and integrity of genetic heritage, require environmental assessment for plans, projects or programs, promote environmental education and ensure the protection of populations in the development and implementation of projects and programs with significant social and environmental impacts. Such provisions encourage the integration of environmental protection into the project implementation process by all stakeholders.

The national legal framework is marked by several other environmental texts concerning the management of the living environment, in particular pollution and nuisances, natural resources (fauna, flora, water), the institutional framework for the management of the environment and natural resources, etc.

IV.3.3.2. THE ENVIRONMENTAL CODE AND ITS IMPLEMENTING REGULATIONS

Act No. 2001-01 of 15 January 2001 on the Environmental Code makes the environment a national heritage that must be protected and the general principles of prevention and precaution

established. The Environmental Code governs all sectors of the environment and sets out the guiding principles of good management, compliance with which is necessary in all areas. All these provisions contribute to the effective protection and management of the environment.

The various projects requiring an ESIA are defined by article R40 of the decree implementing the Environmental Code.

This code was supported by regulatory provisions including:

- Prime Minister's Circular No. 009 PM.SGG/SP of 30 July 2001 reminding all structures of the need to comply with the provisions of the Environmental Code to ensure effective environmental protection and management;
- Circular No. 0001/PM/SP of 22 May 2007 on the implementation of the provisions of the Environmental Code;
- Circular No. 0008 PM/SGG/SP of 24 June 2010.

These Prime Minister's circulars remind all structures of the need to comply with the provisions of Act No. 2001-01 of 15 January on the Environment Code and the implementing decree No. 2001-282 of 12 April 2001, which stipulates that all development projects or activities likely to harm the environment and the health of populations must be subject to an environmental assessment before they are carried out.

IV.3.3.2.1. Regulations under the Environmental Code

Decree No. 2001-282 of 12 April 2001 implements the Environmental Code by stipulating, in particular, the need to carry out an environmental assessment before the development of any activity likely to affect the environment. The decree defines the scope of the environmental impact assessment. Depending on the potential impact, nature, scale and location of the project, project types are classified into one of the following categories:

- **Category 1:** projects are likely to have significant impacts on the environment; an environmental impact assessment study will integrate environmental considerations into the economic and financial analysis of the project; this category requires a thorough environmental assessment.
- **Category 2:** projects have limited environmental impacts or impacts can be mitigated by applying measures or design changes; this category is subject to a summary environmental analysis.

The Ourossogui-Matam airport rehabilitation project is classified in category 1 of projects subject to a thorough environmental assessment, in accordance with the decree implementing Act 2001-01 of 15 January 2001 on the Environment Code (article R40 and annex 1).

The following orders were issued shortly thereafter by the Ministry of Environment to regulate the procedures and modalities for carrying out an EIA:

- Order No. 009471 on the content of ESIA terms of reference. Promoter has complied with this requirement;
- Decree n° 009470 fixing the conditions for issuing approval for the exercise of activities relating to ESIAs;

- Order No. 009468 regulating public participation in environmental impact assessment. This text specifies the procedure for the participation of the population;
- Decree n° 009469 on the organization and functioning of the technical committee. This text supports the Ministry of Environment in the validation of the environmental impact assessment report
- Order No. 009472 on the content of the ESIA report. This text specifies that the impact study report must contain, in particular, a description and analysis of project variants, an assessment of the potential impacts of the project, the risks of technological accidents, measures to mitigate and compensate for adverse effects and a framework for an environmental monitoring and follow-up plan.

The validation of the impact study must be carried out by a technical committee in support of the Ministry of the Environment and Sustainable Development, as specified in Order No. 9469 of 28 November 2001. This decree defines the members and responsibilities of the committee. The Committee's Secretariat is provided by the Directorate of Environment and Classified Establishments (DEEC).

On the basis of the final study (containing comments received during the public consultation), the technical committee will have to submit a decision to the Ministry at the request of the Promoter. The Department must then report the decision (positive or negative).

The table below provides a summary of the Environmental Code laws involved in this project.

Table 17: Some basic articles of the Environmental Code in relation to the project

Themes	Main content related to the project	Articles	Summary of the application text	Relevance to the project
Technological risks, Chapter I (TITLE II Prevention and control of pollution and nuisance)	Management of establishments with technological risks	Article L.9	Describes facilities classified for environmental protection.	The project is a classified facility
		Article L.10	Divides classified installations (L.9) into two classes.	Some of the facilities present risks to the biophysical and human environment, so the airport is in first class.
		Article L.11	"The first class shall include installations which present serious dangers or inconveniences to the interests referred to in Article L 9[...] the second class shall include installations which, without serious inconveniences to the interests referred to in Article L 9 [...]"	
		Article L.12	"The categories of installations subject to the provisions of this Act and the classification of each of them shall be defined by order of the Minister for the Environment, after consulting the Ministries of Industry and Civil Protection. ».	This project must comply with this article
		Article L.13	"Installations classified in first class must be subject, before their construction or commissioning, to an operating permit issued by order of the Minister for the Environment under the conditions laid down by decree. This authorization must be subject to their removal, within a radius of at least 500 m, from dwellings, buildings usually occupied by third parties, establishments open to the public and areas intended for habitation, a watercourse, a lake, a road or a water catchment area;	The project will comply with this provision before commissioning. However, this report first aims to obtain the environmental discharge before obtaining the certificate of conformity.
		Article L.14	"Authorizations are granted without prejudice to the rights of third parties. They do not prevent the application of the provisions of the Town Planning Code regarding building permits. ».	
		Article L.16	"The application for authorization of a first-class installation must be the subject of a public inquiry prescribed by decision of the State representative under conditions set by decree";	
		Article L.23	"Where the operation of classified installations presents, for the interests mentioned in Article L 9, serious dangers or disadvantages which the measures to be taken under the provisions of this Law are	The promoter will implement all measures to control risks that may

			not likely to eliminate, the closure or removal of such installations shall be ordered by order of the Minister for the Environment....".	affect its personnel and the environment around the site.
Waste management, Chapter III (TITLE II: Prevention and control of pollution and nuisances.	This chapter sets out the conditions for solid waste management. It will cover general information on waste, discharge conditions and solid waste treatment.	Article L.30	"Waste must be disposed of or recycled in an environmentally sound manner in order to eliminate or reduce its harmful effects on human health, natural resources, fauna and flora or the quality of the environment. The provisions of this Chapter shall apply to all categories of waste, including biomedical waste. ».	The promoter must manage the waste that will result from the construction and operation phase
		Article L.31	"Any person who produces or holds waste must himself ensure its disposal or recycling or have it disposed of or recycled by companies approved by the Minister of the Environment...".	
		Article L.37	"The disposal of waste by industrial, producing and/or processing structures must be carried out with the authorization and supervision of the Ministry of the Environment, which sets requirements".	
		Article L.38	"Where waste is abandoned, deposited or treated contrary to the provisions of this Act and the regulations made for its application, the authority holding the police power shall, after formal notice, automatically ensure the disposal of such waste at the expense of the person responsible. [...] ».	
Pollution and degradation of soils and subsoils, Chapter III (TITLE III Protection and enhancement of receiving environments)	Management of contaminated soils.	Article A81	The protection of the soil, subsoil and the resources it contains, as limited resources, renewable or not, against all forms of degradation is ensured by the State and local authorities.	The project must not result in soil pollution
Air pollution and unpleasant odor, Chapter II	Air Pollution Prevention	Article A78	In order to avoid air pollution, buildings, agricultural, industrial, commercial or craft establishments, vehicles or other movable objects owned, operated or held by any natural or legal person shall	The project must not result in air pollution or odors that inconvenience

			be constructed, operated or used in such a way as to meet the technical standards in force. They are all subject to a general obligation to prevent and reduce harmful impacts on the atmosphere.	surrounding populations, compromise public health or safety,
Sound Pollution, Chapter IV Impact study	Noise pollution prevention	Article A84	Noise emissions that could harm human health, cause excessive inconvenience to the neighborhood or harm the environment are prohibited. The natural or legal persons issuing such issues must take all necessary measures to remove them. When the urgency so warrants, the Minister of the Environment, in conjunction with the Minister of the Interior and the Minister of the Armed Forces, shall take all enforcement measures ex officio to put an end to the disturbance.	Construction and operating work must not emit noise that could affect people and workers
	Impact study devices	Article L 48	"Any development project or activity likely to affect the environment, as well as policies, plans, programs, regional and sectoral studies, shall be subject to an Environmental Assessment (EA). The impact assessment is part of an existing authorization, approval or concession procedure; the main actors involved in the environmental impact assessment procedure are the promoter and the competent authorities. The impact study is prepared by the promoter and submitted by him to the Ministry of the Environment, which issues a certificate of authorization after technical advice from the Directorate of the Environment and Classified Establishments.	Compliance with this provision is the result of this study.
		Article L 51	The environmental impact assessment shall include, as a minimum, an analysis of the initial state of the site and its environment, a description of the project, a study of the modifications that the project is likely to generate, and the measures envisaged to remove, reduce or compensate for the negative impacts of the activity and their cost before, during and after the project is carried out. A decree issued on the basis of a report by the Minister of the Environment specifies the content of the impact assessment;	
		Article L52	The public hearing procedure is an integral part of the environmental impact assessment;	

		Article L53	The participation of the population is a response to the desire to democratize the decision-making process and is guaranteed by the State to be dedicated towards decentralization and regionalization.	
		Article L56	The operator of any classified installation subject to authorization is required to come up with an internal operating plan to ensure that the competent authorities and neighboring populations are alerted in the event of a disaster or threat of a disaster, that personnel are evacuated and that the causes of the disaster are contained.	

IV.3.3.2.2. Environmental standards

- **Air Quality Protection (NS 05-062)**

The NS-05-062 standard is a document setting the standards for atmospheric emissions in Senegal according to environmental principles. Its purpose is to protect the environment and people from harmful or uncomfortable air pollution. It applies to existing and new fixed installations and vehicles likely to generate gaseous effluents. It includes maximum emission limit values, including for fixed combustion engines.

According to the standard, air pollution must be reduced at the source with appropriate devices. To do this, emissions must be captured as close as possible to their source.

For any operation or construction of facilities emitting air pollutants, the standard requires the promoter to provide the competent authority with information on the nature and quantity of the emissions; the location of the release, the height from the ground at which it occurs and its variations over time; and any other characteristics of the release necessary to assess the emissions.

The regulations require that before any construction or installation of a facility likely to pollute the atmosphere, the holder must make forecasts of its share of the production of immissions. These forecasts should provide information on the type of immissions, their scope and frequency of dissemination.

Dispersion conditions and the nature and intensity of emissions must also be included in the forecast.

According to the standard on atmospheric emissions, site emissions must be limited by reducing emissions from machinery and equipment and by using operating procedures that take into account the size of the site, the duration of the site, the nature of the site, etc.

This standard is applicable to the project because during the construction phase there will be dust and exhaust emissions caused by the works and equipment (machinery, cars, etc.) and atmospheric emissions due to Volatile Organic Compounds (VOC).

The release limit value for the main air pollutants is presented in the following table:

Table 18: Limit values for air emissions

Substances	Flow rate	Discharge limit values
Total dust	D <= 1 kg/h D> 1 kg/h	100 mg/m3 50 mg/m3
Carbon monoxide. The authorization order shall, where appropriate, set a release limit value for carbon monoxide		
Sulphur oxides (expressed as sulphur dioxide)	D > 25 kg/h	500 mg/m3

Substances	Flow rate	Discharge limit values
Nitrogen oxides excluding nitrous oxide, expressed as nitrogen dioxide	D > 25 kg/h	500 mg/m3

- **Water Quality Protection (NS 05-061)**

The Senegalese standard NS 05-061 published in July 2001 sets the limit values for wastewater quality before discharge into the natural environment and before connection to a collective wastewater treatment plant. The standard also sets out the conditions for spreading effluent and sewage sludge.

This standard is applicable to this project because the works will generate wastewater discharges during the construction and operation phases.

The following are also prohibited:

- all spills of hydroxylated cyclic compounds and their halogenated derivatives, regardless of the receiving environment;
- any spills of substances likely to promote the development of abnormal odors, flavors or colors in natural waters when used for human or animal consumption or other purposes;
- any spills of hydrocarbons or other chemical products, toxic products, by ships or other means of transport and by pipelines etc.....;
- all spills from septic tank emptying trucks in unauthorized locations. In each Commune and Local Community, spill locations must be indicated;
- all uses of raw waste water for spreading on food and feed crops: **Annex III ;**
- all spills into lakes, ponds and ponds.

- **Protection against noise**

There are no specific standards regulating noise emissions as such, but protection against noise is regulated in the Environmental Code in Article L84, which stipulates that: "Noise emissions likely to harm human health, cause excessive inconvenience to the neighborhood or harm the environment are prohibited".

Limit values for human health (corresponding to the limit values measured in the nearest dwellings) are defined in the regulatory part of the Environmental Code:

- **55 dB(A) to 60 dB(A) during the day;**
- **40 dB(A) at night.**

Decree No. 2006-1252 of 15 November 2006 laying down minimum requirements for the prevention of certain physical environmental factors (Chapter IV. - Noise). These include articles 13 and 14, which stipulate the necessity to

- favor the least noisy manufacturing processes;
- reduce at the source the noise emitted by professional equipment and, in particular, machines;

- isolate, in specific premises, noisy equipment whose operation requires only a limited number of workers;
- avoid the diffusion of noise from one workshop to another;
- arrange workspaces to reduce noise reverberation on glass walls or ceilings;
- organize work so that employees are away from noise.

Art. 14. - The daily sound exposure level received by a worker throughout his working day must not exceed eighty-five (85) weighted decibels (dB(A)). If it is not technically possible to reduce the daily noise exposure level below 85 dB (A), the employer must provide employees with suitable personal protective equipment. He must ensure that they are actually used. This limit of 85 dB (A), required for the use of personal protective equipment, may be lowered depending on the nature of the work, intellectual or otherwise, requiring concentration.

In addition, inter-ministerial orders relating to measures to reduce noise pollution sources are notified to operators of noise emission sources.

These requirements must be respected in the implementation of the project. Indeed, the installations must be built, equipped and operated in such a way that their operation cannot be at the origin of airborne or solidified noise likely to compromise the health or safety of the neighborhood or to constitute an obstacle to its tranquility.

Transport vehicles, handling equipment and construction machinery used inside the installation, and likely to be an inconvenience to the neighbors, must comply with these regulations, as well as construction machinery.

Other legislative texts also concerning the environment and the management of natural resources that may affect the project are listed below:

IV.3.3.2.3. Other texts at the national level

- **Civil Aviation Code**

Act No. 2015-10 on the Civil Aviation Code is the regulatory basis for civil aviation in Senegal and contains two hundred and eighty-nine (289) articles divided into seven books. The articles of this law and other texts concerning civil aviation are below.

Book III of this code concerns aerodromes. Title I deals with the aerodrome regime. And Chapter 1 of the title describes, through Articles 137 to 145, the creation, certification and commissioning of aerodromes. According to article 137 of the Code, "any surface on land or water, including buildings, installations and equipment, intended to be used, in whole or in part, for the arrival, departure and evolution of aircraft at the surface, shall be considered as an aerodrome." Article 142 states that “the Civil Aviation Authority shall certify Senegalese airports and aerodromes such as that of Saint-Louis used for international flights and certify landing strips such as that of Matam.”

The classification of aerodromes is described in Articles 146 and 147 of Chapter 2. Chapter 3 deals with the conditions for the operation and management of aerodromes. The general

provisions (Section I) are described in Articles 148 and 149. Articles 150 to 153 provide information on fees (Section II). Article 150 provides that "at any aerodrome open to public air traffic, services rendered to users and the public shall give rise to remuneration in the form of charges levied for the benefit of the person providing the service, in particular for the following operations:

- aircraft landing and take-off;
- use of air navigation assistance devices;
- use of aeronautical telecommunications networks;
- parking and aircraft shelters;
- use of the facilities provided for the reception of passengers and goods;
- use of various installations and tools;
- occupancy of building land;
- visit all or part of the airport's reserved areas. »

Title II of the Code deals with aeronautical easements and the protection of operations and intoxication. Chapter 1 concerns aeronautical easements. Articles 154 to 164 set out the provisions to be taken for this chapter. "In order to ensure the safety of aircraft traffic, special easements known as "aeronautical easements" are instituted. " (Article 157).

The protection of operations and the environment are described in Chapter 2 and Section I deals with general provisions (Articles 165 to 169). Article 168 states that "aviation operators are required to comply with applicable environmental protection standards. To this end, they are subject to the general obligation to maintain airports, including the disposal or recycling of waste and pollution control. "The participation of local communities and people living near airports such as Saint-Louis and Matam in environmental management is organized and encouraged, in particular through

- free access to information on nature protection, without prejudice to the requirements of national defense and state security;
- consultative mechanisms to obtain the opinion and input of local communities and populations;
- environmental awareness, training, research and education. ».

Section II of this Title deals with criminal provisions (Articles 170 to 175).

Article 170 provides that "anyone who stays, enters or carries a weapon without legal authorization in land prohibited by the regulations and general instructions of aerodromes assigned to a public service, or leaves draught, load or mounting cattle or animals, shall be punished by a penalty of six months' to two years' imprisonment and a fine of 20,000 to 200,000 francs and may, in addition, be forfeited any right to compensation in the event of an accident. The procedures for investigating and recording infringements are those provided for in this Code. »

"Violations of the provisions concerning aeronautical easements for alternate use and beaconing instituted in the interest of air traffic shall be punishable by a fine of 250,000 to 7,500,000 francs.

In the event of a repeat offence, the offences are punishable by a fine of 500,000 to 15,000,000,000 francs. " (Article 171). "Violation of the provisions of article 170 of this Code shall be punished in accordance with the provisions of the Environmental Code. " (Article 175).

In the rehabilitation and operation phase, the promoter must take into account all the provisions of this code, particularly those concerning airports.

This code is supplemented by regulatory provisions including:

- **Ministerial Order No. 10284 MTTTA-ANACS-DTNA-PDS dated 19 November 2007 on the composition of the file to be attached to an application for authorization to create an aerodrome or open an existing aerodrome, whether or not open to public air traffic.** Any application for an authorization to establish an aerodrome or to open an existing aerodrome, whether or not it is open to public air traffic, shall be made in accordance with the provisions of this Order in Articles 1 to 5. The application for authorization to create an aerodrome must be submitted by public authorities, public establishments or natural or legal persons governed by private law wishing to create the airport or by their duly accredited representative. Natural or legal persons governed by private law must prove in their application that they meet the conditions set out in Article 2 of Decree No. 64-503 of 3 July 1964 and those set out in the Senegalese Civil and Commercial Obligations Code. The application must specify the full name or designation and the address of the applicant. "» ;
- **Order No. 03038 of 29 February 2016 approving the aeronautical regulations of Senegal (RAS).** The purpose of this Order is to approve the aeronautical regulations of Senegal (RAS), pursuant to the provisions of Article 3 of Decree No. 02015-1968 of 21 December 2015 establishing the framework for the supervision of civil aviation safety in Senegal (Article 1). The provisions to be taken into account in Senegal's aeronautical regulations are described in Articles 2 to 4 of this Order;
- **Order n°007200/MICITIE/ANACS/DG/DNAA of 12 July 2011 fixing the composition of the weight plan of an aerodrome.** Article 1 states that "this Order determines the composition of the mass plan of an aerodrome. "The mass plan drawn up on a scale of at least 1/10,000th shall include:
    - the airport boundaries;
    - the implantation of the axes of the strips;
    - the distribution of the different operating areas;
    - road links with neighboring centers;
    - possibly, the land to be reserved for extension. " (Article 2);
- **Decision No. 000266/ANACIM/DG of 01 February 2017 on the development and implementation of an animal impact risk management procedure by the airport operator/manager**. This Decision requires any aerodrome operator/manager to develop and implement an animal impact risk management procedure in accordance with the applicable regulatory provisions. The measures taken to implement this decision are described in Articles 2 to 8 of this Order;
- **Decree No. 64-503 of 3 July 1964 on the conditions for the establishment, use and classification of aerodromes open or not to public air traffic and aeronautical easements and State control;**

- **Decree n°2015-1968 establishing the framework for the supervision of civil aviation safety in Senegal**;
- **Aerodrome Certification Process, May 2016 edition**. This process outlines the certification steps and applies to all international flight aerodromes;
- **Senegal's Aeronautical Regulations No. 14 (RAS 14), Aerodrome, Volume 1: Aerodrome Design and Technical Operation**. It includes standards prescribing the physical characteristics and obstacle limitation surfaces to be provided by aerodromes, as well as certain installations and technical services normally provided at an aerodrome. It also contains specifications for obstacles outside obstacle limitation surfaces. These specifications are not intended to limit or regulate the operation of an aircraft;
- **Senegal Aeronautical Regulations No. 14 (RAS 14), Aerodrome, Volume II: Helicopters**. It includes standards (specifications) prescribing the physical characteristics and obstacle limitation surfaces that helipads must have, as well as certain installations and technical services provided in principle on a helipad. These specifications are not intended to limit or regulate the operation of an aircraft. In designing a helipad, account shall be taken of the critical theoretical helicopter, which has the largest dimensions and maximum take-off weight, for which the helipad is intended. It should be noted that SIR 6, Part 3, contains provisions for helicopter flights.

- **Urban planning code**

Act No. 2008-43 of 20 August 2008 on the Town Planning Code is the basic text on town planning and housing. It was voted by both (02) houses of parliament and promulgated by the President of the Republic. This law is divided into six (06) books.

The Urban Planning Code is supplemented by regulatory provisions including:

- **Decree No. 2009-1450 of 30 December 2009** on the regulatory part of the Urban Planning Code. This Decree highlights the conditions for exercising the responsibilities of the new directorates created within the Department of Urban Planning and Housing, in this case, the Directorate of Surveillance and Control of Land Use and the Directorate of Congestion Control. It specifies the procedures for the examination and approval of master urban plans, master urban plans, detailed urban plans and subdivision plans;
- Decree **No. 2010-99 of 27 January 2010** on the Construction Code. The main purpose of this decree is to strengthen safety in construction with appropriate regulation of the types of relationships that should exist between the various construction stakeholders, while in some cases making the presence of a specialist mandatory.

- **Hygiene Code**

Act No. 83-71 of 5 July 1983 on the Code of Hygiene essentially regulates individual public or collective hygiene and environmental sanitation. The law defines, among other things, the hygiene rules relating to the control of epidemics as well as those applicable to dwellings, industrial installations, public roads and waste conditioning. The Code provides for a real hygiene police force to ensure the effectiveness of its application.

Title II of this Code deals with public health. Chapter 1 describes through articles 2 to 13 all the devices to be taken into account in the context of hygiene on public roads. Chapter 2 regulates hygiene in the home (Art. L14 to L35). Chapter 3 provides guidelines on food hygiene.

In the rehabilitation and operation phase, populations that will engage in small-scale commercial, catering activities should comply with the hygiene rules in Chapter III of this Code for hygiene in classified establishments, markets and outdoor commercial activities.

During the rehabilitation and operation phase, the promoter and the workers must take into account all the measures set up by the code to ensure rational waste management as well as hygiene and health at the site level.

- **Forestry Code**

The Forest Code is based on Act No. 98-03 of 8 January 1998, supplemented by its implementing decree No. 98-164 of 20 February 1998. The Code governs plant resources and protected areas. Clearing procedures are described in Chapter 2 of the decree implementing the Forest Code in Art. R. 47 to Art. R. 55.

Any request for clearing must be examined by the legislative bodies of the local authorities concerned, which send their detailed opinion on the request to the Departmental Council (Art. R47.). The land clearing permit is issued by the departmental council on the advice of the relevant municipal council.

However, this authorization may not be granted on a fifty-meter (50m) strip on either side of the main roads under the terms of Article R. 50 paragraph 2 of the Code.

The Code fully or partially protects certain plant species. Derogations from the slaughter of fully protected species can only be obtained for scientific or medicinal reasons (art R 61).

However, partially protected species may be felled with the authorization of the Water and Forestry Services.

With regard to protected species, the regulations are defined in the Hunting and Wildlife Protection Code for wildlife species and in the Forest Code for flora.

Under this project, rehabilitation work will require tree cutting and clearing. These activities will be carried out in accordance with the provisions of the Code.

- **Sanitation Code**

It is described by Law n°2009-24 of 08 July 2009 on the Sanitation Code and the implementing decree n°2011-245 of 17 February 2011 on the application of the Law on the Sanitation Code. This law defines a single, harmonized sanitation code, which provides access for all to the rule of law on sanitation in Senegal.

For the treatment of domestic water and industrial waste water, the airport must be equipped with a drainage system for such water established in accordance with the provisions of this code, its implementing regulations and other texts in force (Art. L. 15).

- **Water Code and its application texts**

Act No. 81-13 of 4 March 1981 on the Water Code provides for the various provisions to combat water pollution while reconciling requirements relating in particular to drinking water supply and public health, agriculture, the biological life of the receiving environment and fish fauna, site protection and water conservation. Title II of this text (Articles 47-63) on water quality protection deals in particular with water pollution. The various provisions make it possible to combat water pollution while reconciling requirements relating in particular to drinking water supply and public health, agriculture, the biological life of the receiving environment and fish fauna, site protection and water conservation.

For this reason, no spill, flow, discharge, direct or indirect deposit into a groundwater table or a watercourse likely to change its characteristics may be made without the authorization of the Minister in charge of hydraulics and sanitation (Article 49).

The implementing regulations of the Water Code are listed below:

- **Decree No. 98-555 of 25 June 1998 implementing the provisions of the Water Code relating to water policing**, which concerns both surface and groundwater. The decree provides for measures to combat water pollution and its regeneration to meet certain demands, including those relating to the supply of drinking water to the population, the biological life of the receiving environment and especially fish fauna, site protection and water conservation;
- **Decree No. 98-556 of 25 June 1998** implementing the provisions of the Water Code relating to authorizations for the construction and use of water catchment works;
- **Decree No. 98-557 of 25 June 1998 establishing the Higher Water Council**;
- A technical committee on water was created by order n°9060 of 14 December 1998.

The promoter must avoid any uncontrolled use, waste, any act resulting, voluntarily or not, in the pollution of water resources in the project area and ensure the rational use of groundwater.

- **The Labor Code and its implementing regulations**

In the implementation of the rehabilitation project for Ourossogui-Matam airport, various texts relating to workers' health must be respected. Among these texts, we can mention:

- **Act No. 97-17 of 1 December 1997** on the Labor Code, which sets out working conditions, in particular with regard to working hours, which may not exceed 40 hours per week, night work, women's and children's contracts and compulsory weekly rest periods. The text also deals in its title 11 (art. L.167 to 187) with health and safety in the workplace and indicates the measures that any activity must take to ensure health and safety, guaranteeing a healthy environment and safe working conditions.
- **Act No. 73-37 of 31 July 1973** on the Social Security Code, as amended by Act No. 97-05 of 10 March 1997, which deals with accidents at work and occupational diseases in

its Title II. The code gives guidance on all the measures relating to the prevention of accidents at work and occupational diseases that must be taken during the implementation of the project;

- **Act No. 2010-03 of 9 April 2010** on HIV AIDS, which emphasizes information on HIV AIDS, particularly in the workplace and for people involved in transport;
- **Decree No. 67-1359 of 29 December 1967 repealing and replacing articles 25 and 30 of Decree No. 62-146 of 11 April 1962** organizing the labor service. It stipulates that: "For equal professional qualifications, priority for recruitment must be reserved for workers of Senegalese nationality who are habitually resident in the place of employment in the department of the place of employment or in the region of the place of employment". The decree only applies to positions that do not require a high level of qualification: laborers and other trades in the same category.

In 2006, new decrees were added to the provisions put in place. It is a question of:

- Decree No. 2006-1249 of 15 November 2006 laying down the minimum safety and health requirements for temporary or mobile construction sites;
- Decree No. 2006-1250 of 15 November 2006 on the circulation of vehicles and machines within companies;
- Decree No. 2006-1251 of 15 November 2006 on work equipment;
- Decree No. 2006-1252 of 15 November 2006 laying down minimum requirements for the prevention of certain physical environmental factors;
- Decree No. 2006-1253 of 15 November 2006 establishing a medical labor inspectorate and establishing its powers;
- Decree No. 2006-1254 of 15 November 2006 on the manual handling of loads;
- Decree No. 2006-1256 of 15 November 2006 laying down the obligations of employers with regard to safety at work;
- Decree No. 2006-1257 of 15 November 2006 laying down minimum requirements for protection against chemical risks;
- Decree No. 2006-1258 of 15 November 2006 laying down the missions and rules for the organization and operation of occupational medicine services;
- Decree No. 2006-1260 of 15 November 2006 on the conditions for ventilation and sanitation of workplaces;
- Decree No. 2006-1261 of 15 November 2006 laying down general health and safety measures in establishments of all kinds.

Texts relating to occupational medicine

- Decree No. 2006-1253 of 15 November 2006 establishing a medical labor inspectorate and establishing its powers;
- Decree No. 2006-1258 of 15 November 2006 laying down the missions and rules for the organization and operation of occupational health services;
- Decree No. 2006-1255 of 15 November 2006 on the legal means of intervention of the Labor Inspectorate in the field of Occupational Health and Safety (IRTSS).

During the rehabilitation and operation phase, the promoter must comply with the provisions of the Labor Code for labor management. It is recommended to approach the IWHSB before starting any activity.

V.DESCRIPTION OF THE ENVIRONMENTAL AND SOCIAL CONDITIONS IN THE PROJECT AREA

V.1. GEOGRAPHICAL AND ADMINISTRATIVE LOCATION

The Ourossogui-Matam airport site is located in the Commune of Ourossogui, Matam Department and Region of the same name.

The Matam Region, located in the north-east of Senegal, covers an area of 29,616 km², or 1/7 of the national territory. It is the second largest region in the country after Tambacounda. The region is limited:

- to the North-West by the Saint-Louis Region;
- to the west by the Louga Region;
- to the Southwest by the Kaffrine Region;
- to the south by the Tambacounda Region;
- to the east and northeast by the Senegal-Mauritanian border.

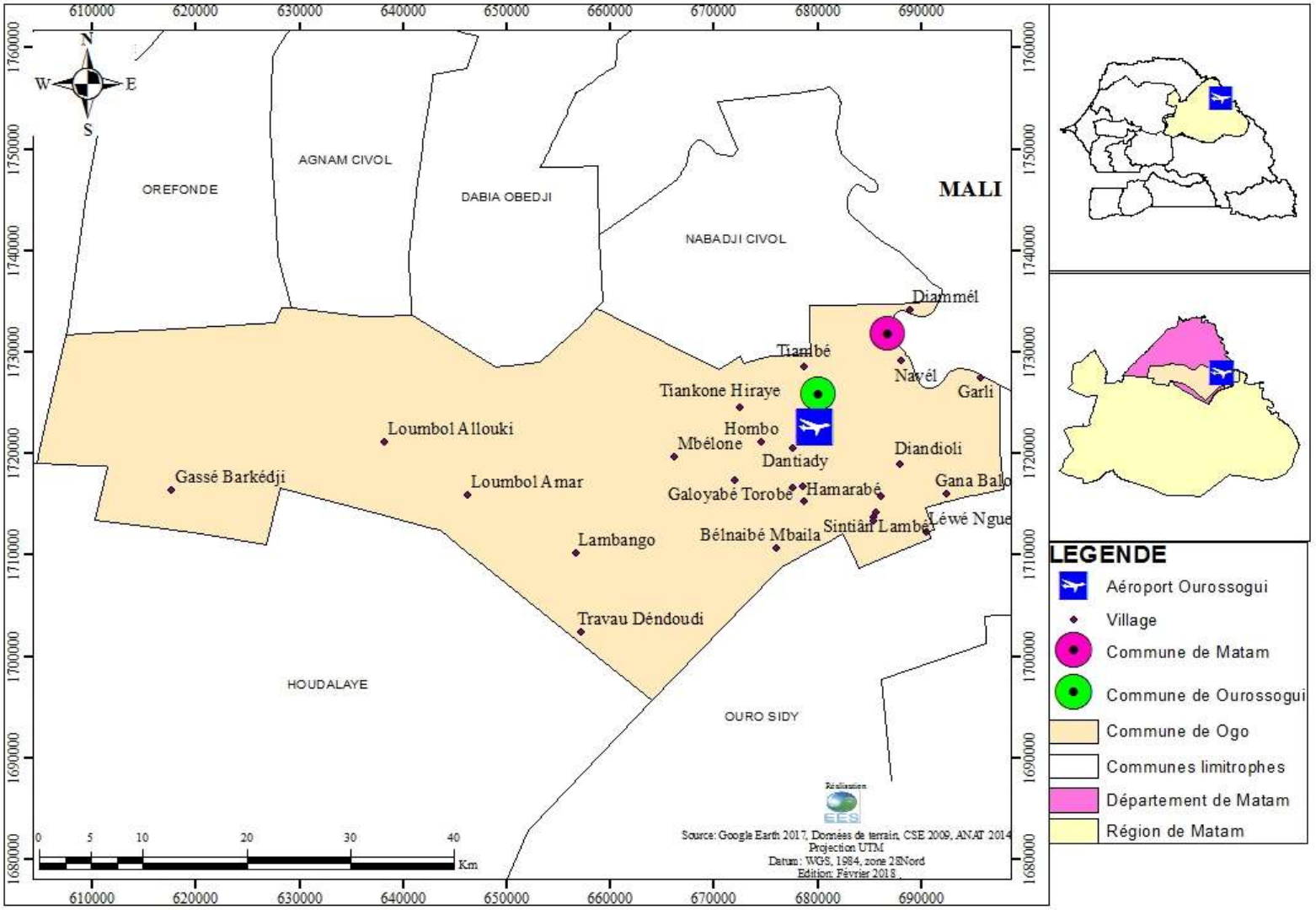
The Commune of Ourossogui, located in the southeast of the Matam Department, is surrounded by the Commune of Ogo. The municipality is limited

- to the north by the village of Thiambé;
- to the south by the village of Ogo;
- to the east by the Commune of Ogo;
- to the west by the villages of Thiancone Hiraye and Thiancone Boguel.

V.2. LOCATION OF THE AIRPORT IN THE COMMUNE OF OUROSSOGUI

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.



Map 2: Location of Ourossogui-Matam Airport

V.3. ACCESSIBILITY OF THE SITE

The Ourossogui-Matam airport is accessible by the N3 national road located 20 m from the site. The other national roads listed below also provide access to the airport:

- the N1 national road (Dakar-Thiès): from Thiès, take the N2 national road (Thiès-Louga-Saint Louis-Podor-Ourossogui);
- the N1 national road (Dakar-Thiès): from Thiès, take the N3 national road (Dakar-Thiès-Diourbel-Linguère-Ourossogui ;
- the N1 national road (Dakar-Fatick-Kaolack-Tambacounda): from Tambacounda, take the N7 national road (Tambacounda-Ogo-Ourossogui);

V.4. LOCATION AND LAND USE OF AREAS OF INFLUENCE

V.4.1. LOCATION OF AREAS OF INFLUENCE

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. It depends on the nature of the project and the natural (habitats of fauna, flora, etc.) and human environments surrounding it on which the project is likely to have an influence.

Depending on the potential sources of impacts resulting from the implementation of this project, two (02) areas of influence can be distinguished.

V.4.1.1. AREA OF DIRECT INFLUENCE

It corresponds to the right-of-way that will house the rehabilitation and operation of Ourossogui-Matam airport, an area on which the project is technically feasible (direct right-of-way area).

V.4.1.2. EXTENDED AREA OF INFLUENCE

It can be compared to all the surrounding localities (districts, towns, villages, etc.), to the establishments and activities adjacent to the airport, to the biophysical, river and marine environment. It also includes the roads and hydraulic infrastructures located in the area where the airport is located.

This extensive area of influence is divided into close and remote study areas. The extent of these areas is defined according to their physical, human or biological components concerned.

- **Nearby study area**

It corresponds to the immediate environment of the site. The biological and river environment included in this nearby study area can be circumscribed within 500 m around the airport's right-of-way area.

This delimited radius makes it possible to take into account the ecological complexes of interest potentially present near the airport but also the hydrographic network.

The human environment identifiable in the nearby study area is limited to the populations directly concerned, mainly those of the city of Ourossogui and the village of Ogo.

- **Remote study area**

The physical environment within the remote study area is defined according to the specificities of each parameter studied. Thus, hydrography, climate, geology and morphopedology are presented on a large scale covering the normal variations of each parameter and according to the data available as close as possible to the project area.

The biological environment extends 1 km from the project area. This circumscribed radius makes it possible to take into account biological homogeneity/specificity on a macroscopic scale.

The human environment extends to the Commune of Ourossogui, the Ogo District, the Matam Department, the Matam Region and the country according to themes addressed. Public consultations also follow this pattern.

V.4.2. LAND USE OF THE IDENTIFIED AREAS OF INFLUENCE

V.4.2.1. AREA OF DIRECT INFLUENCE

Corresponding to the site's right-of-way, this area is an ASECNA land title. This right-of-way is occupied by various components of the current airport.

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.

Photo 1: Dike located east of the airport

Photo 2: Garbage dump

The components of the current identified airport are:

- one (01) administrative building with a VIP lounge;
- one (01) mini solar power plant providing power supply for the ASECNA antenna;

- one (01) unmaintained lateral runway with two (02) Stop Extensions (PA) of 100 m each;
- two (02) ASECNA transmission antennas, one of which is not functional and 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.

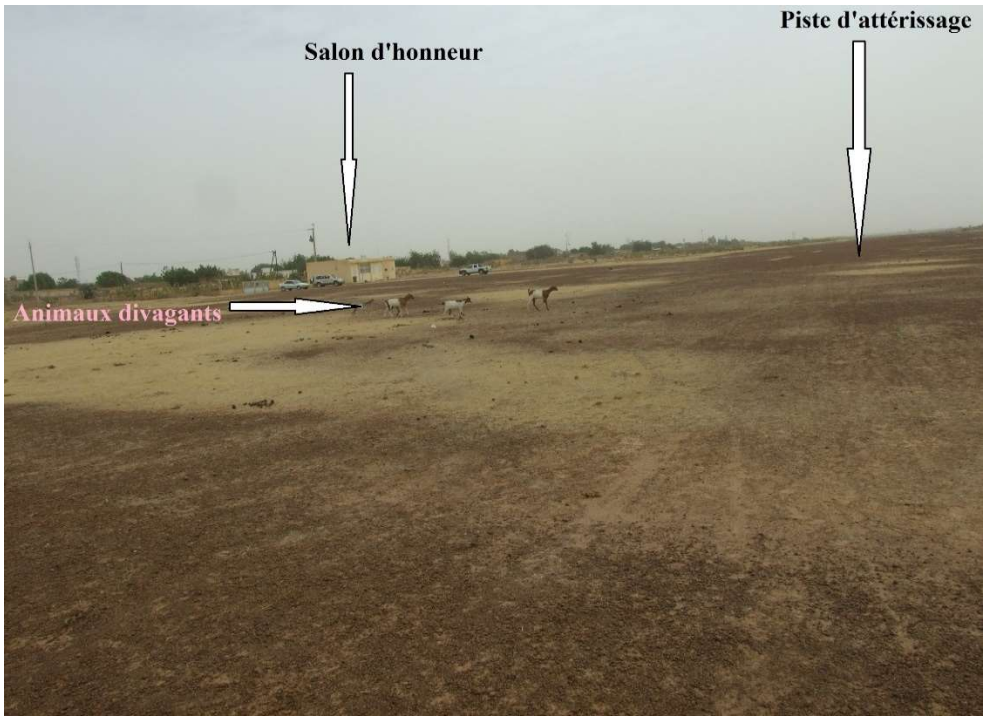


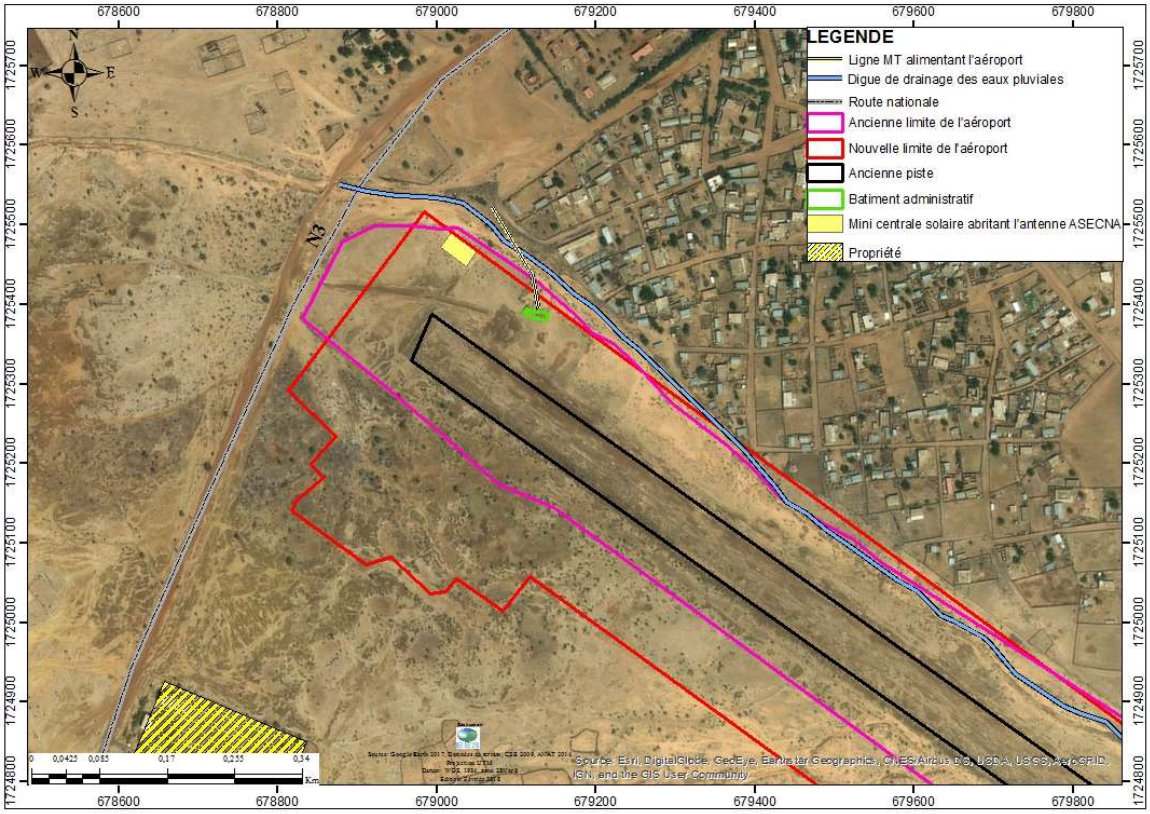
Photo 3: Ourossogui-Matam Airport

The dilapidated and destroyed fence in places favors a permanent divagation of domestic animals (cows, goats, donkeys) inside the airport.

Photo 4: Mini unit supplying the antenna

Photo 5: ASECNA antenna not working

The components of the current airport are shown on the map below.



Map 3: Identification of airport components

V.4.2.2. EXTENDED AREA OF INFLUENCE

Nearby study area

This area corresponds to the immediate environment of the Ourossogui-Matam airport site.

- **Land use north of the airport**

The airport is limited to the north and northeast by a rainwater drainage dike, a Medium Voltage (MV) line supplying the airport and houses located along the airport wall. The presence of the regional hospital is also noted at about 2.5 km.

- **Land use east of the airport**

The airport is limited to the east by houses in the city of Ourossogui and to the south-east by a bare ground with allotment boundaries. Also, a borehole at about 170 m and the N2 national road at 250 m has been identified.

- **Land use south of the airport**

The airport is limited to the south by a few unused crop fields, garbage dumps, the non-functional ASECNA antenna, a Medium Voltage (MV) line and natural vegetation mainly dominated by *acacias* and *Calotropis procera*.

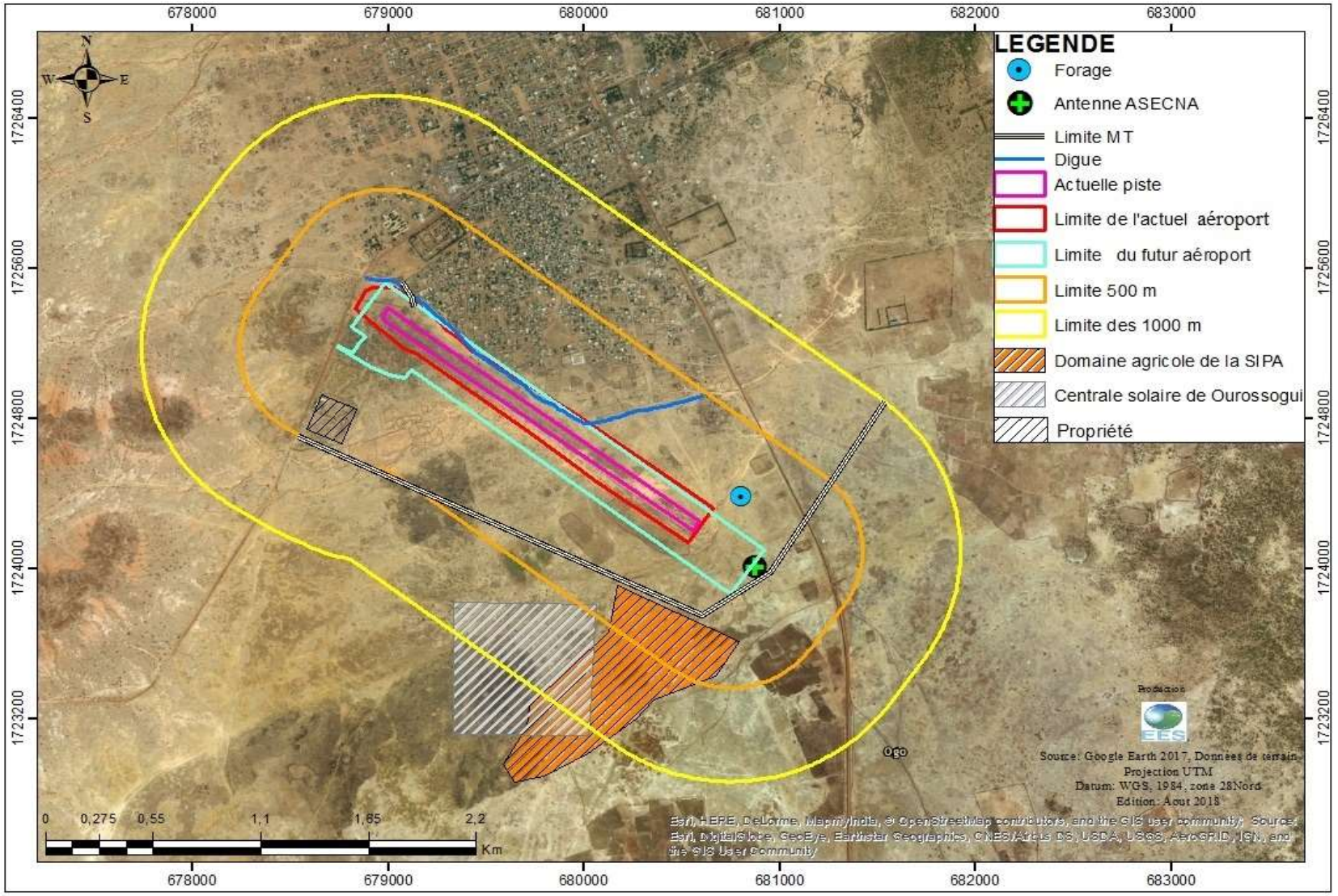
This area is marked by a fairly large gully due to intense rainwater runoff on the slope. It is also worth noting the presence of the Ourossogui solar power plant at about 500 m and the SIPA agricultural estate 200 m south of the airport.

- **Land use west of the airport**

The airport is bounded to the west by the N3 national road, a landfill of garbage and natural vegetation with the predominance of *acacias*.

Order N **003/CO/18 of 06 March 2018** closing the waste disposal site behind Ourossogui airport was issued by the mayor of the municipality (see annex 5). As a result, the landfill will be removed and the site cleaned up.

The Ourossogui Concerted Development Zone (ZAC) and a private property have been identified to the southwest of the airport. This ZAC is made up of parcels that have been allocated to the teacher interunion for the promotion of social housing. It is located in the immediate vicinity of the airport. Private property has also been identified approximately 240 m southwest of the airport.



Map 4: Land use in the project's areas of influence

V.5. DESCRIPTION OF THE PHYSICAL ENVIRONMENT

V.5.1.GEOLOGY

The Commune of Ourossogui is located in the Senegal-Mauritanian sedimentary basin of Secondary and Tertiary age. Indeed, the geological formations of this basin are composed of ancient lands largely covered by recent Quaternary deposits.

In the project area, the known outcrop formations identified are tertiary and quaternary formations.

Tertiary formations (m/e5-6; m/e5c; m/e5d; e5d and D/m/5d) are represented by Eocene age formations including :

- the Upper Bartonian Lutetian constituted by the Taïba formations which are characterized by limestones and nummulite marls;
- Lutetian characterized by Lam-Lam formations composed of limestones, marls and yellow ochre clays laminated with attapulgite, fossilifers and phosphate horizons.

The Quaternary formations (CF1, F2) known at the surface in the project area are characterized by:

- the red sands of the continental dunes made up of sands with fluvial characteristics of Pleistocene age which are based on the formation of Taïba (Upper Lutetian - Bartonian);
- recent river alluvium from Holocene alluvial formations that occupy the paleo-valleys.

The Ourossogui-Matam airport is located on alluvial formations made up of recent river alluvium.

V.5.2.RELIEF

The Commune of Ourossogui is located in a transitional zone ("***Djédjégol***") between the lands of ***Walo*** and ***Dieeri***. The *Walo* corresponds to the land cultivated in the flooded area, while the *Dieeri* refers to land that cannot be flooded by the river's floods.

The altitudes of the project area range from 0 to 60 m and those of the airport from 15 to 39 m. The highest altitudes are recorded in the upper part, especially the *Dieeri*, and the lowest in the lower part, also called *Walo*.

The municipality is located on the slope of a plateau sloping from west to east, a situation that favors intense runoff and consequently water erosion and gullying.

Thus, to counteract these negative effects of intense stormwater runoff, a drainage dike has been built. This dike crosses the north/north-east part of the airport.

V.5.3.WATER RESOURCES

The hydrological and hydrogeological structure of the delta is closely linked to the tectonic and geodynamic history of the area.

V.5.3.1. SURFACE WATER RESOURCES

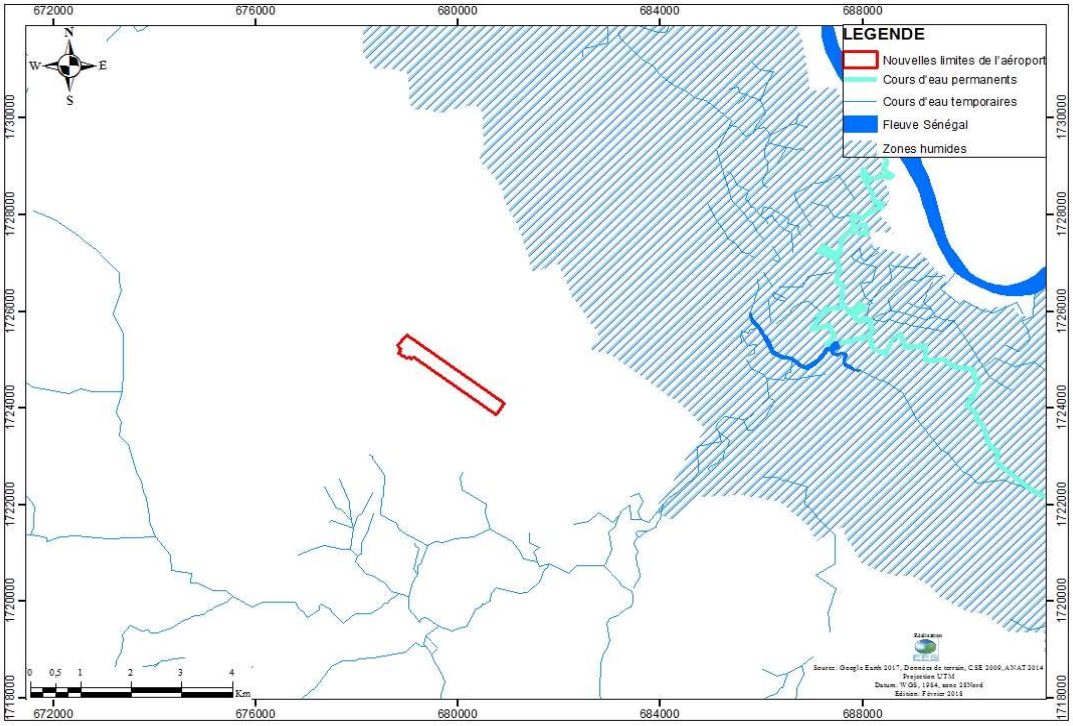
The surface waters of the Matam Region are mainly composed of the Senegal River and its main tributaries, notably the Diamel, Dioulol, Tiguéré and Braga rivers.

The Senegal River, 1700 km long, runs along the region for about 200 km to the east and north. It originates in Guinea and flows through Mali and Mauritania before flowing into the Atlantic Ocean in Saint-Louis. It is the most important watercourse in the country and its regime varies according to the seasons.

Indeed, the river records a period of high and low water, respectively, from June/July to October/November and from November/December to May/June. The river's flooding provides water for groundwater and other aquifers.

The relatively large hydrographic network of the area means that during the rainy season, all the fossil valleys fill up, making it difficult to travel throughout the *Dandé Mayo*.

There are also many water points in the project area, including marigots and perennial or temporary ponds. In the Commune of Ourossogui, ponds are located in low pressure areas such as Wendou Kanda. These temporary pools, which fill during the rainy season, are generally used as watering troughs for livestock and swimming areas for the population.



Map 5: Hydrography of the project area

V.5.3.2. GROUNDWATER RESOURCES

Groundwater in the Matam Region is quite abundant and is contained in the groundwater, the Eocene, Continental Terminal and Maestrichtian aquifers.

Groundwater is collected by wells at a depth of between 25 and 100 m. The Eocene and Continental terminal aquifers are captured between 100 and 200 m. As for the Maestrichtian aquifers, their depth can sometimes reach 300 m. The Maestrichtian and Eocene aquifers are exploited by drilling.[3]

In the Commune of Ourossogui, the exploited slicks are:

- the groundwater table captured by wells with depths ranging from 12 to 20 m;
- the groundwater of the Continental Terminal;
- the Maestrichtian tablecloth.

V.5.3.3. WATER SUPPLY TO THE COMMUNE OF OUROSSOGUI

The supply of drinking water in the Commune of Ourossogui is ensured through the operation of 04 boreholes (1 is not yet operational). These boreholes are managed by the Drilling Steering Committee. Some characteristics of these 04 holes are presented in the table below.

Table 19: Characteristics of the Ourossogui boreholes

	Aquifer captured	Roof depth	Static level	Test flow rate	Pumping rate	Folding down	Quality
F1	Continental Terminal	91 m	10.1 m	50 m3/h	47 m3/h	3.9 m	Good
F2		96 m	14.3 m	54 m3/h	50 m3/h	9.4 m	
F3	Maastrichtian	100 m	13.8 m	54.88 m3/h	50 m3/h	7.39 m	
F4		-	-	-	82 m3/h	-	

Source: DGPRE Matam, 2018

Other than these 03 boreholes, the populations of Ourossogui use wells and some ponds to satisfy their water needs and to supply livestock. This water is often used without prior treatment.

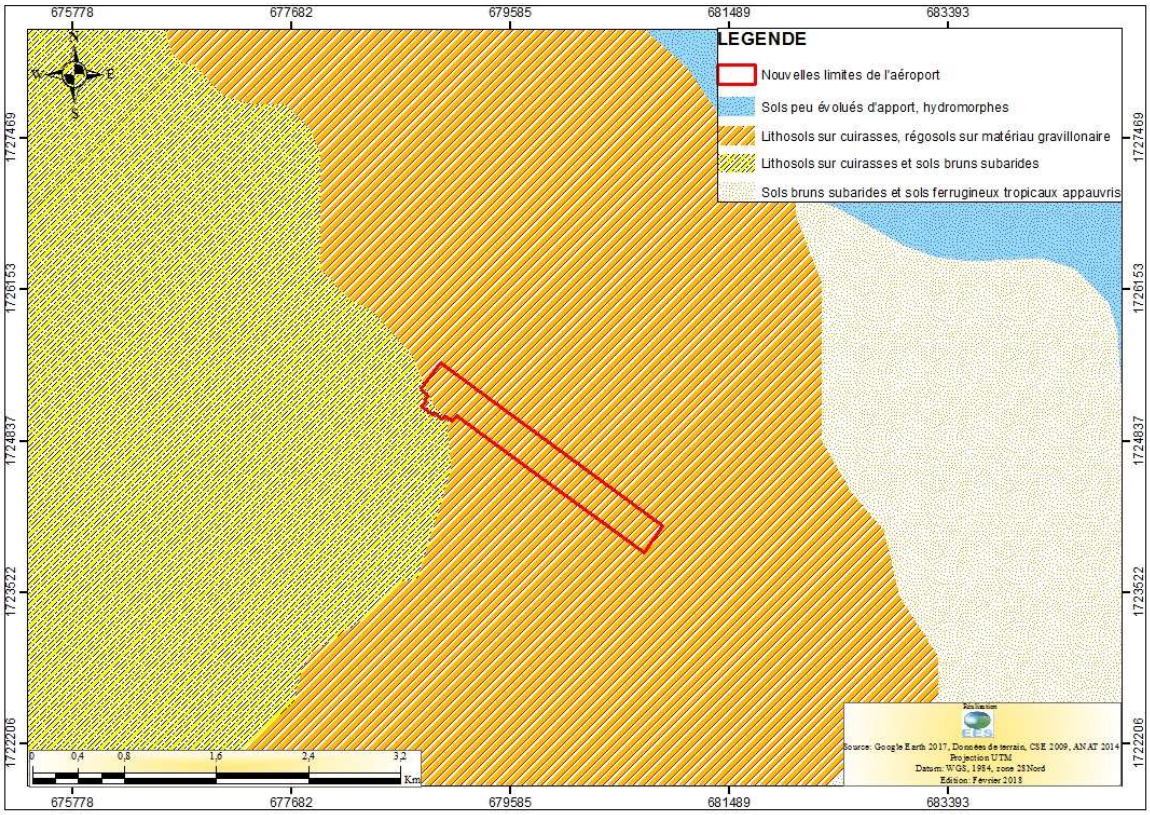
V.5.4.MORPHO-PEDOLOGICAL CHARACTERISTICS OF THE PROJECT AREA

In the project area, the types of soils identified are:

- **Hydromorphic soils on clay or *walo* material, otherwise known as *hollaldé***, which are the soils of the settling basins in the different valleys; they are very clayey, low in organic matter and have a low percolation rate;
- **Vertic or *founded* soils** that develop on river terraces or low glaciers and are influenced by fluctuations in the alluvial groundwater table; these soils have a clayey-sandy texture;
- **Sub-arid brown soils**, which are ***falo*** soils, on the banks of the river or marigots, they are made up of current deposits, from sandy to sandy-clayey texture;
- **lithosols**, which are characteristic of hill massifs, result from the intactness of rocky outcrops (granites).

[3] Regional Forest Action Plan, September 2003

The Ourossogui-Matam airport is located on lithosols on breastplates and regosols on gravel. These soils are locally covered with a thin sandy veil. The breastplates most often form vast flat areas where the ground surface is strewn with gravel and many blocks and stones of scattered breastplate, the product of their superficial dismantling.



Map 6: Morphopedology of the project area

V.6. CLIMATE

V.6.1. GENERAL CHARACTERISTICS OF THE CLIMATE

The Ourossogui-Matam airport is located in the Sahel continental climatic zone. Located between the 300 mm and 400 mm isohyets, the climate of the project area is characterized by the alternation of a long dry season from November to June, marked by the predominance of the continental trade wind and a short rainy season from July to October dominated by the monsoon flow from the St Helena High.

The study of climate data concerns the monthly averages of the various climate parameters recorded at the Matam weather station from 1987 to 2016.

V.6.2. CLIMATIC PARAMETERS

V.6.2.1. WINDS

- **Types of flows**

The project area is swept by two (02) types of flows: the continental trade wind, also known as the harmattan, and the monsoon.

- **Continental trade winds or harmattan**

The continental trade wind comes from the Saharo-Libyan High (Maghreb) and is responsible for the hot and dry continental winds. It is a flow that is very hot during the day and cool at night. This dry air flow is unable to cause precipitation. On the other hand, it is at the origin of the dust clouds observed during the dry season. Three (03) directions are assigned to it, namely the North, Northeast and East sectors;

- **Monsoon**

It is nothing more than an extension of a trade wind when it crosses the geographical equator. The monsoon comes from the St. Helena high with the western and northwestern dominant areas. It enters the country during the northern summer coinciding with wintering. This flow dominates during the rainy season and is at the origin of precipitation.

Wind direction

The analysis of the wind rose in the project area, from 1986 to 2015, shows a directional variation of the wind according to the season. It highlights two (02) distinct periods:

- the first from **November to April** coinciding with the dry season. This period is marked by the predominance of winds from the North to the East. During this period, the warm, dry easterly winds that dominate the circulation for six (06) months with frequencies that can reach 80%. From April and May onwards, the north-westerly winds that mark the transition to the end of the dry season and the advent of the rainy season are apparent;
- the second period from **June to October**, marked by the predominance of warm and humid winds from the West and South-West sectors (81.5% of frequencies). It coincides with the advent of the rainy season characterized by the circulation of monsoon flows. October, marked by the presence of northerly winds, is a transitional period that marks the end of the rainy season and the advent of the dry season.

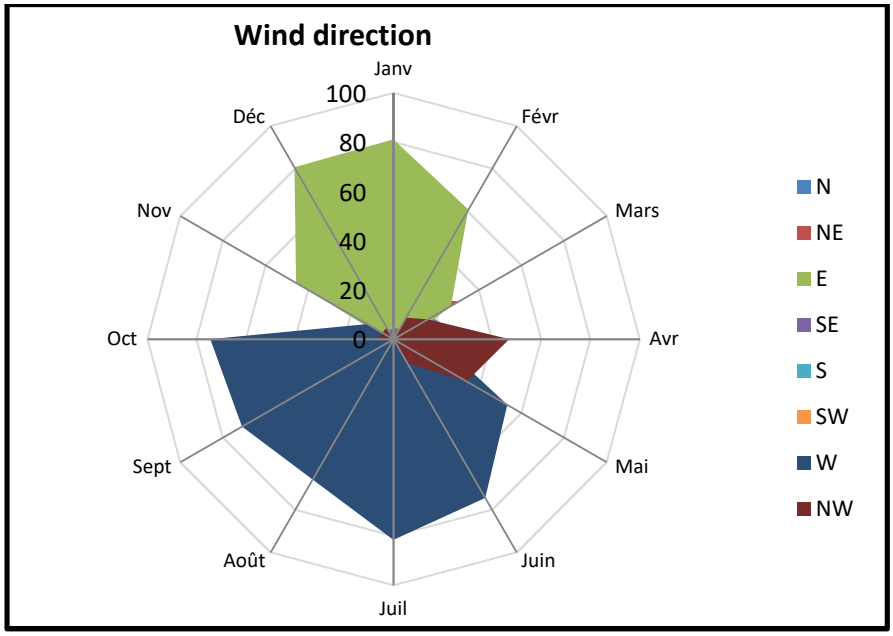


Figure 2: Percentage of dominant wind directions at Matam station, 1987-2016

Source: ANACIM 2018

- **Wind speeds**

The evolution of the curve of the monthly average wind speed is unimodal with a maximum in June (2.1 m/s) and a minimum in November (0.9 m/s). The normal from 1987 to 2016 is 1.3 m/s. The highest speeds are recorded from May to September (rainy season) and the lowest from October to April (dry season).

The figure below shows the inter-monthly variability of wind speeds.

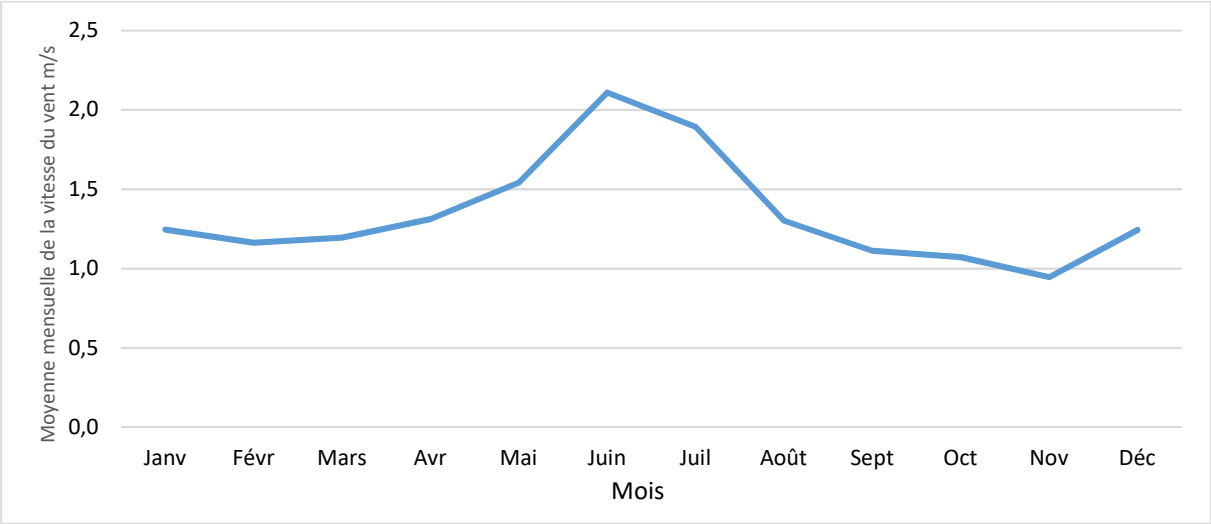


Figure 3: Monthly average wind speed, Matam station, 1987-2016
Source: ANACIM 2018

Generally, wind remains an essential parameter and its influence is important on the other parameters.

In addition, strong gusts of wind can sometimes ground aircraft. Thus, wind direction and strength must be regularly measured by electronic sensors located near the runways.

V.6.2.2. INSULATION

It is a parameter that is highly dependent on cloud cover and precipitation. The average daily duration of sunstroke in Matam is quite constant. Indeed, it varies on average between 7 am and 9 am/day. The lowest exposure values are recorded between June and September. This period coincides with the rainy season, which is marked by a fairly high cloud cover that reduces insolation. From October, the end of the rainy season, sunstroke values begin to increase slightly to reach their maximum in April with 9 h/day. The normal rate from 1987 to 2016 is 8 hours/day.

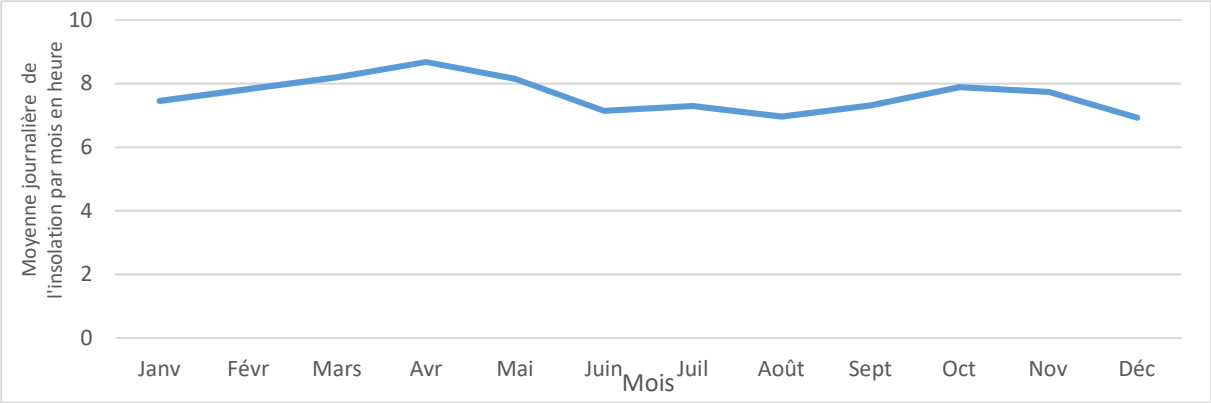


Figure 4: Average daily trend per month in insolation, Matam station, from 1987 to 2016
Source: ANACIM 2018

V.6.2.3. TEMPERATURES

The continental nature of the region and the influence of the Mauritanian desert, which is spreading its heat and dust waves, mean that Matam records fairly high temperatures throughout the year. Indeed, the normal temperature from 1987 to 2016 is 30.6°C. The lowest average temperatures are recorded between November and February. The highest temperatures are observed from March to June and September to October.

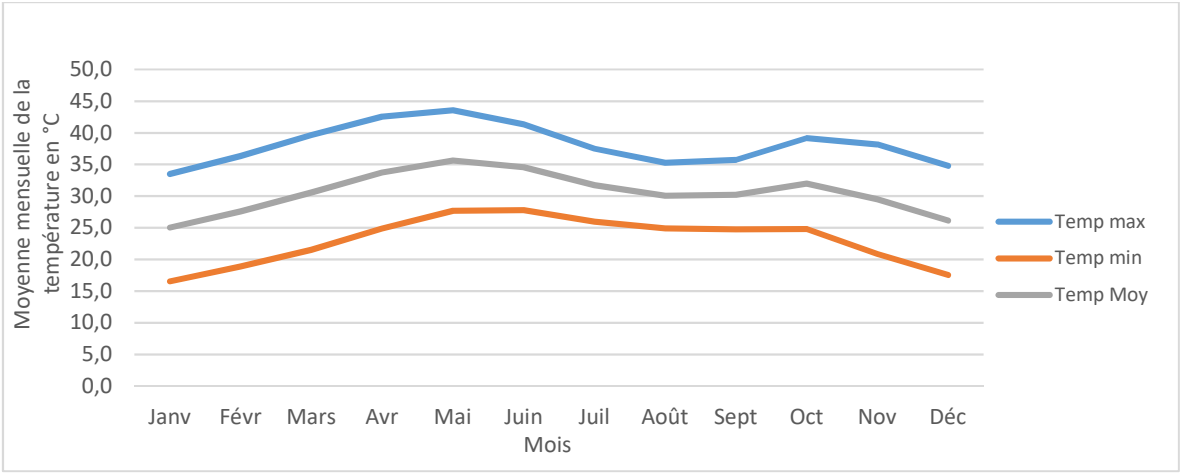


Figure 5: Evolution of monthly average temperatures, Matam station from 1987 to 2016
Source: ANACIM 2018

V.6.2.4. EVAPORATION

The monthly average evaporation curve shows a unimodal evolution with a maximum in May (328.8 mm) and a minimum in September (112 mm) in the middle of the rainy season. The normal from 1987 to 2016 is 216.4 mm.

In addition, the highest evaporation values are recorded during the non-rainy season from October to June, during which time most water bodies dry up in the project area. The lowest values are observed during the rainy season, from July to September.

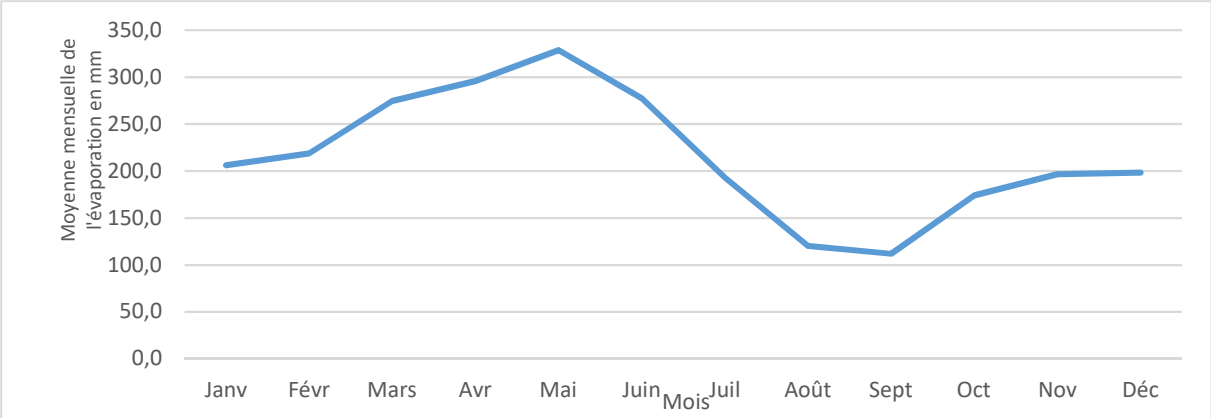


Figure 6: Average monthly evaporation rate, Matam station, 1987-2016

Source: ANACIM 2018

V.6.2.5. RELATIVE HUMIDITY

The analysis of the monthly average relative humidity curve shows a unimodal evolution with a maximum in September (71%) and a minimum in March (30%). The maximum and minimum averages follow the same trend. The normal rate from 1987 to 2016 is 45%. The most important values are recorded during the rainy season, between June and September. This is due to the presence, during this period, of the monsoon characterized by high humidity. From October onwards, humidity begins to fall and reaches its lowest level in March.

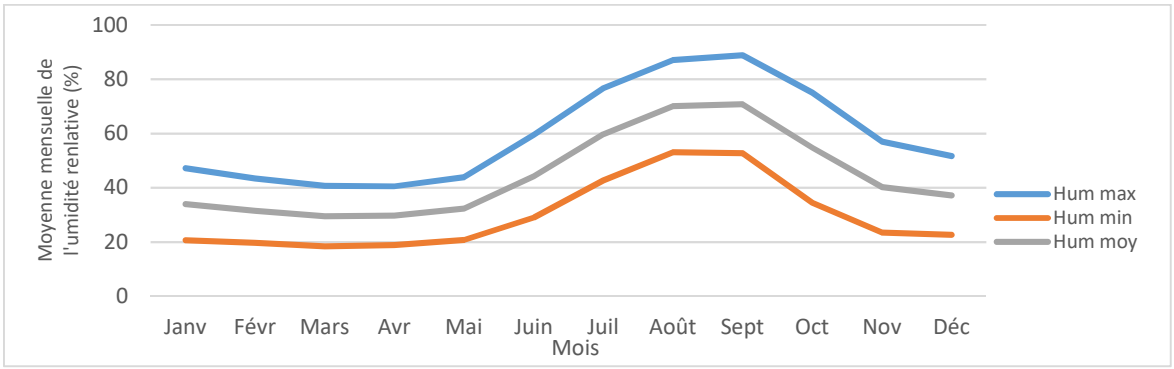


Figure 7: Monthly average change in relative humidity, Matam station from 1987 to 2016

Source: ANACIM 2018

UX: Maximum relative humidity; UN: Minimum relative humidity; UM: Average relative humidity.

V.6.2.6. RAINFALL MEASUREMENT

The Ourossogui-Matam airport is located in the Sahel continental climatic zone, between the 300 and 400 mm isohyets. Indeed, the annual rainfall accumulation in the area rarely exceeds 400 mm, the normal rainfall accumulation (1987 to 2016) is 397 mm.

The analysis of monthly rainfall is of paramount importance as it allows the monthly and interannual evolution of rainfall to be captured.

- **Inter-monthly variations in precipitation**

The analysis of the evolution of the monthly averages shows an inter-monthly variability in rainfall. Indeed, the rainy season starts in the project area in June/July and ends in October. Most of the rains are recorded between July and September. Otherwise, these three (03) months concentrate most of the seasonal cumulation. During this period, rains range from crescendo to the middle of the rainy season (August) and then begin a gradual decline towards the end of the season. The rainfall profile thus shows a single peak corresponding to the month of August, which remains the rainiest month with 159 mm.

In addition to this wintering rainfall, there is also off-season rainfall also known as "*Heug*" rainfall in January (1 mm) and February (1 mm). These rains are associated with invasions of polar air. They are generally low or insignificant, but can exceptionally reach high values.

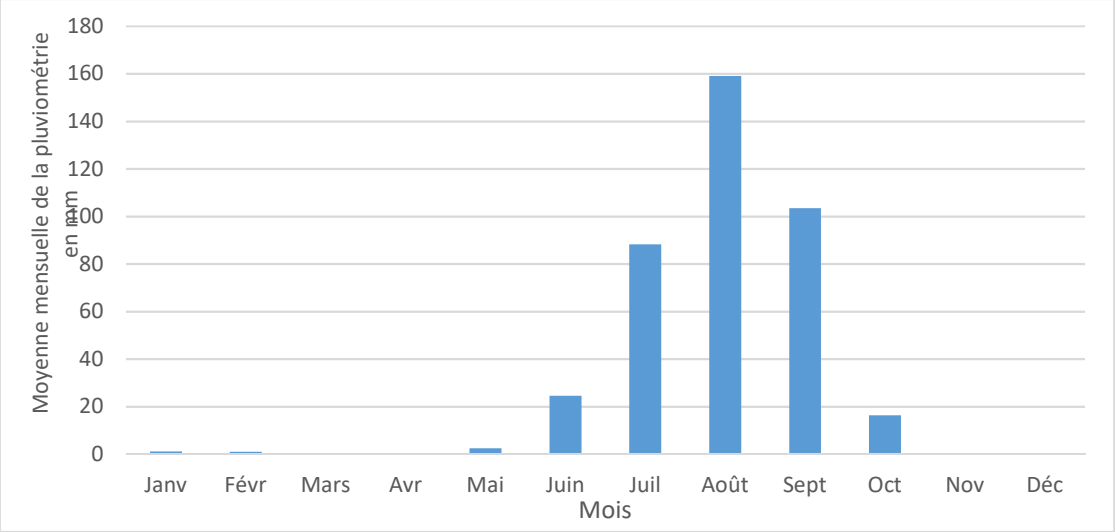


Figure 8: Average monthly precipitation trends, Matam station, 1987-2016

Source: ANACIM 2018

- **Interannual variation in precipitation**

During the rainy season, precipitation is linked to the presence of the monsoon from the St. Helena high. They are not very abundant and rarely exceed 400 mm/year. Indeed, the normal from 1987 to 2016 is 397 mm.

The analysis of the annual rainfall discrepancies shows an interannual irregularity in rainfall in Matam. Indeed, over the 1987 to 2016 series (30 years), 15 years of deficit were recorded, i.e. less than normal compared to 15 years of surplus. The year 1992 is the most loss-making year in the series with a deficit of 231.6 mm, while 2000 is the most loss-making year with a surplus of 320.3 mm. In addition, a return to normal rainfall has been noted since the 2000s.

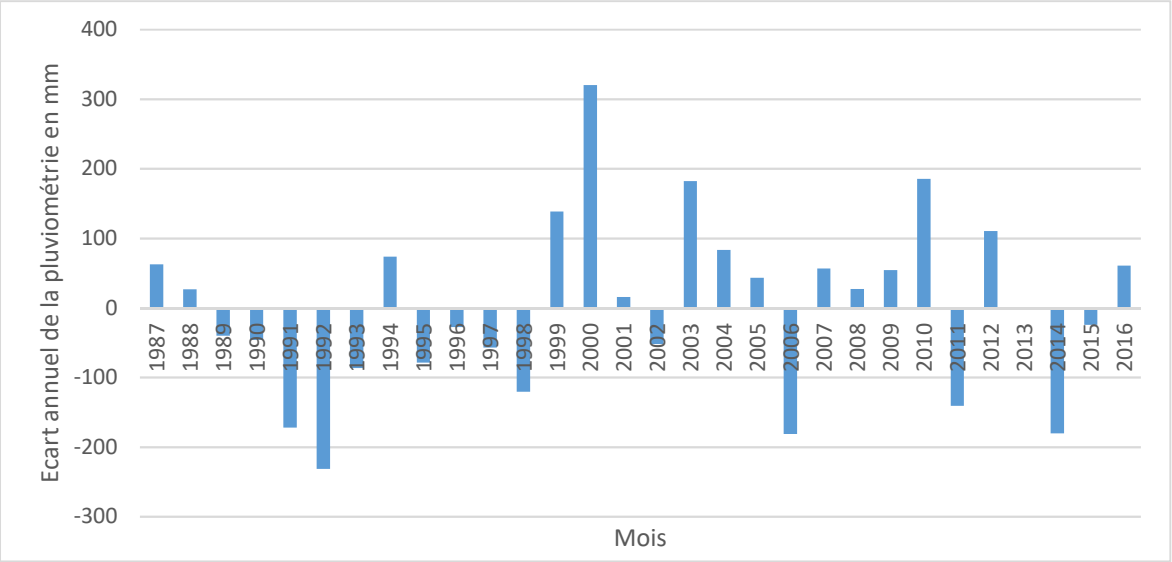


Figure 9: Interannual rainfall trends, Matam station, 1987-2016

Source: ANACIM 2018

In summary, accurate knowledge of the weather situation is essential for air traffic. Indeed, for an aircraft to take off or land, it is necessary to monitor weather conditions at the airport in addition to visual observations and the use of specific equipment such as: the ceilometer that determines the altitude and cloud layer coverage, the transmissiometer that evaluates visibility, as well as various sensors that measure current weather conditions.

The most frequent incidents related to meteorology are:

- an unfavorable wind;
- fog and/or low cloud in all seasons and at all times;
- cumulonimbus, especially during the hot season;
- low clouds clinging to the terrain and resulting in poor visibility;
- etc.

V.7. DESCRIPTION OF THE BIOLOGICAL ENVIRONMENT

V.7.1. FLORA

The Ourossogui-Matam airport is located in the Middle Valley of the Senegal River. The latter is marked by the diversity of plant formations. Indeed, there are Sahelo-Sudanese, Sahelian formations, formations on continental dunes and coastal dunes, alluvial formations, etc.

The vegetation of the Matam Region, a semi-desert area, is mainly composed of thorny species that characterize a clear savannah, a wooded to shrubby steppe. It is essentially characterized by species such as. *Acacia raddiana* (Seing), *Acacia* seyal (Sourour), *Acacia nilotica* (neb-neb), *Acacia senegal* (werek), *Balanites aegyptiaca* (Soump), *Calotropis procera* (Paftann), *Ziziphus mauritania* (Sideem), *Tamarix senegalensis. On the* banks of the river, the dominant species is the *Typha australis.* As for the grass cover, it is dominated by *Andropogon gayanus* and *Cenchrus biflorus*

The Commune of Ourossogui is located in the Sahelo-Sudanian biogeographical domain par excellence that of the wooded savannah. The main species encountered are *Acacia raddiana* (Seing), *Acacia nilotica* (neb-neb), *Acacia* seyal (Sourour), *Balanites aegyptiaca* (Soump), *Calotropis procera* (Paftann), *Ziziphus mauritania* (Sideem). The area is not very rich in plant resources. Indeed, the combination of natural and anthropogenic factors has led to a significant decline in vegetation. On the municipal perimeter, only a few relics of wooded areas remain.

The Ourossogui-Matam airport site is marked by the presence of sparse vegetation mainly composed of the species *Calotropis procera* (Paftann) frequently found on degraded soils.

Photo 6 and Photo 7: On-site vegetation

V.7.2. PROTECTED AREAS

The Matam Department has 04 classified forests (Balel, Diamel, Gaol and Lambango) with a total (cumulative) area of 12,280 ha[4]. The closest classified forest to the project site is the Balel classified forest located about 12 km away.

V.7.3. PROTECTED SPECIES

At the Ourossogui-Matam airport site, no species partially or completely protected by the Forest Code in force in Senegal has been identified.

V.7.4. WILDLIFE AND AVIFAUNA

The faunal capital of the area is declining quite significantly due to several factors, notably natural and human. However, birds are quite common in wetlands. Indeed, these areas are resting or breeding areas for birds.

Avian fauna remains the most represented class. It is characterized by a large colony of native and migratory species. The main bird species found in the area are presented in the table below.

[4] Regional Economic and Social Situation of Matam 2013, ANSD, April 2015

Table 20: Species encountered on site

SPECIES (Vernacular and scientific names)	FAMILY	ORDER
Abyssinian Rollier (*Coracias abyssinicus*)	Coraciidae	Coraciiformes
Armoured Lapwing (*Vanellus spinosus*)	Charadridae	Charadriformes
Heron, beef breeder (*Bubulcus ibis*)	Ardeidae	Pelecaniforms
White Stilt (*Himantopus himantopus)*	Recurvirostridae	Charadriformes

Source: EES, February 2016

It should be noted that only the beef heron (*Bubulcus ibis*) is fully protected by the Hunting and Wildlife Protection Code (Act No. 86-04 of 24 January 1986 and Decree No. 86-844 of 14 July 1986).

Small wildlife is also well represented with the presence of small rodents, reptiles, etc. Large terrestrial fauna is poorly represented due to the nature of vegetation, climate and anthropogenic factors. All these parameters have favored the migration of several species.

The airport site is not of particular interest in terms of wildlife resources. However, its proximity to surface waters (Senegal River and its tributaries, marigot ponds, etc.) makes it an environmentally sensitive area. Indeed, surface waters contribute to the physiological life of fauna and flora but also to the maintenance of biodiversity.

V.8. SOCIO-ECONOMIC SITUATION OF THE PROJECT AREA

V.8.1. DEMOGRAPHIC SITUATION

The Ourossogui-Matam airport site is located in the Commune of Ourossogui, Matam Department and in the region of the same name.

The population of the Commune of Ourossogui to host the Ourossogui-Matam airport rehabilitation project is estimated at 18,226 inhabitants in 2017, including 9,766 men and 8,460 women.

This population represents 6% of that of the Matam Department (317,421 inhabitants) and 3% of that of the region (654,981 inhabitants)[5]. The municipality covers an area of 15.25 km2 and has 10 administrative districts, including Aïnoumady I and II, which are the closest to Ourossogui-Matam airport.

The Halpulaar ethnic group, composed of Peulh and Toucouleurs, is the majority group in the city. The presence of Wolofs, Soninkés, Maures, Diolas, Sérères and some West African ethnic groups (Nigeria, Ghana, Cameroon, Burkina Faso, Guinea, Burundi and Zambia[6]) is also noted.

[5] Population projection of Senegal (2013-2063), ANSD

[6] Ourossogui Municipal Investment Plan, July 2012

Table 21: Ethnic distribution

Ethnicity	Percentage
Halpulaar	84%,
Wolofs	12%
Sarakolés	2%
Moors	1%
Others	1%

Source: Ourossogui Municipal Investment Plan, July 2012

V.8.2. SPATIAL PLANNING - LAND ISSUES

The distribution of the population by size shows that the traditional districts of Windé II, Mango I and Aïnoumady I have the largest human concentrations in the Commune of Ourossogui. This phenomenon is explained by the high land pressure in these districts and the way in which the space is occupied, which is not organized according to known urban planning standards.

The land base assigned to the airport is a land title. To avoid any form of illegal occupation of this area, the airport area must be precisely delimited.

V.8.3. CULTURAL, RELIGIOUS AND TOURIST HERITAGE

The cultural activities of the Commune of Ourossogui are structured through certain SCAs (Sports and Cultural Association) and the new practices of cultural days of great affluence. These cultural associations include 03 theatre groups located in the Mango, Darsalam and Windé districts.

The Windé I and II districts also have cultural organizations with the existence of 2 musical groups Gona Poury and the Rap Dream Gued Pina group.

The population of the Commune of Ourossogui is made up of a large majority of Muslims divided into the following brotherhoods: Tidjanes, Khadres and Mourides. It also has a small minority of Christians (0.5%), most of whom are civil servants. There are 24 mosques, 09 of which are large and 15 small.

Several religious events are organized annually by the faithful through *Ziarras* and *Maouloud*. On the religious level, the Commune of Ourossogui is animated by several annual religious celebrations.

Table 22: Major cultural activities of the Commune of Ourossogui

Location	Nature of cultural activities and frequency
Ainoumady I and II	1 annual Ziarra + 1 MaouLoud
Mango	3 Annual Ziarra
Modern I, II and III	3 Annual Ziarra
Windé I and II	1 large annual conference

Source: Reconstruction of PIC data from Ourossogui, July 2012

V.8.4. FARMERS', COMMERCIAL, TOURIST AND OTHER ORGANIZATIONS

From the point of view of the social organization of the populations, the Commune of Ourossogui is characterized by the presence of many associations and social organizations. These organizations are located both locally and abroad. They are active in many sectors of the economic and social development of the Commune of Ourossogui. Among these, it is worth mentioning among others:

- the Union of Nationals of Ourossogui (URO) created in 1975 and bringing together nationals (France, Gabon, Dakar...) and residents of the municipality. Its many achievements are mainly focused on education and the control of the distribution of drinking water throughout the city;
- the Association for the Development of Ourossogui (ADO) created in 1980 on the initiative of emigrants (notably the French section) and focusing on socio-economic activities. It is in partnership with Non-Governmental Organizations such as the Drôme-Ourossogui Senegal Association (ADOS) and the Integrated Podor Project (PIP) in the fields of food aid, cereal banks, and the construction of the social and literacy center;
- the Solidarity Association for Franco-Arab Development and Education and Literacy of the River zone (ASDEFAAF), initially oriented towards teaching Arabic, is currently conducting development activities (fattening sheep and market gardening);
- the 90 women's promotion groups grouped within the communal council with many fields of activity despite the lack of supervision, training and above all the difficulties of access to sources of financing;
- youth associations, in particular the 13 CSAs in the various districts;
- socio-professional associations evolving mainly around income-generating activities such as trade with the Union Nationale des Commerçants et Industriels du Sénégal (UNACOIS);
- craftsmanship with the Ourossogui Craftsmen's Group (GAO).

Other socio-professional entities of the EIG type exist in the municipality. They are involved in such varied fields as livestock farming, small business or credit savings (Tontines). These better structured and supervised associations represent a great potential for the development of the municipality in the implementation of many of its projects.

Table 23: Some associative movements and their fields of activity

Associative movements	**Number of people**	**Fields of activity**
GPF, GIE, CSD and other women's groups	90	Micro-credit, milk processing, trade, poultry farming, sheep fattening, cereal processing, dyeing, sewing, catering, breeding, market gardening, etc.
Youth associations	15	Football, dancing evenings, martial arts, reforestation, theatre, conference, *set-setal,* etc.
Sports and cultural associations, socio-cultural, socio-professional and civil society associations	25	Sport, cultural events, socio-professional activities, etc.

Source: Ourossogui PIC, July 2012

V.8.5. VULNERABLE GROUPS IN THE PROJECT AREA

The latest poverty line survey conducted in 2010-2011 in Senegal showed that the proportion of people living below the poverty line had gone from 55.2% in 2010 to 48.3% and 46.7% in 2011. The most vulnerable social groups are included in this rate of the national population considered poor.

The following criteria have been used to characterize poverty in the Matam Region, according to the following social classes:

- **the rich** (**4% of the** population) are those who have means of subsistence and access to leisure, and have the financial capacity to invest;
- **the least wealthy** (**46%** of the population) are those who can only cover the daily expenses or who have a breadwinner to do so;
- **the poor** (**50% of the** population) are those who have no means of subsistence and are almost dependent on other social classes to survive.

It is also worth noting that people with disabilities are organized through the Council for the Rehabilitation and Integration of Disabled Persons (CORIPH). This association was set up in 2009 and counts among its members the physically handicapped, the deaf and dumb, the visually impaired, etc. The members of the association have the ambition to receive training in current professions and to promote them by accessing funding for Income Generating Activities (IGAs).

V.8.6. BASIC INFRASTRUCTURE

V.8.6.1. EDUCATION

The Commune of Ourossogui is marked by the coexistence of formal education (teaching French) and informal education relating to the teaching of the Koran, Arabic and literacy.

The schools available to the Commune of Ourossogui are listed in the following table.

Table 24: Schools in the Commune of Ourossogui

School establishment	Private	Public	Total Total
Nursery/pre-school	-	03	03
Elementary	-	05	05
Average teaching	01	01	02
Secondary education	-	01	01
Professional training	-	01	01

Source: Ourossogui ICP, July 2012, Commune of Ourossogui

Non-formal education is represented by the Koranic school practiced through the many "*Daaras*", Islamic institutes and literacy classes. The municipality has 02 Islamic institutes and 72 *daaras*. Literacy supported by NGOs has 05 classes.

The school infrastructures of the Ainoumady I (Ourossogui I primary school, kindergarten of the same name) and Ainoumady II (primary school) districts are the closest to the site.

V.8.6.2. HEALTH

The Matam Region is divided into 04 health districts (02 in the Matam Department, 01 in the Kanel Department and 01 in the Ranérou-Ferlo Department).

It has one (01) single hospital dating from 1973, 05 health centers, 75 health posts, 52 health huts and 29 pharmacies.[7]

In the field of health infrastructures, the Commune of Ourossogui has:

- one (01) regional hospital center;
- three (03) health posts, one of which is under construction;
- two (02) pharmacies;
- three (03) private pharmacies.

The regional hospital located about 2.5 km away and the Ainoumady health post about 2 km from the site are the health facilities closest to the airport.

V.8.6.3. DRINKING WATER SUPPLY

Access to water for the population in the city of Ourossogui is based on the 03 boreholes available in the municipality. For these hydraulic structures, the two (02) produce 47 m3/h and 50 m3/h respectively, and operate on average 7 h/d. The third borehole with a production of 50 m3/h operates continuously. These boreholes are managed by the Drilling Steering Committee. The exploitation of these boreholes ensures that the water needs of the local population and livestock are met.

The populations of Ourossogui also use the water from wells and certain ponds to meet their needs and supply livestock. This water is often used without prior water treatment.

V.8.6.4. SANITATION

The city of Ourossogui faces huge sanitation problems, including sewage disposal, rainwater drainage and household waste collection.

- **Wastewater drainage**

There is no sewerage system in the city. This type of waste is managed individually and is managed through septic tanks that are emptied periodically. These emptying operations are carried out by the town hall's pumping tank, which it rents to users to empty the pits.

- **Rainwater drainage**

The city does not have a stormwater drainage system. The only existing structure is the stormwater drainage dike built on the northwestern edge of the city and approximately 3 km long. This dike crosses the airport in its northern to northeastern part.

[7] ANSD/SRSD de Matam : Situation Economique et Sociale Régionale 2013, published in April 2015

- **Household waste collection**

The collection of household waste is carried out by the town hall, which has collection equipment and staff. The equipment and staff are distributed as follows:

- 2 tractors each with a dumpster for garbage collection;
- 15 people divided into teams of 04 elements per tractor, 04 elements on the public road and 03 at the bus station.

The city has neither garbage cans nor public dumpsites and collects almost no Household Waste Tax (T.O.M) to properly take charge of this service. As such, the municipality has initiated a project entitled Mobilisation and Concerted Planning for Waste Management and the Environment in Ourossogui (MODECO) whose action plan includes among others:

- the development of a concerted landfill;
- the management of wild deposits;
- the construction and rehabilitation of school sanitary blocks;
- environmental capacity building;
- the revitalization of school latrine management committees.

V.8.6.5. ENERGY

The energy needs of the Municipality of Ourossogui are met by SENELEC through its interconnected network. The municipality houses a substation for connecting the hydroelectric network of the Manantali power plant. The airport's electricity supply is provided by SENELEC. However, the airport has a mini solar power plant to supply the ASECNA antenna.

V.8.6.6. TRANSPORTATION

In the Matam Region, there are 3 transport networks listed below.

- **Road transport**

There is a fleet of 2872 vehicles, all categories combined. The general condition of the road network is poor, especially for unpaved roads and tracks. Urban transport is almost provided by "*clando"* taxis, with an outdated fleet. Intercity transport is provided by 7-seater vehicles, coaches (12, 15, 19 seats) and buses with 60 seats.

- **Inland waterway transport**

It is provided by canoes to serve the localities along the river. Thus, a large number of people and large quantities of goods are transported daily from one locality to another along the river.

- **Air transport,**

With a runway approximately 1,700 m long and 30 m wide, The Ourossogui-Matam airport is the only airport infrastructure in the region. It is characterized by four types of aircraft flights: official visit flights, military flights, private flights and commercial flights. During 2013, 57

aircraft landed at the region's airport and allowed 957 passengers to tread the tarmac of the airport[8].

V.8.7. SOCIO-ECONOMIC ACTIVITIES

V.8.7.1. AGRICULTURE

Agriculture in the Commune of Ourossogui is essentially rain fed and is characterized by food crops such as millet, maize, sorghum and rice. This activity is carried out on the floodplains that separate the municipalities of Ourossogui and Matam.

The following table shows the amount of speculation by the Matam Department for the 2014/2015 season.

Table 25: Food crop season 2014/2015 for the Matam Department

Millet	Sorghum	Corn
2109 tons	263 tons	71 tons

Source: SES Regional Matam 2013 published in April 2015

It should be noted that in the immediate environment of the airport site, the land is not used for agricultural purposes. Indeed, they are made up of lateritic quarries and sparse vegetation mainly composed of *Calotropis procera* (Paftann) frequently found on degraded soils.

V.8.7.2. BREEDING

Livestock farming occupies a prominent place in the economy of the Matam Region. Indeed, the importance of livestock is visible through its number and diversity. The Commune of Ourossogui is located in the Matam Department, which is a pastoral area. The livestock consists of cattle, sheep, goats, horses, asses, camels. The municipality is marked by the lack of pastoral areas, which leads to a migration of livestock. The composition of the livestock is detailed in the following table.

Table 26: Livestock composition during the 2014 / 2015 season

Cattle	Sheep	Goats	Asins	Equines	Camelins
135200	213500	116000	16230	13790	115

Source: SES Regional Matam 2013 published in April 2015

V.8.7.3. FISHING

In the Matam Region, fishing is practiced on the Senegal River, which borders the region for a distance of 200 km, as well as on its tributaries and ponds. Of the 2709 fishermen and 1130 pirogues in the Region, the Matam Department contains 70% of the fishermen and 65% of the pirogues. The volume of catches increased from 2201.16 tonnes in 2013 to 2021.746 tonnes in 2014. The Matam Department recorded 1243.15 tonnes in 2014.[9] To meet its needs, the region is obliged to import fishery products. The processing of fishery products is a very timid activity in the region, given the low level of production compared to demand.

[8] ANSD/SRSD de Matam : Situation Economique et Sociale Régionale 2013, published in April 2015

[9] ANSD/SRSD de Matam : Situation Economique et Sociale Régionale 2013, published in April 2015

V.8.7.4. CRAFTS

There are several trades (production, services and arts) in this sub-sector that provides a large number of jobs. In 2014, there are 2063 craft companies registered with the Matam Chamber of Trades, including 907 belonging to the "Production" section, 126 to the "Service" section and 1030 to the "Art" section. Craft activities are essentially made up of sewing, hairdressing, weaving, wood and metal carpentry, shoemaking, product processing, jewelry, sculpture, dyeing, pottery, blacksmithing, etc. These activities are carried out in the heart of the city center or in the neighborhoods.

V.8.7.5. TRADE

The Matam Region has 81 permanent markets and 19 weekly markets. The Matam Department has 28 markets[10]. Trade includes several actors who sell products from all sectors of activity (agricultural products, livestock, fisheries, food and construction products). The crossroads of the city of Ourossogui and the border position of the project area with Mali and Mauritania make the development of commercial activities favorable. The only permanent market in the municipality is about 2 km from the airport site.

[10] ANSD/SRSD de Matam : Situation Economique et Sociale Régionale 2013, published in April 2015

VI.ANALYSIS OF VARIANTS

VI.1. METHODOLOGY

The variant analysis is a chapter of the ESIA that allows comparisons to be made between different technological options and the potential for development of facilities within the land right-of-way, in order to provide the best possible option. This chapter also examines the "no project" option, which provides the rationale for the project's rationale.

This analysis, based on the advantages and disadvantages of each option studied, will optimize the promoter's choices in terms of safety, economic, social and environmental aspects.

To do this, the analysis of the variants was carried out for the following topics:

- the "no project" option;
- the demolition variants of existing structures;
- the refueling variants.

The site variants for this project have not been studied insofar as the project concerns the rehabilitation of Ourossogui-Matam airport, whose right-of-way is already clearly defined.

VI.2. "NO-PROJECT" OPTION

One of the first options that frame the project is the "no project" option. This option will not make it possible to achieve the objectives of the Emerging Senegal Plan, which aims to make the country a regional air transport hub by focusing on three (03) pillars: the commissioning of the Blaise Diagne International Airport (effective since 07 December 2017), the start of the national fleet's activities under the supervision of Air Senegal SA and the rehabilitation of regional airports. If this last pillar is not achieved, this flagship PES project will not be effective.

Moreover, not to carry out such a project is equivalent to maintaining the isolation of inland regions and the low level of domestic air transport traffic, which will result in a reduction in the country's connectivity and interregional trade.

From an environmental point of view, the option not to carry out the project would avoid all the negative impacts associated with airport rehabilitation work and operations. No pollution or nuisance would therefore be generated.

The situation of the receiving environment will be under the sole influence of its usual management method. However, the purpose of this study is to demonstrate that with the rehabilitation work, no significant changes will be noted in the environmental characteristics of the study area.

From a socio-economic point of view, not carrying out such a project would mean compromising the economic development of the areas concerned by the loss of business opportunities (commercial activities) around the site induced by the demolition work, reconstruction and airport operations. In addition, employment opportunities for workers in the

area will be lost as well as this additional opportunity to develop expertise and train the local workforce through technology transfer.

On the basis of this analysis, the airport rehabilitation project is essential to enable air transport to be optimized by bringing them up to standard.

VI.3. VARIANT OF DEMOLISHING THE EXISTING BUILDINGS

Rehabilitation work will begin with the demolition of existing structures within the airport. This demolition will concern the passenger terminal building, as well as the complex consisting of the control tower and the technical block.

Before starting work, it is essential to carry out a complete and thorough examination of the building to be demolished, as well as the structures and sites adjacent to it. This stage of preliminary studies is not the least important. It requires sufficient time and resources to carry it out.

In addition to diagnosing the structures to be demolished, this study makes it possible to define the types of waste produced, quantify them and propose a recovery and disposal process for each type of waste.

Following this phase, the contracting authority can define the most appropriate demolition method that integrates both the economic aspect and good control of nuisances and risks.

Thus, several techniques can be used to carry out this destructuring phase. Within the framework of this project, three techniques, mechanical deconstruction, demolition by cutting and demolition by explosives, were analyzed.

The table below highlights the advantages and disadvantages of each of these techniques.

Table 27: Advantages and disadvantages of demolition alternatives

Demolition variant	Advantages	Disadvantages
Demolition by explosives	Reduced intervention times; Limitation of the impact area of the materials; Possibilities to direct the fall of the building; Efficient and economical technique.	Requires in-depth technical know-how and a great knowledge of structures; Requires specific organizational and security rigor; Increased risk of material spills, landslides, collapses and fires; Waste is mixed and sorting is difficult; Produces a lot of dust and noise and vibration pollution.
Demolition by cutting	Precision of the cuts ; Absence of shocks; No vibration; Safety of implementation; Allows access to difficult areas; Preferable technique in case of partial demolition.	Expensive equipment (diamond tools and concretion tools, thermal, electric or hydraulic saws, torches); High noise level ; Need to use experienced staff; Smoke emissions (cutting by torches).

Demolition variant	Advantages	Disadvantages
Mechanical deconstruction	Possibility of selective sorting of material waste; Possibility of using a new generation mechanical excavator with misting system; Allows water to be injected just before the concrete cracking for dust collection; Noise pollution reduced by the use of crunchers instead of rock breakers.	Requires a careful analysis of the building; Meticulous, complex and technical work, Its implementation requires more time.

- **Conclusion on the selected alternative**

The analysis of the table shows that deconstruction is the best method of demolition because it makes it possible to combine increased safety with the control of noise and vibration pollution.

This option thus makes it possible to preserve the safety of buildings not concerned and people working around the airport demolition site.

Photo 8: Mechanical shovel deconstruction

Source: www.sned.fr

This deconstruction makes it possible to separate the different categories of materials, remove hazardous waste and recover certain elements. Moreover, in 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.

VI.4. LIGHTING VARIANT

Any airport must have a lighting system. It is used to guide aircraft approaching the airport, those about to take off, those heading for the apron, etc. It also ensures the safety of airport staff, passengers and aircraft. This type of lighting must be placed on the edges of the runway, the end of the runway and the threshold, but also on the stop lines and edges of the taxiway (aircraft taxiway).

Several types of lighting can be used in airport operations. In this subsection, three (03) of them will be compared, namely halogen lighting, low-energy lighting and solar lighting.

The table below highlights the advantages and disadvantages of each of the above-mentioned systems.

Table 28: Advantages and disadvantages of lighting variants

Lighting variant	Advantages	Disadvantages
Halogen lighting beaconing	Instant ignition Warm color Low prices	Short life span Low light output Warming up during operation
Low consumption lighting	Good light output Average life span Moderate price	Fragile Low resistance to on/off cycles Slow ignition Presence of mercury UV emission
Solar lighting beaconing	Excellent light output Long service life Good resistance to on/off cycles Recyclable	Very high price Eye Hazards with Blue Shade Blisters

- **Conclusion on the selected alternative**

The analysis of the table shows that solar beaconing is the most appropriate system for this project. However, given its high cost, this option becomes economically dissuasive. Thus, the option chosen remains halogen lighting. Indeed, its acquisition is much easier than the two (02) other types of markings. To optimize your light output, you should just choose bulbs that provide a higher lumen.

VII. PUBLIC CONSULTATION AND INFORMATION DISSEMINATION

Public consultation is a constituent element of the Environmental and Social Impact Assessment. It promotes the free expression of the perception of a project by representatives of all categories of stakeholders (administrative authorities, state technical services, local populations).

Indeed, it is a regulatory process, set out in the Environmental Code by Ministerial Decree No.° 9468 MJEHP-DEEC of 28 November 2001 regulating public participation in environmental impact assessment. This communication exercise allows the assessment of the level of acceptance of the project by the stakeholders, which corresponds to its socio-institutional validation.

The objectives of the public consultation are essentially:

- to inform stakeholders about the project to rehabilitate Senegal's regional airports;
- to gather their opinions and concerns in relation to the components, objectives, issues and priorities of the project;
- to collect the recommendations of the stakeholders met, the application of which will improve the viability of the project in its host environment;
- to collect updated data on the locality, department and region from the technical services of the State and local authorities, which will make it possible to understand the initial situation in the project area.

VII.1. ADOPTED METHODOLOGY

In order to achieve the objectives set, the methodology used proposes the following phases:

- identification and contact with the various stakeholders, through written correspondence. These provide general information on the start of the project's ESIA and include a summary project description and a site location map. At the same time, a request for a meeting is specified in the letter;
- the organization of meetings with the targeted actors, the objectives of which are to better address the project and place it in its context. These meetings also make it possible to identify the economic, social and environmental impacts of the project and to initiate the necessary reflections in order to propose appropriate solutions;
- the development of the public consultation report that will provide the promoter and decision-makers with a better understanding of stakeholders' views on the project in order to take them into account as the project progresses.

VII.2. SCHEDULE FOR CARRYING OUT PUBLIC CONSULTATIONS

The public consultations were conducted in three (03) phases, which are:

- the preparation and filing of preliminary newsletters and appointments;
- meetings with the various targeted stakeholders;
- the drafting of the reports of the exchanges made during the public consultations.

These steps lead to the drafting of the chapter on public consultation.

VII.3. IDENTIFICATION OF STAKEHOLDERS

AT THE NATIONAL LEVEL

At the national level, the following structures were encountered:

- Senegalese Aerodromes Directorate (ADS);
- Blaise Diagne International Airport (AIBD);
- National Agency for Spatial Planning (ANAT);
- Airport Infrastructure Department ;
- High Authority of Senegal Airports (HAAS)
- Civil Protection Directorate (DPC);
- Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA);
- National Agency for Civil Aviation and Meteorology (ANACIM);
- General Directorate of National Security (DGSN);
- General Customs Directorate (DGD);
- National Police;
- SMCADY.

In the private sector, we have identified the following stakeholders.

- SONATEL ;
- TIGO ;
- EXPRESSO ;
- AGEROUTE ;
- EDS ;
- SONES
- SENELEC ;
- ONAS.

At regional and departmental level

The following **administrative authorities were** met.

- Governor of the Matam Region;
- Prefect of Matam;
- Matam County Council.

Among the **decentralized technical services of the State** we can mention the following:

- Regional Division of Environment and Classified Establishments of Matam ;
- Regional Water and Forest Inspectorate of Matam ;
- Matam Regional Labor and Social Security Inspectorate ;
- Matam Regional Sanitation Service ;
- Matam Hygiene Department;
- Regional Directorate of Rural Development of Matam;
- Matam Regional Hydraulics Division ;
- Regional Department of Urban Planning of Matam;

- Regional Livestock Service of Matam ;
- Matam Land Registry Office;
- Regional Service of Territorial Development of Matam ;
- Regional Planning Service of Matam;
- Regional Service of Statistics and Demography of Matam;
- Matam Fire and Rescue Company (fire brigade).

At the local level

The structures and authorities concerned by this consultation are as follows:

- Municipality of Ourossogui;
- Commander of Ourossogui-Matam Airport;
- Matam Regional Development Agency ;
- Support Center for the Local Development of Matam.
-

The populations of the districts listed below were also met:

- Aïnoumady district 1 ;
- Aïnoumady district 2.

VII.4. RESULTS OF THE PUBLIC CONSULTATIONS

Following public consultations with stakeholders, the results obtained are expressed in terms of criteria, acceptability, formulation of fears, concerns and strong recommendations.

VII.4.1. PERCEPTION OF THE PROJECT BY ADMINISTRATIVE AUTHORITIES, LOCAL ELECTED OFFICIALS AND DECENTRALIZED TECHNICAL SERVICES OF THE STATE

The administrative authorities, local elected officials and technical services in the Matam Region have all welcomed and extolled the airport's rehabilitation project. According to almost all the parties consulted, it plays an extremely important economic role not only because of its geographical position but also because of the development of the tourism sector in recent years.

However, despite the enthusiasm shown, they did not fail to make strong recommendations to the firm and the promoter for a better analysis of the environmental and social impacts that the project could generate as well as their effective management through the application of optimal management measures. In addition, coordination between the various services involved in the rehabilitation of the airport will have to be ensured. The following table is a summary of the opinions, fears and recommendations issued during these meetings.

Table 29: Results of consultations with administrative authorities, local elected officials and technical services in Matam

Consulted Stakeholders	Opinions, fears	Recommendations for action
Governance of the company	- This project is promising and attractive - It will provide the region with the capacity to initiate the development of various projects, including tourism	- Consult the populations in order to imbue them with the project and gather their opinions - Public information and participation are extremely important
Prefecture	- The prefecture will support the firm in carrying out its study (deputy prefect) - If necessary, reschedule another meeting to find the prefect on site, absent from the region.	- Share documents on the configuration of the installations, and all other documents likely to best inform the administrative authority
Municipality of Ourossogui	- The airport is fundamental for the city of Ourossogui - Any relocation can only be done outside the Commune, which no longer has any space available. - Ourossogui wants this infrastructure to remain in the Commune - For rehabilitation, there is enough space - The increase in length will be limited by the presence of RN3 - There are many unemployed young people and graduates in the area	- An extension is possible on the side of the ZAC - Informing the population of the existence of the project - In the event of relocation, inform the population in real time - Involve the population in the implementation of the project - Consult with the populations and support them in the event of relocation - Focus on local employment
Advice departmental	- The neighborhoods adjacent to the airport are traditional neighborhoods - These inhabitants have permits to occupy and they are the first dwellings of the commune - A dike, a waterway, crosses the airport from end to end	- Avoid accidents during the delivery of construction equipment and materials - Set up a recruitment committee led by the Departmental Council - If the airport is not relocated, extend it if possible to the ZAC side - Improve the dike and do not obstruct the natural waterway
Regional Division of Environment and Classified Establishments	- It is a development project that involves many challenges - Matam is a new region that suffers from a lack of infrastructure; everything needs to be built - This project will help to open up the region and open up the region to the rest of the country by making it easier to access - It will help to lay the first groundwork for the development of local tourism - Currently the military is staking to avoid the animals' divagation when a flight is scheduled to land at Ourossogui-Matam airport. - Apart from the high heat, there are dust peaks at certain times of the year that can be a risk for aircraft navigation	- Take into account the proximity of the solar and thermal power plants to the airport and analyse their effects on aircraft airworthiness - Check if the extension does not encroach on the Commune of Ogo - Integrate the facilities around the airport into the hazard study - Conduct a census of all activities around the airport in case of travel - Involve the population - Provide a comprehensive plan of the airport with the location of all facilities planned by the project

Consulted Stakeholders	Opinions, fears	Recommendations for action
		- Include in the report the necessary means of fighting the fire - Integrating the environmental dimension into CADs - Fund study tours and training to strengthen the capacity of the local technical committee ideally before the project starts
Regional Water and Forest Inspection	- It would first be necessary to know the limits of the extension in order to be able to make an inventory and set slaughter taxes - The airport is not in a classified area but rather in a terroir area	- Pay slaughter taxes before the start of the construction site - Make plantations of species adapted in terms of compensation - Take into account the landfill located to the west of the airport in the event of an extension to this side
Regional Sanitation Service	- Matam is located on a hillside facing west to east - The region does not have very abundant rainfall, the runoff water comes from the Ferlo - In Ourossogui, there is no sanitation network - There are two (02) emptying trucks in Ourossogui but they are only equipped with vacuum cleaners, which makes it difficult to recover the sludge - There is a project to create a water treatment plant in Matam	- Install a stormwater drainage system - Provide sanitation facilities to collect wastewater - Rehabilitate the natural waterway around the airport by building a closed or underground canal - Ideally, hydrocured trucks would be needed to take the water and mud from the pits.
Regional Hydraulics Division	- Ourossogui is a very vast crossroads that is 4 or 5 times the size of the Commune of Matam - There are two boreholes in Ourossogui that are far from meeting the needs of the population - The quality of the water is good, it contains no iron, fluorine or chlorine - There is no good management of the Ourossogui boreholes - Many neighborhoods are not served by water - Ourossogui should be a perimeter leased by the SDE	- Build a borehole in the airport to guarantee its autonomy in water
Regional Service for Spatial Planning	- The rehabilitation of the airport is necessary in view of the development prospects offered to the region - The Matam region is a locality of high emigration - This project will shorten travel time between AIBD and Matam - Part of the airport is not fenced off - There is a strong presence of animals inside the airport - The right-of-way of the side site is occupied by dwellings	- Accompany populations to set up fodder crops in order to avoid the divagation of animals in search of grass to graze - Enforce architectural standards in the vicinity of the airport

Consulted Stakeholders	Opinions, fears	Recommendations for action
Regional Department of Urban Planning	- There are physical and natural constraints on the site and its immediate environment - There is a rainwater channel on either side of the runway - Some dwellings adjoin the eastern boundary of the airport - There are beginnings of fragmentation to the south of the site after the water flow path - On the south side of the airport, there is also a water tower, orchards - There is a craft quarry to the west of the site - If the extension is on the west side, it could encroach on the land base of the BIA. - The army has expressed a wish to extend the military camp to the airport for convenience and security reasons - The airport's flight cone (north side) is inhabited with some buildings in R+1	- Make a complete inventory of the existing situation in and around the airport - Overlay the existing plan with the ZAC plan and the future airport plan to identify likely occupations to be relocated - Consider relocating the airport to the Commune of Ogo - Negotiate with urban planning to have land on the west side for an extension - Consult the land register to find out the status of the airport's land and its total land base
Fire Brigade	- With this lateritic runway there is a risk of stones intruding into the aircraft engine - Security at this airport is provided by the military - The military stakes to prevent animals and talibés from entering the runway during an aircraft takeoff or landing - The aircraft overflies the national highway at low altitude - Currently there are no security devices in the airport - BNSP firefighters preposition themselves to ensure fire safety during take-off and landing of aircraft - In the brigade there is only one emulsifier can that is not enough to put out an aircraft fire. - The airport does not have a water supply or hydrant - The hospital is close to the airport, this will facilitate evacuation in the event of an accident or illness - The heat potential of the buildings will determine the type of emergency system to be installed. - There is a project to build a fire station in Ourossogui	- Provide the airport with a supply of emulsifiers - Construct a water tower in the airport that can supply a fire hydrant or gallows - Equip the rooms with ABC fire extinguishers - Install RIAs for the protection of technical premises - Set up an ISS system for the partitioning of buildings - Recruit ASECNA firefighters on site or provide BNSP firefighters at site with adequate equipment for extinguishing aircraft fires and train them in extinguishing this type of fire - Establish a direct connection between the engineers and the airport - Approach the BNSP to define the means of control that depend on the type and quantity of product stored

Consulted Stakeholders	Opinions, fears	Recommendations for action
Regional Hygiene Brigade	- The BRH is in the process of accompanying the project - It will reduce travel, facilitate medical evacuations, which is an important element of health assistance. - Serious security problems arise at the airport - The airport's right-of-way is occupied by the populations - The BRH is in charge of health surveillance - There is no wastewater management system in Matam	- Relocate the airport if possible because it is close to the population - Establish an efficient and integrated system for waste management by airport staff for safety reasons - Give increased vigilance at the airport itself in the garbage cans - Provide toilets adapted to all social strata - Recruit qualified people for household waste management - Monitor water quality - Set up a vaccination unit for the health control of travelers
Regional Labor and Social Security Inspectorate	- The sector concerned is the construction industry - The declaration of establishment must be made in 5 copies - A company with more than 10 employees must have an employee representative - The day worker must be employed from 8am to 6pm	- Declare at the level of the IRSST any company or institution involved in the project - Make formal contracts that will be covered by the IHRT - Favor local employment with equal competence - Declare employees to the CSS and IPRES - Declare the number of daily workers to the IRSST - Do not pay wages below the national scale - Mark the site and set up safety instructions - Provide workers with suitable PPE and require them to be worn - Ensure that harnesses are worn and scaffolding is in place when working at height - Appoint an HSE manager on site or a person who can provide first aid in the event of an accident

VII.4.2. PERCEPTION OF THE PROJECT BY THE STRUCTURES ENCOUNTERED AT THE NATIONAL LEVEL

The categories of actors working in several sectors, in particular the aeronautics sector and the representatives of the concessionaires, were met and gave their opinions and concerns on the project.

In essence, they highlighted the existence of constraints related to the different phases of airport upgrading: demolition, construction, equipment and operation and made recommendations to the developer and operator of the airport.

In addition, they believe that the advent of renovated airports will generate new economic activities around these infrastructures: various shops, passenger transport services from the airport to their final destination, service opportunities for the maintenance of premises and the collection of solid and liquid waste.

The table is a summary of the exchanges made with national entities.

Table 30: Results of consultations with structures at national level

Opinions, fears	Recommendations for action
s not question the project in its principle of upgrading airports, which is a strong recommendation of IATA; gional airports receive direct flights from Europe and e, which forces them to be built to the highest of safety and security in air navigation: Cap Skiring, uis, Ziguinchor ; be wise for Cap-Skiring, which is more frequented t-Louis, Matam and Kédougou, to benefit from this nd to be modernized and better equipped; , Kolda receives more traffic than Tamba and u; or airport brings in the most economic benefits, given he main airport (AIBD) that supports the regional -Louis, it would be interesting to develop the freight ade will provide each airport with a control tower and avigation aids; al airports, there is a wildlife hazard control service cue and fire-fighting service (SSLI); agement of an airport to standards is expensive because pressible expenses (water, energy, security, equipment nce, etc.); rtant to highlight the versatile nature of Ziguinchor	• Establish a consultation between the Promoter TRANSCON and the ADS for the follow-up of airport rehabilitation works; • Take into account the training of personnel who must manage these airports; • Provide for duplicate equipment so that in case of malfunction the second one takes over; • See the possibilities of maintaining part of the runway during the work and define specific landing procedures under work conditions.

ANACIM	• The project responds to an old ASECNA recommendation that regional airports be renovated and upgraded to ICAO and IATA standards; • Faced with the obligation to make weather data available in real time, airports will have to be equipped with the most modern means of communication.	• Build new infrastructure at each airport; • Provide premises for measuring devices and ANACIM agents; • Relocate old weather stations if necessary; • Distribute the new GIS coordinates of the weather stations • Centralize the data collected continuously/stations; • Provide modern SAOMA-type equipment in regional airports; • Rehabilitated airports should be equipped with the most modern means of communication. ADIE and ANACIM have a common project in this direction.
CPD	• The widening of the runways will ensure the safety of aircraft during take-off and landing; • Airport security is managed by ASECNA; • ASECNA fire brigades are in charge of fire safety inside airports, the state fire brigades come in as reinforcements if necessary; • There is a memorandum of understanding between ASECNA and the DPC for mutual assistance in the event of a fire or accident; • Aircraft fires are difficult to control, but fortunately Senegal has only recorded a few very rare cases of aircraft accidents; • ASECNA firefighters specialize in aircraft fires; • ASECNA has all the necessary provisions to ensure fire safety; • The ERP regulations are a reference document for the calculation of disengagements (Decree 5945 of 14 May 1969 establishing safety rules against the risks of fire and panic in ERP systems).	• Fence airports and put deterrent mechanisms above fences (barbed wire, glass shards, etc.); • Limit breaches to avoid animal divagation and brush at airports; • Put surveillance cameras on the facades in front of the aircraft parking air; • Strengthen security and vigilance around airports; • Place the fuel tanks on a reinforced concrete watertight retention that can contain the entire stored product; • Install fire hydrants at the expense of fire hydrants that are likely to be buried by sand; • Install RIAs, cooling rings, multi-purpose powder extinguishing media, as other means of firefighting; • Set up general and selective alarms; • Do not align more than 25 consecutive chairs without overlap in waiting rooms;

		• Arrange exits according to the number of people likely to frequent the area; • Make sure that the doors open from the outside (article 50 of decree 5945 of 14 May 1969) for a room that must contain more than 50 people.
AIBD	• The most commonly monitored environmental parameters are noise, air quality, water, energy and waste management; • Air quality influenced by air traffic flows, the high frequency of traffic of vehicles and machines of all kinds serving the airport area, • Water quality and energy are the subject of an option to empower the airport; • AIBD has a functional WWTP for wastewater management; • AIBD is linked to the National Parks Directorate for optimal management of biodiversity, which is achieved through the preservation of indigenous plant and animal (bird) species; • The airport right-of-way cannot be fenced (4500 ha) for the moment but the limits are monitored by the gendarmerie and the DESCOS with whom AIBD collaborates; • To assess its level of compliance with the ESMP, it is essential to conduct regular internal audits; • On the social side, very important communication is required.	• Compensate for vegetation losses through reforestation campaigns; • Take into account the monitoring of birds in the context of the control of avian risk; • Create a framework for functional consultation between airport managers, local populations, administrative and local authorities, certain technical services; • Work with the Airport Operations Branch to reframe the replicability of environmental compliance practices in airport terminals; • Establish community relays within the population for permanent two-way communication.
HAAS	• This project is a good initiative; • Blaise Diagne International Airport is the only airport that meets international standards; • The main objective of HAAS is to ensure airport security by ensuring the protection of aircraft and passengers;	• Involve HAAS in the implementation of the project; • Discuss safety terms before construction begins; • Comply with Senegalese standards for the construction and equipment of airports; • Require HAAS approval of construction plans; • Install a fence wall with a standard height and topped with barbed wire; • Separate "departure" and "arrival" flows in airports;

	• According to HAAS, Cape Skirring airport should be the priority because it receives international flights while Ziguinchor airport receives domestic flights; • There are manuals explaining the specific materials to be used in the construction of the various compartments of an airport; • The National Agency of Civil Aviation and Metrology (ANACIM) deals with all questions concerning safety distances with the populations, construction and safety standards; • HAAS' involvement in airport management is related to everything related to security, especially at departure and also to the devices to be installed in the passenger circuit (up to access to the aircraft in compliance with all the rules).	• Contact ANACIM for a list of approved equipment; • Have all equipment validated by ANACIM and the Senegalese Radiation Protection and Nuclear Safety Authority (ARSN); • Prefer the installation of the VOR guidance system indoors rather than outdoors for safety reasons and discuss it with ANACIM; • Ensure that each structure (police, gendarmerie, customs, health service) has premises within the airports; • Implement preventive measures against terrorism (speed bumps, check points, inspections, internal and external rounds, etc.); • Allow HAAS to carry out verification visits to rehabilitated sites before opening.
DPAF	• This project will make the areas concerned viable and will have a positive impact on tourism and economic activities; • At these regional airports, the DPAF mainly provides border policing and immigration control and ensures compliance with security standards; • Control will be increased and modernized at airports and border surveillance strengthened; • The air police are not permanently present at these airports, but work in collaboration with the police station attached to the local community concerned; • Notified by the Airport Commander, the Head of Post sends elements in case of flight (landing or take-off) to ensure security and control operations.	• Take into account the airport's proximity to the market at Kédougou airport (gold zone); • Establish modern infrastructures that meet international standards; • Ensure that the fence wall is brought up to standard to avoid frequent divagation of animals; • Take into account the proximity of Saint-Louis airport to the homes and the regional hospital in the event of an extension; • Take into account the extension possibilities that are often made at the terminal level; • Provide on-call accommodation for the police.
CUSTOMS	• An airport without customs service cannot be considered international;	• Take into account Customs' concerns before carrying out the work

	• Customs controls the people and goods that must be safe and well supervised; • The rehabilitation of The Ourossogui-Matam airport will allow the development of traffic, especially with immigrants from the area; • Cap Skirring also receives a lot of traffic and should benefit from the rehabilitation; • All appropriate measures must be taken to ensure that the upgrading of these airports integrates customs formalities into a strategic position that makes it possible to mark out the entire airport; • It is desirable to provide the floor plans of the spaces to be built in order to determine the positions (orientations) of the premises allocated to Customs.	• Provide customs facilities both on arrival and departure of flights at all airports; • Provide on-call accommodation for night flights • Take into account the freight circuit to be secured and set up warehouses for its storage; • Emphasize the principle of standardization of infrastructures, distribution of premises and equipment to be set up. • Take into account the possibility of establishing them as international airports as soon as the volume of traffic and services justify this status.
SMCADY	• The airport designation cannot be validated without a kerosene trade; • The availability of this fuel in sufficient quantity is an obligation for an airport; • This requires storage in tanks, generally with large capacities near the runways, of the quantities of fuel to be transhipped to the requesting aircraft manufacturers; • These quantities and fuel types (AVGAS and kerosene) are dependent on: o the frequency of air traffic to be served, o the nature of the aircraft serving the route, o the nature of the fuel required. • The other airports will have well-dimensioned storage facilities or be supplied on demand according to the flights scheduled;	• Carry out the adequate sizing of the fuel stocks necessary for the regional airports to be rehabilitated according to needs and avoid large-capacity storage if it is not necessary; • Comply strictly with the checklist of procedures for controlling the quality of fuel deposited in storage tanks; • Carry out regular quality inspections of installations (subject to frequent safety-inspections) on an unannounced and scheduled basis.

	• International inspections are the responsibility of civil aviation institutions to comply with JIG Standards, IATA and major fuel airlines; • SMCADY has maintained its performance by obtaining a GOOD rating on all these inspections.	
AGEROUTE	• During earthworks, there may be competition between the company in charge of the rehabilitation works and AGEROUTE, in particular for the supply of backfill materials (sand, laterite, etc.) in the quarries; • Misunderstandings could arise as to who is responsible for restoring quarries at the end of the work; • The classified road network has a load capacity (weight, gauge) that must be respected to maintain roads in good condition. • Regulation No. 14/2005/CM/UEMOA for heavy vehicles for the transport of construction equipment and materials is the reference document in this field.	• Create a consultation framework between the project owner of the rehabilitation works and AGEROUTE; • Comply with weight, gauge and axle load standards; • Communicate on the period of equipment transfer and the planned route for vehicles and take into account traffic disruptions; • Ensure the maintenance of damaged roads and approach AGEROUTE in case of intervention on the classified network; • Consider cumulative impacts and propose mitigation measures to minimize the impacts related to its work; • Tie up trucks when supplying construction sites with construction materials to mitigate impacts on air quality; • Set up continuous air quality measurement systems for effective monitoring of physico-chemical air parameters in real time at each airport.
EDS	• The airports of Saint-Louis, Ziguinchor, Tambacounda and Kédougou are served by the EDS networks of the localities concerned; • It should be noted that the airport has a private network and the SDE meter is located at the entrance; • Matam airport is served by the local ASUFOR; • Airport reconstruction projects will be supplied with water from the EDS network except in the case of Ourossogui;	• Set up a water storage device equipped with a booster for an autonomy of 3 to 4 days; • Choose water-saving equipment and regularly monitor their consumption to detect any discrepancies; • Avoid the proximity of the SDE connection to the ONAS network if it exists because the latter could contaminate the SDE pipes in the event of a defect and install a non-return valve at the entrance to the airport's private network;

	• In Saint-Louis, the site could be supplied with water from a direct withdrawal from the Bango reserve after an agreement contract with OLAG. • This approach will reduce the pressure on the drinking water resource; • It is important to install a water storage device for autonomy in the event of a power failure; • This device is sized according to daily needs; • Some equipment is remotely managed and there are possibilities of interference.	• Disinfect the network set up in airports before it is put into service with concentrated bleach; • Avoid draining used oil from construction machinery and vehicles on site (liquid waste); • Prevent noise pollution by prohibiting night work; • Regularly water all around the perimeters of buildings during their demolition; • Take into account air pollution and cover trucks transporting construction materials; • Prohibit the use of rubble for wetland backfilling (solid waste). • Avoid a frequency conflict between airport equipment and the remote management system of SDE facilities by approaching ARMP.
ONAS	• It is essential to decide on the provisions adopted for the evacuation of rainwater in the perimeters of airports; • Poor water management can cause damage to the ecosystem; • The existing sewerage network is very far from the airport for Ziguinchor, Tambacounda and Kédougou; • For Saint-Louis and Ziguinchor the network is more or less distant but connection possibilities exist; • For Matam, there is a draft Master Sanitation Plan • The modalities of collaboration may be defined within the framework of a protocol signed with ONAS.	• Establish a stormwater drainage network and define a discharge point; • Estimate liquid discharge rates and see opportunities to connect to the local network for Saint-Louis and Ziguinchor airports; • Ensure that there are no oils or hydrocarbons in the liquid waste to be discharged into the system; • Implement a wastewater treatment system for other airports; • Characterize and estimate the daily flows for the proper sizing of the treatment system.
SONES	• Physical and biophysical environmental aspects must be taken into account in the study; • In Ziguinchor the airport is very close to the people; • It is necessary to specify whether the airport will close during the work or continue to receive flights;	• Involve the populations in the process and establish permanent communication during the work; • Take dust emissions into account during construction and propose effective mitigation measures;

	• For water supply, the river can be the solution.	• See the possibilities to connect to the SONES network for water supply; • Approach the Office du Lac de Guiers (OLAG) in case of a stitching on the river.
SENELEC 1	• SENELEC's intervention will be at the level of the regions concerned; • In its operational organization, SENELEC is structured into 4 regional delegations: this is the • Regional delegation Center-Ouest which covers Thiès, Mbour and Diourbel ; • Central-East regional delegation covering Fatick, Kaolack, Kaffrine, Tambacounda and Kédougou, whose distribution unit is in Kaolack and the technical unit in Tambacounda; • Center-Nord regional delegation covering Louga, Saint-Louis and Matam and • Regional delegation Center-Sud which covers Ziguinchor, Kolda and Sédhiou. The distribution unit of the Southern delegation is located in Ziguinchor.	• Submit to SENELEC the assessment of the needs of airport equipment brought up to standard to enable the study and technical opinions of their electrical energy autonomy; • Re-evaluate the files on the electrical energy needs of airports that will be shared with the Distribution Department; • To be able to establish a common indicative schedule between the SENELEC Regions Directorate and the Cabinet in order to facilitate the coordination of the success of these consultation missions of the Regional Delegations; • The SENELEC Regions Directorate will send EES the file of the organization chart of the Delegations of the regions concerned with precise indications of the useful contacts to be made.
SENELEC 2	• SENELEC has solved most of its problems related to the production of sufficient quantities of energy; • It is the quality of the transmission and distribution network that is currently a problem; • However, only Saint-Louis and Matam are in the interconnected network; • SENELEC has a network of underground and overhead cables in all these areas, which constitutes a real potential danger; • Possibilities for cable redirection exist at the expense of the promoter.	• Define and communicate in time the electrical energy needs in terms of power for effective management; • Submit a request for a power increase, if the airport is already connected; • Take into account the presence of warning grids during the work and stop at the appropriate time to avoid impacting underground cables; • Ask for a power cut when working near overhead cables.

SONATEL POTOU	• SONATEL's network is present in all these areas and airports are generally well served; • It is always possible to move equipment or cables if they are impacted by the work; • The impact on a cable can affect nearly 1000 users; • The network is essentially aerial, only the optical fiber is underground; • This optical fiber does not yet exist in Kédougou.	• Inform SONATEL before starting work; • Take into account the presence of the fiber located at a depth of 0.5 m and the warning screen at 0.8 m during the work.
TIGO	• Their antenna is present in the five regions concerned by the project; • The frequencies they use do not interfere with aeronautical frequencies; • The optical fiber may not be impacted because it is underground; • Sometimes their antenna is impacted by work and moved; • The antennas are in a strategic position to obtain a good network; • Their movement can be costly and lead to the installation of a second antenna to reinforce the network.	• Get closer to their services before the work begins; • Take into account the presence of their antennas in strategic positions.

VII.4.3. PERCEPTION OF THE PROJECT BY LOCAL POPULATIONS

The meeting with the populations of Aïnoumady 1 and 2 located a few meters from the airport wall was held at the home of the Aïnoumady 1 neighborhood chief who, for the occasion, invited the elders, imams, women, youth and other relevant organizations from these two localities to discuss the project.

The population praised the firm's participatory approach, which is contrary to what was done when the current fence wall was erected. The population was surprised to see houses demolished and to be subjected to the screen effect that it constituted for them but also for the cattle that lacked access roads. Faced with what they described as provocation, the people had to break down part of the wall because they were tired of making a long detour to go to the other side of the district to join their orchards or take their animals to drink and graze grass.

The presence of the airport is desired, as well as its rehabilitation, but nevertheless, the populations are concerned about this project because they do not want to be displaced and are afraid that the works will have a negative impact on the protection dam that protects them from flooding. With the reconstruction of the airport's fence wall, they also fear that their mobility will be reduced. Some even go so far as to say that it would be better to relocate the airport to a site that has already been identified. This way, they will not have to suffer the inconveniences related to the activity.

Overall, the inhabitants of Ainoumady 1 and 2 are ready to support the project provided that the fears are allayed and the recommendations implemented with broad consultation involving all stakeholders. The recommendations made by the populations are summarized below:

- take into account the concerns of the populations in the study;
- make a restitution to the populations before validating the report;
- relocate the airport to Dentiady if necessary;
- take into account the protection dike and rehabilitate it;
- avoid any escape;
- in case of extension, do it on the side of the ZAC;
- rightly compensate the populations affected in the event of physical or economic displacement;
- provide a passage between the fence wall and the houses to avoid major detours;
- to favor the local workforce, especially the young people of Ourossogui;
- take into account public health issues;
- favor local contractors for all works, as is currently the case with the choice of a Senegalese firm to carry out the ESIA;
- integrate the population into the project's monitoring committee.

VII.5. CONCLUSION ON THE PUBLIC CONSULTATIONS

The public consultation, which is a tool for exchanges between the promoter and the project stakeholders, allowed the latter to freely share their opinions, fears and concerns regarding the rehabilitation project of Ourossogui-Matam airport.

The result is a good acceptability of this project. This will allow the revitalization of air movements through a modern airport.

However, issues related to safety and nuisance caused by construction work and later aircraft movements were raised by the majority of stakeholders who, to address them, made the recommendations mentioned above.

VII.6. STAKEHOLDER ENGAGEMENT PLAN

VII.6.1. COMMUNITY RELATIONS POLICY

A good relationship with the communities is one of the major conditions for the success of this demolition and reconstruction project, which complies with ICAO and IATA standards.

During the construction phase, it is recommended that TRANSCON recruit as a priority the local workforce as soon as it is established that the required skills are available.

During the operational phase, the administration of the airport domain is the responsibility of the Ministry of Air Transport staff. However, the sale of services whose actors will be determined and authorized by the airport commander is also possible.

The application of a good community relations policy would be beneficial to the promoter.

VII.6.2. HUMAN RESOURCES MANAGEMENT POLICY

The promoter must have in its procedures, an internal human resources management policy, in accordance with the Labor Code in force, which must cover the following aspects:

- Prerequisites before starting any activity:
    - provide the IWHSS with the declaration of establishment of the company and the declaration of the worker's movements;
    - use a Health Insurance Institution (IPM) for non-occupational diseases.
    - join the Social Security Fund and IPRES through the Declaration of Workers' Movements (DMT), the types of contracts will also have to be reported to the IRSST.
- Human resources policies and procedures:
    - set up internal regulations that must be validated by the labor inspector, focusing on general working conditions (working hours, discipline, safety measures);
    - set up a clear and accessible communication system for all workers in the company.

- Working conditions :
    - respect collective agreements;
    - improve working conditions through compliance with health and safety rules at work.
- Employment conditions and equal opportunities:
    - protect contractual and temporary workers;
    - avoid any discriminatory policy when hiring;
    - avoid any harassment by management or senior employees;
    - avoid forced labor;
    - prohibit the work of minors;
    - extend labor policies to suppliers, recruitment agencies and other third parties;
    - develop grievance mechanisms for workers.

This human resources management policy can be improved by the promoter but should be communicated to the staff.

VII.6.3. INFORMATION AND COMMUNICATION TOOLS FOR STAKEHOLDERS

The stakeholder engagement plan is an ongoing process that must be undertaken before rehabilitation work begins.

Different methods will be used to inform stakeholders of the ongoing engagement process undertaken by the promoter. These will include traditional methods such as newsletters, posters and monthly information meetings.

When it comes to stakeholders such as administrative and local authorities, technical agencies and public agencies, communication will be by official mail.

The letters will also be used to inform them of the mechanisms for engagement and dissemination of information related to compliance work.

For stakeholders at the local level, illustrative signs and posters in the form of monthly newsletters will be placed on bulletin boards in each relevant location (neighborhood/village public square, schools, mosques, prefecture, sub-prefecture and town hall) to inform relevant stakeholders about mechanisms for engagement and information dissemination.

Finally, during the rehabilitation work, the installation of road signs will also inform people about key activities that could affect them (e.g. starting work, transporting equipment to the site, number of jobs created, etc.).

VII.6.4. GRIEVANCE MECHANISM WITH WORKERS AND COMMUNITIES

The production of a mechanism will make it easier to receive and give appropriate responses to complaints and concerns about the activities of the Ourossogui-Matam airport Rehabilitation Project by considering their processing within a timeframe that is acceptable to stakeholders.

Complaints can come from a variety of sources (use of local labor, environmental problems, failure to meet expectations). Thus, they can be classified according to the following criteria:

- type of procedure ;
- complaints involving contract workers;
- environmental and social performance;
- cultural issues ;
- behavior of the personnel working on the site;
- lack of information and communication about the project.

VII.6.5. RECEIPT AND REGISTRATION OF COMPLAINTS

The promoter may make available to the communities surrounding the airport complaint books or forms for the filing of any claims, complaints or grievances. They will be submitted to the district committees and the commune concerned. They may also be deposited at the prefecture or sub-prefecture.

When a complaint or claim is filed, the complainant (who has identified himself/herself) receives an acknowledgement of receipt. Those who cannot complete the complaint booklet will be able to submit their verbal complaint to the team responsible for receiving complaints at the site level. The latter will complete the grievance booklet and a witness copy with acknowledgement of receipt and the team leader's stamp will be given to them.

VII.6.6. COMPLAINT HANDLING

As defined in the paragraphs above, the sponsor will need to establish a team to be responsible for the implementation of the grievance mechanism. It will be the first to receive complaints and is responsible for handling them.

All complaints received are recorded in the complaint register and a complaint follow-up form is opened. The actions taken to process the complaint (processing chronology and proposed solutions) must be mentioned.

The register must at least include the following:

- date of receipt of the complaint;
- name of the person who received the complaint;
- address and contact of the complainant;
- the subject of the complaint;
- the resolution schedule (beginning and end of the execution of the corrective action);
- date on which the complaint was resolved;
- date of sending the notification to the complainant.

VII.7. CSR POLICY OF THE PROJECT

The promoter will have a well-defined CSR policy, based on the expectations of the local community and/or population.

TRANSCON will opt for a policy that goes beyond the legal framework imposed on it by implementing best practices.

This policy can be based on its sensitivity and CSR budget according to the development priorities of the municipality, either towards:

- the hygiene and health component:
  - comply with measures to protect populations against all potential nuisances identified, particularly in terms of noise and dust (see PGES);
- the social aspect:
  - to promote the employment of indigenous working populations in the neighborhoods surrounding the airport in their rehabilitation projects.

All these actions will promote a better coexistence of the airport with the populations of their host environment.

VIII.ENVIRONMENTAL AND SOCIAL IMPACT ANALYSIS

VIII.1. METHODOLOGY AND LIMITATIONS OF THE EVALUATION

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 various points covered in this section are the identification of the direct, indirect, temporary and permanent effects of the project on the receiving environment as well as the identification of socio-economic impacts, and proposes 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 by the project is presented in Chapter X of this report.

VIII.1.1. PRESENTATION OF THE ENVIRONMENTAL COMPONENTS

The environmental components likely to be affected by the project are divided into three (03) categories according to their nature and are called important elements of the environment. They are:

- **physical components**
  - air quality;
  - soil quality;
  - the quality of surface and groundwater;
- **biological components**
  - wildlife and birdlife;
  - wildlife habitats;
  - special status species
  - terrestrial vegetation;
- **human components**
  - socio-demographic characteristics;
  - economic activities;
  - land allocation and use;
  - public infrastructure and facilities;
  - archaeological and cultural heritage;
  - public health;
  - the living environment, including public safety, landscape, sound environment.

These environmental components will be impacted during the project, through activities that are presented in the following paragraph.

VIII.1.2. PRESENTATION OF THE SOURCES OF IMPACTS

The activities related to the rehabilitation and operation of the Ourossogui-Matam airport that are likely to generate both positive and negative impacts on the various environmental components are:

- **In the rehabilitation phase:**
  - Demolition work;
  - The transport and storage of construction materials and materials;
  - Mechanical and manual handling of equipment;
  - Traffic in and around the site;
  - Earthworks and excavation work;
  - Construction work;
  - The use of water;
  - Waste generation and management;
  - Job creation;
  - The purchase of goods and services;
- **In operation phase:**
  - Fuel supply;
  - Aircraft refueling;
  - Aircraft cleaning;
  - Aircraft movements (take-off and landing);
  - Waste generation and management;
  - Job creation;
  - The purchase of goods and services.

In order to know the environmental components that will be impacted by each type of activity, the sources of impacts will be reported in a double entry table called the Leopold matrix whose primary function is to identify the potential impacts on the different environmental components. This matrix is presented below.

Table 31: Interaction matrix sources of impacts-important elements of the environment

	Impact-causing activities	Air quality	Soil quality	Surface and groundwater quality	Terrestrial wildlife	Special status species	Avifauna	Terrestrial vegetation	Socio-demographic characteristics	Economic activities	Land allocation and use	Public infrastructure and facilities	Archaeological and cultural heritage	Public Health	Living environment
Rehabilitation Phase	Weeding and deforestation of the site	■	■	■	■	■	■	■							
	Development of access roads	■	■	■	■	■	■	■							
	Routing and storage of construction materials and materials	■	■	■						■		■		■	■
	Mechanical and manual handling of equipment		■	■	■			■						■	
	Traffic in and around the site	■	■	■	■		■	■				■			■
	Excavation and excavation work	■	■	■						■			■	■	
	Rehabilitation work	■	■		■		■			■			■	■	■
	Water use														
	Waste generation and management		■	■				■							■
	Job creation								■	■					■
	Purchase of goods and services								■	■					■
Operation Phase	Fuel supply		■	■											
	Aircraft refueling		■	■											
	Aircraft cleaning		■	■											■
	Aircraft maintenance and servicing		■	■											■
	Waste generation	■	■	■				■						■	■
	Job creation								■	■					■
	Purchase of goods and services								■	■					■

VIII.1.3. EVALUATION PROCESS

Once all the potential impacts of the project on the socio-economic environmental component have been identified, the significance of the foreseeable changes in this component is assessed. The approach and grid for assessing the significance of the effect are briefly described in the following paragraphs.

The methodological approach used to assess the environmental impacts of the project is essentially based on an assessment of the intensity, scope and duration of the anticipated impact. These three (03) qualifiers are aggregated into a summary indicator, the importance of the impact, which makes it possible to make an overall qualitative judgment on the anticipated effects for a component, following an intervention on the environment.

The significance of the impacts will be assessed on the basis of the following criteria:

- the intensity;
- the duration;
- the extent.

VIII.1.3.1. INTENSITY

The intensity of the impact defines the extent of changes that affect the integrity, function and use of each component of the environment affected by the project. It is obtained by crossing the **size of the disturbance** with the **value given to the environmental component** impacted.

The intensity of the environmental impact varies from very high to low and results from the combination of the factor affecting the degree of disturbance and the factor affecting the value of the component. The following table shows the different possible combinations.

Table 32: Impact intensity determination grid

Degree of disruption	**Value of the component**		
	Great	Average	Low
High	Very strong	Strong	Average
Medium	Strong	Average	Low
Low	Average	Low	Low

VIII.1.3.2. DEGREE OF DISRUPTION

The **degree of disruption of** a component defines the extent of the structural and functional changes it is likely to undergo. It depends on the sensitivity of the component to the proposed interventions.

Changes can be positive or negative, direct or indirect. The degree of disruption is judged:

- **high**, when the expected effect jeopardizes the integrity of the component or significantly and irreversibly modifies the component or its use;

- **medium**, when the effect results in a reduction or increase in quality or affects the use of the component, without compromising its integrity;
- **low**, when the effect only slightly affects the quality, use or integrity of the component;
- **indeterminate,** when it is impossible to predict how or to what degree the component will be affected. Where the degree of disturbance is undetermined, the environmental effect assessment cannot be conducted for this component.

VIII.1.3.3. VALUE OF THE ENVIRONMENTAL COMPONENT

The **value of the component** includes both its **ecosystem value** and its **socio-economic value**.

The **ecosystem value of** a given component is considered to be:

- **large**, where the component is of major interest because of its ecosystem role, diversity and outstanding qualities, the conservation and protection of which are the subject of a consensus in the scientific community**;**
- **medium**, where the component is of high interest and recognized quality, the conservation and protection of which is a matter of concern but not a matter of consensus;
- **low,** when the component has an interest and qualities for which there is little concern for conservation and protection.

The **socio-economic value of** a given component is considered as:

- **large**, when the component is subject to legal or regulatory protection measures (threatened or vulnerable species, conservation park, etc.) or is essential to human activities (land);
- **average**, when the component is valued (economically or otherwise) or used by a significant portion of the population concerned without however being subject to legal protection;
- **low**, when the component is little or not valued or used by the population.

The **value of the component** integrates both the ecosystem value and the socio-economic value, whichever is higher, as shown in the following table.

Table 33: Grid for determining the value of the environmental component

Socio-economic value	**Ecosystem value**		
	Great	**Average**	**Low**
Great	Great	Great	Great
Average	Great	Average	Average
Low	Great	Average	Low

For the physical and biological environments, environmental value is based on the establishment and integration of 2 elements (ecosystem and social).

In the case of the human environment, only social value is taken into account in determining environmental value.

This social value expresses the relative importance attributed by the public, the various technical services of the State, local government or any other legislative or regulatory authority to a given environmental component.

It indicates the popular or political desire or willingness to maintain the integrity or originality of a component. This willingness is expressed through the legal protection afforded to it or through public interest at the local or regional level.

Social value is established according to the concerns of the population concerned by the environmental component. The perceptions and concerns collected from populations such as public consultations are used as elements to establish this value.

The intensity of the environmental impact varies from very high to low and results from the combination of the factor affecting the degree of disturbance and the factor affecting the value of the component. The following table shows the different possible combinations.

Table 34: Impact intensity determination grid

Degree of disruption	**Value of the component**		
	Great	**Average**	**Low**
High	Very strong	Strong	Average
Medium	Strong	Average	Low
Low	Average	Low	Low

VIII.1.3.4. DURATION

The duration of the impact determines the period during which the effects will be felt in the environment. It is not necessarily equal to the time period during which the immediate effects of the impact are felt, since residual effects secondary to the initial cause may occur long after the initial cause has dissipated.

When an effect is intermittent, its frequency is determined in addition to the duration of each episode. The duration of the impact can be:

- **long,** when the effects are permanently felt in a continuous or discontinuous manner over the lifetime of the equipment or activities and even beyond in the case of irreversible impacts;
- **average,** when the effects are temporarily felt in a continuous or discontinuous manner over a relatively long period of time but less than the lifetime of the equipment or activities;
- **short,** when the effects are felt temporarily in a limited period of time, usually during the construction period or when activities begin.

VIII.1.3.5. SCOPE OF THE PROJECT

The extent of the impact refers to the area affected by the effects and the proportion of the population affected. It can be:

- **Regional,** when the impact affects a large area; or several components located at a distance from the project; or is felt by the entire population of the study area; or by a significant proportion of the population of the receiving region;
- **Local,** when the impact affects a relatively small area or a number of components located within, near or at a distance from the project site, or is felt by a limited proportion of the population in the study area;
- **Punctual,** when the impact affects only a very limited area or a component located within or near the project site, or is felt by only a small number of individuals in the study area.

VIII.1.3.6. IMPORTANCE

The combination of the intensity, extent and duration of the impact through the evaluation grid below, makes it possible to determine its importance on a component of a given environment. The importance of the impact is judged according to 05 levels according to the value of the variables that define it.

The significance of each environmental impact is assessed by taking into account the mitigation or enhancement measures integrated into the project.

During this first assessment, if it is found that these analyzed impacts are not negligible and that the proposed measures are not effective, specific mitigation measures may be proposed to allow optimal integration of the project into its environment.

Mitigation measures aim to avoid, mitigate or compensate for the negative social and environmental impacts of a project by prioritizing solutions with zero negative impacts.

As for positive impacts, improvement or optimization measures are proposed in order to perpetuate these assets, make them better and benefit a larger layer of the components concerned.

The proposed mitigation and optimization measures integrate operationality, adaptability to the context, ease of implementation and above all the quality/price ratio in order to benefit all parties.

Table 35: Environmental Impact Significance Determination Grid

Intensity	Extended	Duration	Importance
Very strong	Regional	Long	Very strong
		Average	Very strong
		Short	Very strong
	Local	Long	Very strong
		Average	Very strong
		Short	Strong
	Punctual	Long	Very strong
		Average	Strong

Intensity	Extended	Duration	Importance
		Short	Strong
Strong	Regional	Long	Very strong
		Average	Strong
		Short	Strong
	Local	Long	Strong
		Average	Strong
		Short	Average
	Punctual	Long	Strong
		Average	Average
		Short	Average
Average	Regional	Long	Strong
		Average	Average
		Short	Average
	Local	Long	Average
		Average	Average
		Short	Low
	Punctual	Long	Average
		Average	Low
		Short	Low
Low	Regional	Long	Average
		Average	Low
		Short	Low
	Local	Long	Low
		Average	Low
		Short	Very Low
	Punctual	Long	Low
		Average	Very Low
		Short	Very Low

Following the implementation of the specific mitigation measures, the residual impact will be determined and monitoring and evaluation measures will be recommended to guide them and better manage them through a monitoring plan.

The following figure is a summary of the steps to be followed in determining impact significance.

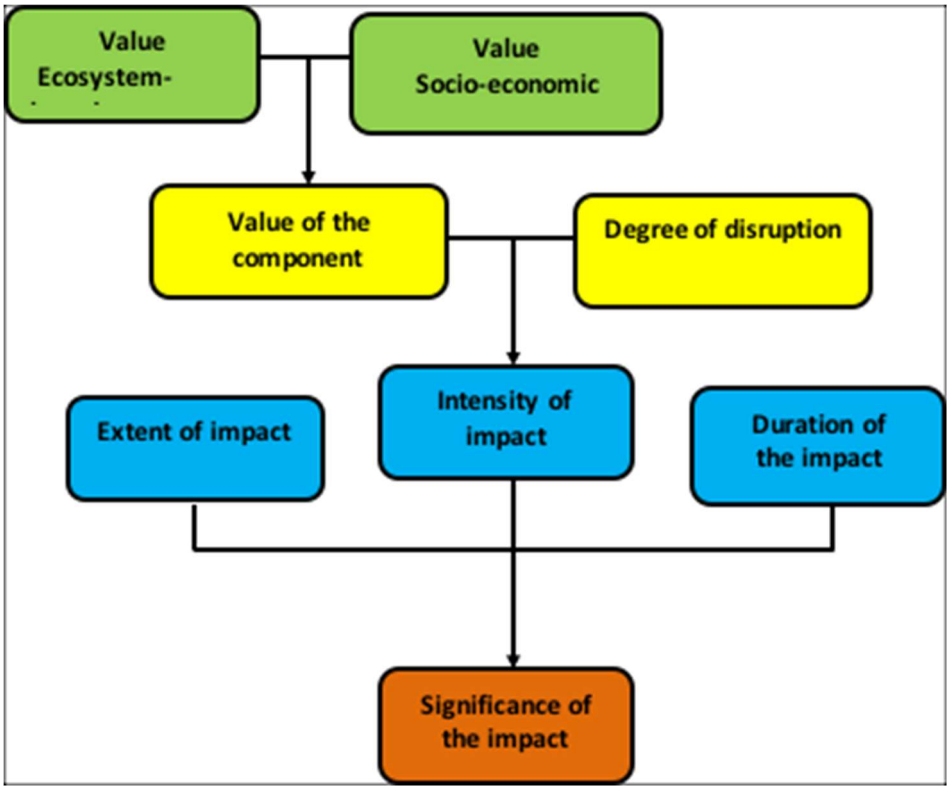


Figure 10: Impact significance identification process

VIII.2. ENVIRONMENTAL AND SOCIAL ISSUES (VALUE OF THE ENVIRONMENTAL COMPONENT - VCE)

This section describes the environmental components likely to be impacted by the project during its construction and operation phases.

VIII.2.1. AIR QUALITY

The rehabilitation and operation of the Ourossogui-Matam airport will generate air pollutants and greenhouse gases. These emissions are likely to affect air quality. The value of the environmental component remains ***high*** because no changes in air quality are noted in the project area.

VIII.2.2. SOIL, SURFACE AND GROUNDWATER QUALITY

Rehabilitation works are likely to affect soil quality and consequently groundwater. It should also be noted that the project site is located on the slope of a plateau sloping from west to east.

This situation favors intense runoff towards the Senegal River (about 9 km from the site) and consequently water erosion. Thus the value of the component is considered to be ***large.***

VIII.2.3. QUALITY AND AVAILABILITY OF DRINKING WATER

The water supply during the rehabilitation and exploitation phases will probably be provided by one of the 4 boreholes available in the Commune of Ourossogui, which often faces water shortages. Given the scarcity and importance of the resource to populations, the value of the component is considered ***high.***

VIII.2.4. VEGETATION IN THE AREA OF DIRECT INFLUENCE

The airport's rehabilitation work will inevitably lead to deforestation and clearing activities.

The airport site is very poor in plant resources and is marked by the presence of sparse vegetation mainly composed of the species *Calotropis procera* (Paftann) frequently found on degraded soils.

However, given the importance of preserving the flora, the environmental value is considered to be **average**.

VIII.2.5. WILDLIFE AND AVIFAUNA

The wildlife and avifauna potential is low in the project area mainly due to human pressure on wildlife habitats. However, the need to preserve wildlife means that the value of the environmental component is considered to be **average.**

VIII.2.6. SOUND CLIMATE

Studies carried out on the initial sound environment of the site have revealed that the sound environment of the semi-urban environment to be used for the project is very quiet.

The environment in its initial state is of the unpolluted (sound) type. Rehabilitation work as well as activities related to airport operations (take-off, landing, etc.) will generate noise. This noise generated could cause noise pollution for local populations but also for workers. Thus, the value of the component is considered **high**.

VIII.2.7.POPULATION HEALTH AND SAFETY

During the rehabilitation and operation phases of the airport, the health and safety of workers and surrounding populations must be taken into account to mitigate any inconvenience. Thus, the value of the component is considered **high** because the preservation of the health and safety of the population is paramount.

VIII.2.8.ECONOMIC ACTIVITIES

During the airport's rehabilitation and operation phases, positive externalities will be produced through the recruitment of manpower, the development of small businesses, the purchase of goods and services and possibly cultural mixing. Thus, the value of the component is **high**.

VIII.2.9. SUMMARY OF ENVIRONMENTAL AND SOCIAL ISSUES

The table below summarizes the environmental and social issues in the project area.

Table 36: Summary of environmental and social issues in the project area

Issues at stake	Environmental Component Values (EVC)
Air quality	Great
Soil and water resources quality	Great
Drinking water quality and availability	Great
Vegetation	Average
Wildlife and avifauna	Average
Economic activities	Great
Hygiene, health, safety and security	Great
Sound climate	Great
Living environment	Great

VIII.3. IDENTIFICATION OF THE MAJOR IMPACTS OF THE PROJECT

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

VIII.3.1. IMPACTS ON THE BIOPHYSICAL ENVIRONMENT

VIII.3.1.1. IMPACTS IN THE REHABILITATION PHASE

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

- 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.).

VIII.3.1.1.1. Impacts on the atmospheric environment

- **On air quality**

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

During rehabilitation work, dust could spread during the movement of machinery and vehicles, the transport of materials and, to a lesser extent, during the loading, unloading and/or storage of construction materials.

Indeed, if the loads of materials (sand, gravel, etc.) are not covered, trucks risk losing part of the materials throughout their journey, thus constituting inconveniences for the populations of the localities crossed but also for the workers present on the site. 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, SOx, 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Punctual	Short	Low

Mitigation measures

In order to make the impacts on air quality during the rehabilitation phase of the airport insignificant, the study recommends the following mitigation measures:

- water 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;
- define the desired technical specifications for construction machinery, with regard to national and international exhaust gas standards;
- inform and raise awareness among local populations.

- **On the climate**

During the airport's rehabilitation work, 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, which will require localized deforestation within the airport site. Vegetation has been identified as a "carbon sink" that absorbs very large amounts of atmospheric carbon, which helps to reduce the amount of atmospheric CO_2.

However, these emissions from construction machinery and vehicles will not have significant impacts on climate change due to their low magnitude (intermittent and limited emissions). Thus, the importance of the impact of rehabilitation works on the climate is considered low.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Punctual	Short	Low

Mitigation measures

Even if the rehabilitation work cannot have a significant impact on the climate, the study recommends that 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 by avoiding the standby position such as idling engine;
- 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.

VIII.3.1.1.2. 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 destructuring**

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. Indeed, the airport is located on the slope of a sloping plateau from west to east, a situation that favors intense runoff and therefore water erosion and gullying. This gully is most noticeable southeast of the airport.

This 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 destructuring.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Local	Short	Low

- **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 if it does not have sufficient bearing capacity to support the weight of these machines.

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.

It should be noted that the airport is located on lithosols on breastplates and regosols on gravel. These soils are locally covered with a thin sandy veil. The breastplates most often form vast flat areas where the ground surface is strewn with gravel and many scattered blocks and breastplate stones, the product of their superficial dismantling.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Local	Short	Low

- **Pollution of soil, surface and groundwater**
  - **By accidental spillage or leakage of chemicals**

The site preparation work as well as the airport rehabilitation work represent a risk of contamination of the soil, surface and groundwater.

Indeed, the storage and handling of certain substances (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.

However, these accidental spills and leaks are punctual even if the immediate environment of the site may be inadvertently affected.

It should be noted that 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

- **By generating waste**

These previously mentioned works are sources for generating solid and/or liquid waste (liquid effluents, packaging, cable reels, empty containers, used spare parts for machinery, etc.).

Poor management of this waste at the site level 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 (excavated material, rubble, plaster, cables, coils, etc.) that is generated over a short period of time. Thus, the significance of the impact is considered to be average.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

Mitigation measures

During the preparation and rehabilitation of the airport, the study recommends the following actions:

- conduct a soil survey;
- define heavy vehicle routes (work lanes) and work 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;
- collect solid and liquid waste according to a waste management plan in accordance with national and international regulatory provisions;
- raise awareness and train staff on solid and liquid waste management;
- limit the site's footprint to the strictly necessary area;
- 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 resources will be very low.

VIII.3.1.1.3. Impacts on water resources used by populations

The airport preparation and rehabilitation works will lead to increased water requirements (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 (01) of the four (04) boreholes (1 not yet functional) of the Commune of Ourossogui. Two (02) of these boreholes capture the Continental Terminal groundwater and the remaining two (02) exploit the Maestrichtien sands groundwater.

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

The study recommends the following measures:

- collect and use rainwater for watering the slopes if the work is carried out during the rainy season;
- 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 conservation;
- 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.

VIII.3.1.1.4. Impacts on flora and fauna

The airport's preparation and rehabilitation work will inevitably lead to deforestation, which will take the form of felling, weeding and brushing of the plant species currently present on the site.

It should be noted that this 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, it should be noted that the current 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 (demolition, construction, use of vehicles and construction machinery, presence of labor, etc.) will generate noise that will impact wildlife. Indeed, a risk of temporary disturbance of terrestrial fauna and bird life in the vicinity will therefore be noted.

In addition, during this phase, several types of waste (excavated material, waste oils, plant debris, construction site waste, etc.) will be generated on site. The risks of pollution following an accidental spill or leak of dangerous products can be noted. 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Average	Low	Low	Punctual	Short	Very low

Measures to mitigate negative impacts

The study recommends the following measures to reduce the impacts on fauna and flora during the rehabilitation phase:

- limit the site's footprint to the strictly necessary area;
- establish an effective system for the management of excavations and waste resulting from the work;
- use machinery, vehicles and equipment that comply with noise emission standards and raise staff awareness;
- 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 inside the site;
- implement an off-site reforestation plan and monitor it, in collaboration with the Matam forest sector.

VIII.3.1.2. IMPACTS DURING THE OPERATING PHASE

VIII.3.1.2.1. Impacts on the atmospheric environment

- **On air quality and climate**

In the operational phase, 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 NOx, CO, CO_2, SOx, SO_2 and to a lesser extent VOCs (Volatile Organic Components) and HC (Unburned Hydrocarbons).

CO_2 is the main reaction 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 (NOx). NOx contributes directly to climate change caused by greenhouse gases, by the absorption of infrared rays reflected from the earth and coming from the sun.

Studies have shown that air traffic contributes to the formation of ozone (O_3), which is not produced directly by aircraft operation but is a secondary pollutant.

Thus, the operation of the airport will lead to greenhouse gas (GHG) emissions. The latter are gaseous components that absorb infrared radiation emitted by the earth's surface. 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Local	Long	Average

Mitigation measures

The study recommends the following mitigation measures:

- identify emission sources and implement an air quality management system;
- work on 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 various sites identified as 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.

VIII.3.1.2.2. Impacts on soil quality, surface and groundwater resources

In the operational phase, the main impacts on land and water relate to pollution that may be caused by accidental leaks of certain chemicals, poor waste management and maintenance and cleaning activities.

Accidental leaks or spills of certain chemicals (waste oils, new oils, fuel, etc.) can lead to contamination of the soil, subsoil, surface and groundwater.

Poor management of this waste at the airport can lead to the dissolution of liquid waste and leaching of solid waste that could contaminate soil, surface water and groundwater through infiltration.

Maintenance and cleaning activities on aircraft, pavements (runway, taxiway and tarmac), buildings (terminals and administrative buildings) and roads (access and service roads) are also likely to produce pollution of soil, surface and groundwater by infiltration.

Indeed, poor management of wastewater, washing water and waste generated by these activities can lead to a deterioration in soil quality and contaminate 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Local	Long	Average

Mitigation measures

In order to prevent pollution of soil and water resources, the following mitigation measures are recommended:

- 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;
- apply preventive and protective measures;
- sort and then store the waste in a sealed storage area;
- regularly monitor solid and liquid waste likely to be polluting;
- 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.

VIII.3.1.2.3. Impacts on water resources used by populations

During this 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 04 boreholes in the Commune of Ourossogui.

The latter faces recurrent water shortages, so that water needs during exploitation could compete with those of the population. Thus, water use must be rational.

Mitigation measures

The study recommends the following measures for the preservation of the resource:

- collect and use rainwater for watering green spaces;
- implement a rational water management policy;
- put up signs at the level of toilets and sinks to raise awareness among employees and travelers about the importance of water conservation;
- repair in time any failure that could cause a water leak;
- promote preventive maintenance of pipes and water points (taps, flushes, washbasins, etc.);
- carry out chemical, biological and other analyses of drinking water.

VIII.3.1.2.4. Impacts on flora and fauna

During the operational phase, the main potential impacts will be related to the generation of noise due to the operation of aircraft (aerodynamic noise, engine noise generated by turbojets, noise generated by rotating parts, in particular propellers), ground handling and transport vehicles, but also to human presence (employees, passengers, etc.). There are also potential nuisances for wildlife and birds from the light and lighting of the airport and its surroundings.

These nuisances related to noise and lighting at the airport are considered to be a source of annoyance and disturbance for local fauna and especially for avian fauna. The latter is the most exposed with risk of collisions. Collisions can cause injury or even death to the animal, either at the time of the accident or after it has fallen.

However, in the project area, there are fewer and fewer 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Average	Low	Low	Local	Long	Low

Mitigation measures

In order to make these impacts insignificant, the study recommends the following measures:

- avoid the divagation of animals in the airport;
- set up a buffer zone between the airport and the natural areas;

- avoid the proliferation of rapidly growing alien species;
- ensure the reduction of engine noise through regular maintenance and technical visits;
- 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.

VIII.3.2. IMPACTS ON THE SOCIO-ECONOMIC ENVIRONMENT

The rehabilitation works and operating activities of the Matam regional airport are likely to generate positive and negative effects on the environment of the human environment.

VIII.3.2.1. POSITIVE IMPACTS

VIII.3.2.1.1. Rehabilitation phase

During the rehabilitation phase of the Ourossogui-Matam 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 area to be rehabilitated will result in the recruitment of unskilled personnel for clearing the brush, guarding, maneuvering, etc. A qualified workforce will also be recruited for tasks requiring specialization.

The paid participation of local labor in the work will improve the standard of living of these individuals and their dependents.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

Bonus measures

In order to make the most of this opportunity, the study recommends the following measures:

- recruit local workers as a priority;
- set up a local recruitment committee;
- pay decent wages to workers;
- involve IWHSS in the declaration and identification of workers;
- declare the opening of the site to the labor inspectorate;
- ensure the protection of workers, especially day laborers, by declaring them to the Social Security Fund (CSS);
- ensure that social dialogue is respected on the site.

- **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. Thus, the significance of the impact is considered to be **average**.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

Bonus measure

The study recommends the 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 perimeter through the definition and dissemination of a code of conduct that will have the value of an internal regulation to be respected;
- raise awareness among workers, service providers and merchants of the importance of hygiene and safety instructions.

- **Business opportunities for SMEs**

The workers will come from a variety of backgrounds: local, regional and international. 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, an opportunity to open up to 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**.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Regional	Short	Strong

Bonus measure

The application of the following measures could improve the positive impact:

- 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.

VIII.3.2.1.2. Operation 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.

These job opportunities are the responsibility of the operator, who defines their profiles, quantifies their needs and is the main authorising officer of the recruitment market. All jobs to be filled must be competitively tendered and concluded in a transparent manner.

Thus, from security to administration, jobs will be created. In addition, The Ourossogui-Matam airport will outsource airport assistance services, from reception to disposal of its waste (solid and liquid). This approach could benefit local companies specialising in these services. Thus, the significance of the impact is considered high.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Regional	Long	Strong

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;
- offer employment contracts in accordance with Senegalese regulations.
- develop maintenance and security training specific to safety, hygiene and health standards for local companies wishing to operate at the airport if the outsourcing of these services is confirmed;
- set up a service of surface technicians responsible for the hygiene and sanitation of the airport premises,
- introduce a distinction rewarding compliance with health and safety regulations for services and service providers in and around 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 Ourossogui airport will contribute, on the 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Regional	Long	Very strong

Bonus measures

- rehabilitate and equip the Ourossogui airport with the most modern technologies;
- revitalize and make the services provided to passengers on departure and arrival more enjoyable: waiting and accompanying platform for passengers, cafeteria, wifi;
- equip the airport with the latest generation of hygiene equipment;
- assign qualified personnel and specialists to the various workstations;
- provide on-call accommodation for staff;
- 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 Ourossogui 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 not only allow the development of the air transport network and, at the same time, that of economic activities through the revitalization of the hotel and catering sub-sectors, the purchase of goods and services, job creation, etc., but also through the creation of new jobs. It will also contribute to the diversification of destinations in the interior of the country and the efficiency of travel time for individuals, politicians, the army and businessmen. As a result, the significance of the impact is considered **very high**.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Regional	Long	Very strong

Bonus measures

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

VIII.3.2.2. NEGATIVE IMPACTS

VIII.3.2.2.1. Rehabilitation phase

Although producing positive impacts, the rehabilitation of the airport is also a source of negative externalities that will be addressed in the following paragraphs.

- **Living environment**
  - ❖ **Noise pollution**

The rehabilitation work will generate noise and dust, especially during demolition activities but also during reconstruction.

This work will require the use of various mobile and stationary equipment. Through the noise they generate, these machines can become a nuisance for the environment, which can affect the living environment of the local populations and the natural environment that are exposed. Among this noisy equipment, we can mention:

- 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

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 certain 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 and the removal of the current wearing course. 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 that will reflect good waste management practices, namely the principle of collection, sorting, recycling and disposal by appropriate and appropriate means. The management of hazardous waste (solvents, waste oil, paint waste, etc.), especially their recovery and treatment, will be carried out with the local specialised companies in accordance with the regulations in force.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

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 authorised landfills;
- create a buffer zone between the airport and the houses.

❖ **Traffic densification**

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 from various horizons. 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 inevitably 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Short	Average

Mitigation measures

- inform stakeholders (municipalities, populations, AGEROUTE...) on the date of the convoy (by radio, newspaper, telephone, 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;
- establish permanent communication with these stakeholders throughout the rehabilitation project;
- use trucks in good working order for the technical inspection for transport to the site and adapted container platforms / doors;
- limit speed to 30 km/h to the right of the population and make drivers aware of the importance of respecting the rules of good conduct.

❖ **Loss of housing for residents of surrounding neighborhoods (Aïnoumady 1 and 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".

In addition, there are the nuisances related to air pollution and especially noise, which will impact these human installations located in the immediate environment 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Punctual	Long	Strong

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).

VIII.3.2.2.2. Operation phase

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

- **Living environment**
  - **Noise pollution**

During the operating phase, 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 (03) 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 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.

As the first source of impact at an airport, aircraft noise has long been a concern for ICAO, which, through Annex 16 of the Civil Aviation Convention and the adoption of new standards, has brought about rigorous regulation in this field, taking into account environmental issues and new aviation technologies.
In this respect, it should be pointed out that noise control is therefore 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 Ourossogui-Matam airport is less than 85 meters from the nearest residential areas. This cohabitation will inevitably expose the populations concerned to the noise pollution generated by the operation of the airport but also and above all the airport's workers.

The implementation of the action plan will significantly reduce this impact, which will then be of great importance.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Long	Strong

Mitigation measures

- Carry out regular acoustic measurements in the noisiest areas and at property boundaries and implement corrective measures;
- Provide workers with adequate PPE to fight against noise pollution;
- Act on flight scheduling and choose time slots that limit night flights;
- Favor airlines that regularly renew their fleets;
- Encourage airlines to raise awareness and train their pilots in flight techniques to reduce noise emissions;
- Create a framework for functional cooperation between airport managers, local populations, administrative and local authorities, and certain technical services to resolve environmental concerns.

❖ **Generation of solid and liquid waste**

During the operational phase, the airport activity includes several entities on the same site. Each company produces a different type of waste. This waste can be classified into two main categories, namely non-hazardous waste such as inert waste, non-hazardous industrial waste, industrial and 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 activities of these various entities of the airport platform will be a source of wastewater generation. Thus, wastewater will mainly come from sanitary facilities and kitchens, emptying aircraft toilets, washing and repairing airport commercial vehicles and technical workshops.

As described in the human environment, the regions benefiting from this project 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, while giving priority to recovery channels (material or energy). In the absence of

possible recovery, the waste is considered as final and must be landfilled (area to be defined with the municipality) or incinerated in a cement plant.

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 is a fundamental value. The value of this environmental component will be considered high and the impact significant.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Long	Strong

Mitigation measures

- set up a solid waste management procedure and provide all companies on the platform with an area dedicated 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;
- consider that, at a minimum, sorting should separate hazardous waste, inert waste and non-hazardous waste.
- 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;
- regularly empty septic tanks by an approved body;
- 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.

- **Water and energy consumption**

The water supply for the future airport will probably be provided by the ASUFOR network. The rehabilitation and upgrading of the airport will result in increased airport use and inevitably lead to 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 which provides the electricity supply for the current airport. A power plant will be installed for emergency power supply and night lighting of the tarmac.

The rehabilitation of the airport and its upgrading to standards 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 03 to 04 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.

VIII.3.3. IMPACTS ON HEALTH, SAFETY AND SECURITY

VIII.3.3.1. IMPACTS IN THE REHABILITATION PHASE

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

The identification of these impacts will make it possible to propose measures to avoid and reduce their likely effects on the various targets.

- **Impacts on hygiene**

Activities related to the demolition and reconstruction of the airport can degrade hygiene in and around the construction site.

Indeed, the health needs of workers, their restoration, the washing water of certain machinery 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. It is not only about body care and nutrition. On a construction site, the reception conditions, the cleanliness of the premises, clothing, the provision of clean sanitary facilities, drinking water and waste management policies are all essential to ensure hygiene.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Punctual	Short	Low

Mitigation measures

The following recommendations are made to the company manager who is responsible for good hygiene on the site:

- raise awareness among workers on the importance of hygiene preservation;
- ensure the sorting and elimination of site waste and monitor it on a daily basis;
- set up visible signage to facilitate the collection and sorting of waste;
- recycle and recover non-hazardous waste (e.g. cardboard, plastics, wood, rubble, concrete, scrap metal, crushing inert waste, etc.);
- carry out special and appropriate treatment for the disposal of hazardous waste containing toxic and harmful substances (empty paint pots, hydrocarbons, batteries, accumulators, etc.) for the environment and people;
- formalize actions concerning waste treatment in the form of a procedure;
- establish strict hygiene rules to be respected by any person working on the site;
- provide a sufficient number of well-maintained sanitary facilities according to the proportion of workers;
- guarantee access to toilets for workers of all categories;
- set up one or more drinking water points accessible to all;
- provide changing rooms for staff.

Health Impacts

Studies show that 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;
- repetitive gestures;
- 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, the rhythmic and repetitive gestures 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, the movement of demolition equipment, earthworks and trucks. Inhalation of dust and breathing in air contaminated with harmful particles can create respiratory problems such as acute respiratory infections.

Awkward postures, carrying heavy loads, repetitive movements can lead to MSDs, fatigue and falls in the long run.

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

The worker's health must be preserved in the performance of his duties. The company manager is responsible for implementing all security conditions to ensure that they are in place.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Punctual	Short	Average

Mitigation measures

In order to avoid or reduce the negative impacts of the activity on the health of workers and residents, the following recommendations are recommended:

- favor wet working processes;
- use a dust collection device;
- use suction devices at source;
- wear suitable PPE and work clothes;
- provide shower(s) on site;
- carry out noise measurements and provide the PPE adapted to the measured values;
- 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;
- provide workers with handling and lifting equipment;
- use visual warning devices instead of audible warning devices;
- stop the engine of unused machinery.

Safety Impacts

During demolition work, workers are exposed to noise, risks of falling from heights, electrical risks, as well as risks of fire and explosion.

Work near electrical lines and installations or near live bare parts involves the same risks as work involving electrical machines, electrification or electrocution.

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.

Coactivity as well as traffic flows in the construction site lead to risks of accidents. Poor organization of demolition debris, poor management of material inventories and uncontrolled deposition of materials on the site can lead to level falls leading to injuries and work disabilities.

The transport of construction materials, the circulation of machinery and the transport of rubble and rubble can lead to traffic accidents and harm workers and populations.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	High	Very Strong	Punctual	Short	Strong

Mitigation measures

Safety on the site is a key factor to be taken into account in order to guarantee the health of workers and local populations and thus be able to respect the site's deadlines. In order to avoid or reduce safety risks on the site, the following recommendations are made:

- implement a traffic plan;
- establish safety procedures for co-activity on the site;
- 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 people lifts and make scaffolding and shoring plans;
- 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;
- limit the traffic speeds of cars and machinery within the site and when they pass on the roads;

- establish a traffic plan on the site and train operators and drivers in safe driving;
- keep the site clean and properly organize the depots;
- ensure the proper functioning of the equipment before use;
- regulate access to the site and place hazard symbols, protective markers and prohibition and warning signs in all areas where there is a danger;
- carry out information and awareness campaigns for the population;
- provide space for customs, police and health services.

VIII.3.3.2. IMPACTS DURING THE OPERATING PHASE

An airport involves several processes and attracts many people. Its 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.

An airport drains a lot of people and there are activities that generate various types of waste. The uncontrolled management of this 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 of the premises.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Low	Average	Local	Long	Average

Mitigation measures

It is important to maintain hygiene in the site and surroundings for this purpose, the following measures are proposed:

- set up a procedure for managing the various types of waste;
- set up visible signage to facilitate the collection and sorting of waste;
- place garbage cans with lids in places where they are needed;
- recycle and recover non-hazardous waste (e.g. cardboard, plastics, wood, etc.);
- carry out special and appropriate treatment for the disposal of hazardous waste containing toxic substances that are harmful to the environment and people;
- establish a reliable sanitation system to prevent the discharge of wastewater or contaminated water into the natural environment;
- set up a rainwater collection system;
- raise staff awareness of the importance of maintaining hygiene;
- keep workplaces, gathering places, equipment, furniture clean;
- provide adequate and hygienic toilets in sufficient number and by gender;
- ensure the permanent healthiness of the premises and sanitary facilities;
- provide workers with changing rooms;

- contract with specialized cleaning services in good standing to manage the site's sanitation.

Health Impacts

Workers are exposed to various risks that can affect their health. Depending on the position and working conditions, they are exposed to the screen, noise, exhaust gases from aircraft and car engines, and awkward postures. Thus, they may have hearing problems following exposure to noise, vision problems, headaches due to long screen exposure, ergonomic difficulties due to awkward postures or poor quality work tools.

Some types of work require physical and mental isolation (air traffic controllers) and prolonged exposure to a screen with high concentration, this can affect mental and visual health and lead to stress.

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.

Workers are also exposed to the risk of falling from a height and colliding with moving vehicles or aircraft, resulting in sprains, open injuries, etc.

Working on or near high-voltage active components exposes the employee to electrical risks. In addition, poor hygiene in the premises exposes both workers and passengers to the risk of disease.

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.

Some workers may be exposed to radio frequencies.

Ground handling service providers may be exposed to chemical risks, in particular when, in the course of their work, they are in direct contact with fuels or other chemicals.

Fuels can pose a risk of exposure to volatile organic compounds through inhalation or dermal contact both in normal operations and in the event of a spill.

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

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	Average	Strong	Local	Long	Strong

Mitigation measures

Since it is essential to protect the health of the crew, passengers, staff and populations, the following recommendations are made:

- 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;
- make noise measurements and provide PPE adapted to the noise level required by the tests;
- carry out the pre-recruitment medical check-up and periodic check-ups every six months;
- provide first aid kits;
- make workers aware of the actions that save lives;
- 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

Various aspects of security can be developed.

Workers, in addition to noise, are exposed to various physical risks depending on the position occupied and the workplace.

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 risk of slipping and falling cannot be ruled out because certain categories of workers are exposed to it. Workers may also be exposed to suction risks associated with working near reactors.

Workers are also exposed to fire and explosion risks and also to electrical risks.

The animal hazard and the presence of FOD on the runway can also pose safety problems. The presence of stray dogs, oxen, sheep and other domestic animals on the runway and taxiways can seriously compromise operational safety as it 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, known to all, are risk factors for the activity. They promote accidents through incursions into sensitive parts of the aircraft or by collision.

Aircraft failures, although very rare, 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. They are also a source of noise.

The introduction of foreign persons for the purpose of vandalism or malicious acts is a risk to be taken into account.

Safety and security at the airport must be greatly increased to avoid and 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.

VCE	Disruption	Intensity	Scope of the project	Duration	Importance
Great	High	Very Strong	Local	Long	Very Strong

Mitigation measures

Safety is one of the most important pillars in aviation. Staff, travelers and the entire system must be protected to preserve their integrity. The following measures are proposed for good safety management.

- install safety signage;
- take measures for the protection of staff and neighbors;
- 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;
- ensure that safety procedures are controlled by the agents responsible for handling aircraft support equipment;
- automate baggage handling and minimize the use of manual handling;
- provide training to all baggage handling employees;
- provide workers with PPE adapted to each type of risk to which they are exposed;
- limit the frequency and duration of workers' assignments to handle heavy baggage and introduce rotations and rest periods;
- train workers in thermal risk prevention;
- train staff in the use of emergency means and evacuation;
- establish a traffic plan;
- develop an emergency plan;
- provide the customs, police and hygiene brigade installed in the airport with the latest generation equipment to carry out their work properly;
- provide the inspection bodies with the latest generation equipment to ensure the screening of baggage and passengers;

- provide training on terrorism warning and security;
- have sufficient equipment for firefighting;
- have a synoptic table in the emergency room of the rescue and fire-fighting service;
- promote regular maintenance and periodic verification of tracks to identify and remove FODs;
- provide a daily cleaning system for the movement area;
- use herbicides in the vicinity of the trails to prevent vegetation from growing;
- avoid the accumulation of waste near the runways;
- 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;
- raise awareness of the importance of not having vegetation, birds or landfills in the vicinity of the airport;
- 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;
- make regular indoor and outdoor rounds;
- establish strict baggage security standards.

VIII.4. ASSESSMENT OF CUMULATIVE IMPACTS

In the Ourossogui-Matam airport area, current and future projects have been identified that could make a substantial contribution to the environmental effects of the airport's rehabilitation.

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

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

VIII.4.1. DESCRIPTION OF FUTURE AND ONGOING PROGRAMMES 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 said central 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, each capable of driving approximately 1200 m² of photovoltaic panels.
It should be noted that 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 Southeast by a SIPA (Agricultural Production Intensification Company) agricultural farm managed by the populations themselves and set up by PRODAM (Matam Agricultural Development Project) which is a state project financed by the AfDB and BOAD.

SIPAs are community-based projects aimed at addressing the scarcity of rainfall and reduced harvests, but also at creating jobs for young people.

It should be noted that the Ourossogui SIPA, which was to be enhanced by the development of market gardening and a goat farm, is 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.

VIII.4.2. CUMULATIVE IMPACTS IDENTIFIED

VIII.4.2.1. POSITIVE CUMULATIVE IMPACTS

❖ **Job creation**

The advent of these projects in the area will generate many jobs that will benefit young people, especially those in the area.

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 these various 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 various projects, vectors of development, 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.

VIII.4.2.2. CUMULATIVE NEGATIVE IMPACTS

- **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, which will become more dense. This situation will have consequences for the environment, health and living conditions through the emission of pollutants from vehicle exhaust gases and the generation of noise. There will also be a safety issue (risk of accidents). However, these accidents can be minimised 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 and extension phase of the airport will lead to the clearing and deforestation of some remaining species. In addition, there are similar activities that will take place during the construction of the solar power plant and that will probably be repeated for the purposes of implementing the ZAC project.

In addition to this massive deforestation in an area where biodiversity must be preserved, there are also losses of habitats and wildlife species.

This destruction of flora and wildlife habitats contributes to the degradation of the natural ecosystem, which is an environmental component to be preserved, especially at a time when global warming and greenhouse gas (GHG) emissions are becoming increasingly prevalent.

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, mainly DAOM (Waste Assimilated to Household Waste), will also be produced. This waste is 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 and appropriate means.

IX.RISK ASSESSMENT

IX.1. INTRODUCTION

IX.1.1.OBJECTIVES OF THE PROJECT

This risk assessment is carried out in order to understand the technological and environmental risks that may occur while affecting the airport and its immediate environment. Thus, it sets out the dangers that the establishment may present in the event of an accident, by presenting a description of these events that may occur, whether their causes are internal or external, related to the products handled or the processes and equipment used.

It describes the nature and extent of the consequences that a possible accident can have. In addition, this study summarizes all the technical and organizational means of prevention and protection planned to eliminate or reduce the hazards identified in the airport risk analysis.

IX.1.2.EXPECTED RESULTS

In accordance with the Methodological Guide for Hazard Analysis of the Senegalese Ministry of the Environment, the objectives of a hazard study are summarized as follows:

- serve as a reference for decision-makers to take security measures into account;
- identify potential issues and dangers;
- analyze risks;
- evaluate the consequences;
- propose means of prevention, control and intervention;
- reduce risk inside and outside the facility;
- provide the basic elements necessary for the development of the POI and other emergency plans;
- inform and raise awareness among staff;
- develop a risk culture among executives, employees and populations.

In summary, the hazard study makes it possible to develop a preventive risk policy towards the public and airport staff.

The results of this ESD will be used as a guide for decision-makers to make the necessary arrangements for the design of suitable premises, the establishment of means of prevention, protection and warning for any future unfortunate event.

IX.1.3.METHODOLOGY OF IMPLEMENTATION

The structuring of the hazard study report follows a chronology that identifies all possible risks in and around the airport. This makes it possible to study their effects on the environment in order to establish a good forecast of probable damage.

The following methodology was adopted:

- description of the natural and human environment of the site;

- description of the facilities, activities and products used;
- identification and characterization of hazardous phenomena;
- preliminary analysis (characterization of the intensity of the effects of dangerous phenomena), risks;
- identification of the accident scenarios selected;
- risk reduction study: prevention measures, safety barriers, etc.

IX.2. DESCRIPTION OF THE SITE ENVIRONMENT

IX.2.1.NATURAL ENVIRONMENT

IX.2.1.1. CLIMATIC CONDITIONS

- **Wind**

Over a 30-year period, the average annual wind speed is 1.3 m/s. The highest speeds are recorded from May to September, while the lowest from October to April.

- **Temperature and exposure**

The project area, due to its location and the influence of the Mauritanian desert, which extends its heat and dust waves, records fairly high temperatures throughout the year. From 1987 to 2016, the recorded normal is 30.6°C. The lowest average temperatures are recorded between November and February. However, the highest are observed from March to June and September to October.

Sunstroke, which is a parameter dependent on cloud cover and rainfall, is of a fairly constant daily average duration in the project area. The lowest insolation values are recorded during the rainy season.

- **Rainfall measurement**

The Ourossogui-Matam airport is located in the Sahel continental climatic zone. The annual cumulative rainfall in the area rarely exceeds 400 mm. The normal (30 years) is 297 mm. There is an interannual irregularity in precipitation.

- **Lightning**

The keraunic level (Nk) corresponding to the number of thunderstorms and more precisely, the number of thunderclaps heard in a given area. It is to be distinguished from the lightning strike density (Ng), representing the number of lightning strikes per km², and per year. These two parameters are not known.

IX.2.1.2. HYDROLOGY AND HYDROGEOLOGY

The hydrographic network is quite dense in the project area. Indeed, it records a period of high and low water, respectively, from June/July to October/November and from November/December to May/June.

There is no water point within the site. However, the airport is exposed to the risk of flooding because this area is located on the slope of a sloping plateau from west to east. This situation favors intense runoff and therefore water erosion and gullying.

IX.2.1.3. GEOLOGY

The Ourossogui-Matam airport is located on alluvial formations made up of recent river alluvium. The altitudes of the project area range from 0 to 60 m and those of the airport from 15 to 39 m. The airport is located on lithosols on breastplates and regosols on gravel. These soils are locally covered with a thin sandy veil.

IX.2.2.MAN-MADE ENVIRONMENT

The Ourossogui-Matam airport is in an urbanized environment with the development of various activities and infrastructures.

IX.2.2.1. RESIDENTIAL AREAS

The Aïnoumady I and Aïnoumady II districts are in the immediate vicinity of the airport. Houses line the airport wall on the east side.

IX.2.2.2. ACTIVITY AND LEISURE AREAS

South of the airport, there are some rainfed fields, garbage dumps and natural vegetation. There is also a solar power plant about 500 m south of the site and SIPA's agricultural estate 200 m away.

A mixed use area (ZAC) and housing are located to the southwest of the site.

IX.2.2.3. TRANSPORT NETWORKS

The N2 national road is about 250 m east of the airport.

IX.2.2.4. OTHER DEVELOPMENTS

There are dikes, ravines and rainwater drainage routes in the immediate environment of the site.

IX.3. DESCRIPTION OF EQUIPMENT, PROCESSES AND PREMISES AT RISK

For this project to rehabilitate the Ourossogui-Matam airport, the existing one will be dismantled and new facilities will be installed.

IX.3.1. AERONAUTICAL PLATFORMS

Aeronautical platforms include different pavements used by aircraft or ground support vehicles for different reasons.

The maneuvering area is the part of an airport to be used for take-offs, landings and aircraft traffic at the surface (excluding aprons). It includes the runway (landing area) and taxiways.

The apron is the part of an airport used for embarking and disembarking passengers, loading and unloading cargo, refueling, servicing, maintenance and parking aircraft. It includes parking areas, maintenance areas, garage areas and apron taxiways.

These platforms must be free of obstacles in order to avoid a possible accident.

IX.3.2. RISK MATERIALS, EQUIPMENT AND PRODUCTS USED

No fuel storage is planned at the Ourossogui-Matam airport. However, electrical equipment, the 140 kVA generator set and assistance vehicles may be at risk.

IX.3.3. RISKY PROCESSES

The landing and take-off phases are the most risky stages in aircraft navigation. Maneuvring within the movement area is also a risk process because crossings between vehicles, people and aircraft can lead to serious accidents depending on the intensity of the impacts.

IX.3.4. FACILITIES AND UTILITIES FOR THE PROJECT

The smooth running of activities around the aircraft is facilitated by vehicles with various functions.

A toilet emptying vehicle will be provided to allow the aircraft to be emptied. This activity will take place at an altitude of about 5 m.

Aircraft tractors are vehicles used to tow the aircraft to its departure area or to transport it between areas remote from the airport.

The airport will have a refueling truck to supply the aircraft with fuel, drawn from the pumping station. This truck has a lifting platform to access the refueling outlets under the aircraft's wings.

The project also includes two fire vehicles, a drinking water vehicle to supply the aircraft at an altitude of about 5 m and an ambulance.

IX.3.5.HAZARDOUS WASTE GENERATED

Hazardous waste generated at the airport includes maintenance waste (waste oils, oil/fuel filters, batteries, rags and soiled packaging), Waste Electrical and Electronic Equipment (WEEE), as well as batteries, fluorescent tubes and lamps.

These wastes are those that present one or more of the hazardous properties represented by hazard pictograms (explosive, flammable, dangerous for the environment, toxic, carcinogenic, etc.). If they are not treated properly, they can cause harm to people and the environment.

IX.4. IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL HAZARDS

IX.4.1.SOURCES OF EXTERNAL HAZARDS

IX.4.1.1. NATURAL EXTERNAL HAZARDS

IX.4.1.1.1. Poor weather conditions

Poor weather conditions, such as gusts of wind, heavy rain, fog or dust, can reduce visibility, hinder airworthiness and lead to potential accidents.

The Ourossogui-Matam airport is exposed to flooding due to its position in relation to the natural rainwater flow path. In the event of runway flooding, the temporary closure of the site, the diversion of aircraft to the nearest airports and a risk of damage to the facilities could be caused.

Lightning is an atmospheric manifestation of electricity, with an electrical discharge accompanied by bright light and a violent detonation. It can fall directly onto the ground, structures or power lines. In all these cases, the consequences can be harmful through propagation by radiation or by the conductor.

Airport runways are large, sensitive open spaces that can be struck by lightning during an electrical storm. The effects of lightning (thermal, electromagnetic, electrodynamic, etc.) can lead to consequences such as fire, burns, destruction of electrical equipment, breakdown, electrocution, hearing and eye damage, etc. The control of weather situations is essential for air traffic. Rigorous monitoring of these with sophisticated devices is therefore essential, in addition to visual observations. It is necessary to provide a storm detector to prevent a storm from occurring and thus limit damage.

IX.4.1.2. NON-NATURAL EXTERNAL HAZARDS

IX.4.1.2.1. Human Environment

The airport is located in a highly urbanized environment. This is as much a danger to this population as it is to it; through its buildings, its activities and its attitudes.

High-rise buildings and cultivation activities around the airport are not compatible with the facility. Indeed, the floors are shielded from the pilots' visibility. In addition, cropping areas are favorable places for birds, which can create an avian risk.

In fact, tree, shrub and thick herbaceous vegetative thickets are used, directly or indirectly, for various species of birds, as nesting sites, perches, quiet oases in relation to the agglomeration, foraging sites, dormitories, etc. Some species also find on the site or its surroundings, others with their specific needs such as water. Their stay may of course be seasonal, but constitutes a definite risk for aircraft.

The anthropization of the immediate airport environment and the lack of sanitation systems for household waste are leading people to create illegal landfills around their homes. However, as

the latter are public and surrounding, they are places of attraction for birds and serve as their food source.

Under these conditions, they can squatter the airport and give rise to avian risks (collision with aircraft, incursion into engines, etc.).

Malicious populations may also try to break down the fence wall to shorten their path. This will lead to the intrusion of animals, free access by foreigners and weaken security within the airport.

IX.4.1.2.2. Activity zones

Domestic livestock farming and cultivation activities in the vicinity of the site are not recommended. In the event of a breach in the airport fence or a lack of vigilance on the part of the guards, animals can enter the site and create accidents, resulting in collisions between animals and vehicles or aircraft, or even create panic among passengers and employees.

Cultivation activities attract birds, which remain enemies of aviation. They can collide with aircraft and cause harmful consequences.

IX.4.1.2.3. Dazzling risks due to the photovoltaic panels of the solar power plant

Most solar panels have a glass front panel. It is the presence of this glass on the front panel that is responsible for a reflective effect. This can be embarrassing for pilots and, if necessary, control towers in the vicinity of airports.

The solar panels, equipped with a particularly transparent special glass, have a reflection coefficient close to that of calm water and twice that of conventional glass.

The mirroring effect of solar panels does not make them incompatible with aeronautical activities. The Ourossogui solar power plant, located about 500 m from the airport, may not generate any glare during the approach phase of the aircraft, depending on its location, orientation and inclination of the panels. It is simply necessary to verify that the characteristics of the solar power plant (in particular, location, orientation and inclination) do not create a visual disturbance for pilots during the landing phase, as this could affect safety. Thus, a glare risk study must be carried out to demonstrate the total absence of visual disturbance.

There are indeed photovoltaic fields in the world near airports with a well compatible coexistence (Saint-Pierre-Pierrefonds aerodrome in France, Cochin International aerodrome in India, Indianapolis International Airport in the United States, Tucson International Airport in the United States, etc.).

IX.4.2. SOURCES OF INTERNAL HAZARDS

The risks that may arise from activities related to the operation of the airport would be due to the use of aeronautical platforms, coactivity, human errors, etc.

IX.4.3. HAZARDS RELATED TO THE USE OF THE MOVEMENT AREA

The airport runway, one of the components of the maneuvring area, is used for aircraft landing and take-off. It is one of the most at risk parties in aviation. In fact, poor air traffic control and traffic management can lead to runway accidents. There are a series of fairly complex and closely related causes such as airline operations, a lack of vigilance and a lack of communication, which are at the root of runway accidents.

Indeed, any incorrect presence of an aircraft, vehicle or individual on the runway and the corresponding protected area is a source of conflict and can lead to collisions or strikes. In addition, during take-off or landing, aircraft are likely to make unintentional runway excursions that may sometimes be without consequences unless they encounter an obstacle in their path.

The apron is the area of highest intensity and variety of movement.

It is the only place where airport employees, passengers, vehicles, aircraft and sometimes casual visitors cross and pass each other. Co-activity in this area leads to risks of collision between aircraft, vehicles or people. This area is an area with a high probability of accidents.

IX.4.3.1. FOREIGN OBJECT HAZARDS ON AIRCRAFT TAXIWAYS

FODs, also known as foreign object debris, are materials or objects that can be sucked up by an aircraft engine or cause damage to an aircraft's structure. To be more explicit, FODs are bulk materials (padlocks, glasses, plastics, labels, metal, tools, stone fragments, suitcase debris, coins, soda cans, etc.). They represent a danger to aircraft on both landing and take-off because they can cause engine failure, aircraft destruction and accidents that can result in injury or death.

Freight operations, cleaning and maintenance of aircraft generate FOD. Poor maintenance of the movement area promotes the incursion of this debris into the open areas of the aircraft, which contributes to accidents.

IX.4.3.2. DANGERS RELATED TO CO-ACTIVITY AROUND THE AIRCRAFT

Working together around the aircraft exposes pedestrians and vehicle drivers to the risks generated by simultaneous activities. These risks may lead to others or reinforce those specific to each activity.

Working near moving vehicles, machinery or equipment involves risks that can lead to serious accidents.

Co-activity leads to exposure to noise and exhaust gases. It also encourages traffic on congested areas when neither procedures, nor traffic plans or preliminary consultations have been established between the various platform stakeholders.

In a co-activity, the most prevalent dangerous situations are the presence of hot spots in the event of refueling, track congestion, noise generation and exhaust fumes. Possible damage in the event of an accident is the appearance of burns, serious trauma, open wounds, etc.

IX.4.3.3. DANGERS RELATED TO ELECTRICAL INSTALLATIONS

Electrical installations can cause short circuits or electrification if insulation systems are not properly installed or the electrical network is undersized. These electrical risks can cause fires, destruction of equipment or even injuries.

IX.4.3.4. DANGERS RELATED TO HUMAN ERROR

Many ground incidents at airports are due to human failure. There are many types of errors, and they are related to various causes. They may be related to the behavior of the pilot, air traffic controller, ground agents, etc.

Failure to follow procedures and miscommunication can lead to disastrous incidents and accidents. Lack of communication during simultaneous work or incompetent agents can lead to errors.

IX.5. ACCIDENTOLOGY AND FEEDBACK

The feedback is an open window on accidentology in various sectors of activity around the world. It makes it possible to learn from past experiences by reviewing the various technological accidents listed; to know their causes and consequences. This feedback thus provides an opportunity to identify any weaknesses in an organization with a view to strengthening the prevention and protection system against failures (human, technical or organizational), in order to improve risk management.

Such information is taken into account in the preliminary risk analysis and helps to propose the best possible options to prevent and combat these types of accidents and protect the environment and potential targets.

IX.5.1. METHODOLOGY AND METHODOLOGY

Research on the accidentology of this project to rehabilitate the Ourossogui-Matam airport was carried out from several sources, including:

- the ARIA database of the Office of Industrial Risk and Pollution Analysis (BARPI), which lists technological accidents that have occurred in various countries around the world (see http://aria.developpement-durable.gouv.fr);
- the French website http://www.crash-aerien.aero which lists air accidents and incidents;
- the website http://airinfo.org which deals with news on French and international civil aviation;
- the database of the Office of Investigation and Analysis for Civil Aviation Safety (BEA), which lists several types of accidents and incidents related to the aviation industry (see https://www.bea.aero/).

Documents, the press and scientific publications relating to events in the aviation industry were also consulted.

The research took into account several types of accidents in the sector. These accidents and incidents are all the more varied as they come from various sources. Some details of the selected accidents are given in the annex to this report.

IX.5.2. ACCIDENTOLOGY RESULTS

The results of the accidentology reveal the existence of several accidents and incidents that have occurred in this sector of activity. The types identified are multiple and come from different causes.

According to the results of the accidentology, most accidents occur at and around the airport, particularly during landing, taxiing and gluing. An analysis of these different results is provided in the following paragraphs.

IX.5.3. IDENTIFIED INCIDENTS

The incidents recorded have several origins and most often take place in mid-flight and a few times on the ground. In the accidentology results concerning the incidents, several cases developed below have been reported.

IX.5.3.1. RETURN BY PLANE TO THE AIRPORT

Aircraft that have already taken off have had to return to the airport due to various causes, such as technical problems, most often related to the engine or poor maintenance of the aircraft. A return case was also detected following a pilot's discomfort.

IX.5.3.2. AIRCRAFT DIVERSION

Aircraft were forced to land at the nearest airport during their flight due to technical problems during the flight. Most of these are hydraulic leaks.

Other causes of aircraft diversions such as bird ingestion in an engine or a smell of smoke inside the aircraft have also been detected.

IX.5.3.3. RUNWAY EXCURSION

Runway exits during take-off and landing have been noted and the causes are unknown.

A report published by the BEA indicates that 62 runway overruns occurred, 44 of which were reported to have resulted from a loss of control of the aircraft pilot during the landing roll.

IX.5.4. ACCIDENTS RECORDED

Several types of accidents have been identified through the review of accidentology. For the most part, the cause is unknown. The consequences range from minor injuries to human death and destruction of equipment.

An analysis of the various accidents identified is made in the following paragraphs.

IX.5.4.1. CRASH

According to the results of the accidentology, an aircraft crash with unknown causes caused 38 deaths and material damage. Another plane that missed its airstrip ended up in a village, killing 32 people and losing equipment.

Other results reveal that after a failed landing, an aircraft landed suddenly on a gas station, killing 200 people and causing the aircraft to burn quickly.

Senegal has had to record a few cases of aircraft crashes, some of which are listed below.

On September 05, 2015, the plane of Air Senegal disappeared, after a collision in flight with a 737-800 of the Equatorial Guinean company Ceiba Intercontinental which operated the Dakar-Cotonou (Benin) route.

The Air Senegal plane on a medical evacuation flight from Ouagadougou, Burkina Faso to Dakar has disappeared from radar and the seven people on board are reported dead. The BEA's report, following his expertise, revealed that the pilot had not followed his flight plan.

On February 01, 1997, an Air Senegal Hawker Siddeley 748 crashed into the ground thirty seconds after takeoff from the Tambacounda airport. The causes are not stated, however, there were 23 deaths and serious injuries.

In February 1992 an aircraft crash occurred at Cap Skirring. A Club Med plane on its way to a holiday village in Cap Skirring crashed, killing about 30 people and injuring 26, some of them seriously. The aircraft was not in compliance with safety standards and the 67-year-old pilot had exceeded the age limit, was "near-sighted and practically deaf" according to the Senegalese investigation commission.

He could have confused the lights of a road with the track (source http://www.crashdehabsheim.net). According to the judicial inquiry and the testimonies of former passengers who had alerted Club Med, the flight to the "Cap Skirring" had for years been very frequently subject to technical problems without unduly affecting the organizers of trips to Cap Skirring.

IX.5.4.2. COLLISION

On the ground and in the air, aircraft can be subjected to impacts that can be violent. The results of the accidentology showed the existence of a collision between an aircraft and a truck on the runway but also the passage of an aircraft in a turbulent area.

The causes of the impact between the aircraft and the truck were not mentioned, but this accident injured 8 truck passengers; the passengers on the aircraft were not injured.

The turbulence occurred in a clear area. So it was unpredictable. As a result, passengers were unable to fasten their seat belts in time. 27 people were injured in this accident.

IX.5.4.3. AVIAN RISK

According to a document on waste management with regard to aeronautical avian risk published in 2015 by the CGEDD, avian risk is a major risk for international civil aviation. It has caused 79 accidents worldwide since 1960, with more than 210 victims. In France, on average over the period 2003-2013, there were 650 collisions each year. 8.8% of collisions are classified as serious, with damage to the aircraft.

In the United States, according to the same document, there were 137,000 collisions between birds and aircraft between 1990 and 2013.

More than 10,000 in 2013, 62% by day, 9% at nightfall, 29% at night and 92% at an altitude below 1,000 m. They caused 25 deaths, 279 injuries, and significant damage to 62 aircraft with damage estimated at an average of $1 billion per year.

At the same time, according to a study commissioned by ASECNA in June 1995 on the control of bird risk at ASECNA airports, it is known that this risk was indeed present at Léopold Sédar Senghor airport in Dakar and that the maximum number of significant incidents is always reported in September/October, during and after the rainy season. This report was based on the results of research on the collision rate on 10,000 movements of Air France aircraft. Of these 10,000 movements through several airports, LSS recorded collisions between birds and aircraft; statistics by year are presented below:

- Year 1993 (Dakar LSS airport): 30 per 10,000 ;
- Year 1994 (Dakar LSS airport): 50 per 10,000.

This report mentions that the LSS airport was a good place to attract birds because of its configuration and its highly urbanized neighborhood. Thus, birds through trees and wild dumpsites found resting, nesting and other areas.

For Dakar Yoff airport, various factors and contextual elements seemed to be major factors attracting birds to the airport site.

IX.5.4.4. FIRE

Fires under different conditions and involving various airport equipment and premises have been reported. For some accidents, the causes are unknown.

The following table summarizes the various types of fires identified in the reports.

Table 37: Airport Fires

Type of fire	Causes	Consequences
Aircraft fire on landing	Technical failure of the aircraft-wing collision with the fence wall	3 slightly injured Apparatus totally destroyed
	Poor weather conditions Forced landing	No injuries Material destroyed

Type of fire	Causes	Consequences
Fire in an airport restaurant	Unknown	Spread of fire to neighboring shops Panic, flight delays
Fire in one of the airport offices	Unknown	No injuries were reported. Flights redirected to other airports
Airport Fire	Criminal origin	Destruction of the electronic landing system
Fire in an airport parking lot	Unknown	Destruction of cars
Fire in a tank truck during refueling of an aircraft	Unknown	No injuries or material damage to the aircraft
Fire in an airport hangar	Inflammation of white-spirit vapors, used when cleaning an aircraft	9 people injured
Aircraft fire in a maintenance hangar	Unknown	1 seriously injured 2 planes destroyed by fire 2 planes destroyed by the collapse of the hall
Fire in the computer system that controls runway lighting	Unknown	Aircraft diverted to other airports
Airport fuel depot fire	Leak in a valve pit and ignition by electric motor	Hydrocarbon spill Damage to tanks

Other fires involving premises within the airport have been identified without any information on their causes or consequences.

IX.5.4.5. EXPLOSION

The only reported explosion is that of an oxygen cylinder in an aircraft in mid-air. The causes have not been stated. The aircraft that had some damage must have landed at the nearest airport.

IX.5.4.6. KEROSENE SPILL

Kerosene spills have been noted as a result of various factors such as tank truck rollover due to driver mismanagement, human errors in valve handling, tank level sensor malfunctions and flange seal failures.

These kerosene discharges, sometimes on the ground, have resulted in soil and water pollution because in some cases the hydrocarbon has entered the rainwater pipeline and mixed with seawater in other cases.

IX.5.5.SYNTHESIS ON THE FEEDBACK OF EXPERIENCES

Of all the accidents recorded in the airport environment, fires are the most prevalent with the greatest impact on equipment.

Human casualties are most often observed during aircraft crashes. The incidents did not reveal any human consequences. Bird hazard is a present risk and is capable of causing several damages.

The lessons to be drawn from the feedback are that these types of accidents or incidents are indeed possible at The Ourossogui-Matam airport and that preventive measures should already be taken into account in order to avoid them or limit the consequences in the event of an accident.

It would also be necessary to:

- fight against the avian danger;
- implement a wildlife management program with habitat modifications and relocations;
- provide methods for dispersing or spacing birds to reduce aviation safety risks;
- rigorously inspect aircraft after each landing and before takeoff;
- raise awareness among all airport managers of the usefulness, implementation and use of procedures for each activity;
- set up a specific regulatory environment for the operation of airport equipment;
- ensure that pilots are in the clear, in particular in terms of approach stabilization and landing technique control when weather conditions are unfavorable and in landing rolling technique;
- compartmentalize the airport;
- provide a fire detection system and an automatic extinguishing system where necessary;
- provide mobile fire or panic response teams;
- Etc.

IX.6. PRELIMINARY RISK ANALYSIS

Risk can be defined as the possibility of damage occurring as a result of exposure to the effects of a dangerous phenomenon. Indeed, it is the cross between the probability of occurrence of a dangerous phenomenon and the severity of its induced effects.

Preliminary risk analysis is the quantification of all the causes and consequences of dangerous phenomena feared in the installation or that could come from its equipment. Thus, it makes it possible to list the different risks and classify them according to a flat-rate hierarchy through a rating grid; this then makes it possible to define the different risk categories as indicated in Senegal's hazard study guide.

This argument is based on the identification of potential hazards, accidentology and issues.

As a result, the PRA makes it possible to classify the risk according to a rating grid and at the same time ranks them according to their degree of criticality defined by the color assigned to them.

It makes it possible to confirm or deny the existence of major risks, i.e. the feasibility or not of a detailed risk study. At the same time, the PRA makes it possible to provide means of

prevention against feared events and means of protection against the effects of probable dangerous phenomena.

Following the results of the PRA, only the most significant feared events will be analyzed in detail. These provide information on the most likely hazardous phenomena that occur in the facilities.

For each component of the project, it is a question of identifying:

- the feared events;
- the dangerous phenomena that result from it;
- their causes, the preventive measures planned by the project and completed by the consultant;
- the consequences, the control measures planned by the project and completed by the consultant.

IX.6.1. METHODOLOGY

IX.6.1.1. ESTIMATION OF THE RISK LEVEL

Estimating the level of risk amounts to making a rating on the basis of which risks will be prioritized. Beforehand, the installation must be divided into systems to better understand the likely risks. The estimation is done according to several methods.

The Preliminary Risk Analysis (PRA) is the method used in this hazard study for the rehabilitation of Ourossogui-Matam airport.

The results of the PRA make it possible to identify the feared events, the dangerous phenomena induced as well as the harmful effects that they can generate.

Thus, depending on the severity of the effects and their probability of occurrence, they will be assigned flat-rate values that will be entered in a grid in accordance with the Senegalese hazard study guide. The allocation of these scores is also based on information obtained from feedback on accidents that have occurred in other similar facilities.

Table 38: Risk allocation grid[11]

Probability scale (P)		**Gravity scale (G)**	
Score	Meaning of the word	Score	Meaning of the word
1 = unlikely	-Never seen in this industrial sector; -Almost impossible in the establishment	1= negligible	-Minor impact on staff -No downtime -Low environmental impact
2 = rare	-Already met in this industrial sector; -Possible in the establishment	2 = minor	-Medical care for staff -Minor damage -Small loss of products -Minor environmental effects

[11] Source: Guide d'étude de dangers du Sénégal

Probability scale (P)		Gravity scale (G)	
Score	Meaning of the word	Score	Meaning of the word
3 = occasional	-Already met in the establishment; -Occasional but may occur occasionally in the facility	3 = important	-Seriously injured personnel (extended work stoppage) -Limited damage -Partial shutdown of operations -significant environmental effects
4 = frequent	-Arrives two to three times in the establishment	4 = critical	-Disabling injury for life, (1 to 3 deaths) -Significant damage -Partial shutdown of operations -significant environmental effects
5 = constant	-Arrives several times a year in the establishment (more than 3 times a year)	5 =disaster	-Several deaths -Extensive damage -Long production shutdown time

The combination of the two scores assigned to each risk factor will allow it to be rated as tolerable, significant or unacceptable risk according to the color code assigned to it in the following table.

Table 39: Risk Rating Grid[12]

Risk level		Consequences				
		5	4	3	2	1
Probability	5					
	4					
	3					
	2					
	1					

By crossing probability and severity, the risk incurred will be on one of the three levels represented by the following colors.

Green: tolerable risk; According to Senegal's hazard study guide, no action is required.

Yellow: significant risk; According to the guide, a short, medium and long-term reduction plan must be implemented.

Red: high, unacceptable risk; Any risk contained in this red section is considered major and therefore, in accordance with the guide, a detailed study including the development of accident

[12] Source: Hazard study guide for Senegal

scenarios that could lead to it is required. Subsequently, prevention and protection measures must be immediately put in place to reduce and control the risk.

IX.6.1.2. SYSTEM CUTTING

In order to better understand the risks, especially those that are major induced by the various components of the site, the airport will be subdivided into different systems reflecting the different platforms or activities that are developed there. These systems are as follows:

- System 1: Aeronautical platforms;
- System 2: Internal and external circulation.

IX.6.1.3. PRESENTATION OF THE RESULTS

The results of the PRA are recorded in the table below. The identified feared events were analyzed in order to know their causes and consequences. Means of prevention against these dangerous events and consequence control have been proposed.

Table 40: Preliminary risk analysis

System 1: Aeronautical platforms										
Consequences	**Kinetics**	**Pi**	**Gi**	**Ri**	**Preventive measures**	**P f**	**Measures to control the consequences**	**Gf**	**Rf**	**Residual risk**
Collision Aircraft fire Injuries	Fast	3	3		Adopt air traffic control and management systems and processes Leave the runway strip and RESA free of obstacles Ensure the authorization of all personnel involved Carry out a roadworthiness test on each aircraft before takeoff and as soon as it lands Provide a sufficient supply of foamer Develop a procedure for measuring the friction coefficient	2	Provide an ambulance and a fire-fighting vehicle for each movement on the runway	2		Material damage
Damage to the reactor Partial or total destruction of the aircraft Injury or loss of life	Slow	4	4		Implement a debris risk prevention plan Training of people working on the movement area Organization of awareness	2	Medical assistance for the injured Rapid removal of any debris on the runway	3		Damage to equipment

								Provide automated foreign object detection systems Provide secure bins for the collection of FODs Regular and daily inspection of the runways					
1.3	Accident	Coactivity in the apron	Material damage Injuries Spreading fuel Fire and fire	Fast	4	3		Establish procedures for each activity Communicate between the different stakeholders in a platform Avoid uncontrolled storage and track congestion Periodically train and sensitize staff	2	Immediate intervention by the emergency services	2		Minor damage
1.4	Invasion of birds or animals on the track	Breaches in the fence area Presence of vegetation on or around the site Presence of a landfill near the site	Avian risk Wildlife risk Injuries Damage to the device	Fast	3	4		Implement a plan to prevent animal danger In collaboration with the municipality, avoid the establishment of cultivation and landfill fields in the vicinity of the airport	2	Use frightening techniques Immediate assistance to the injured	3		Limited damage

								Carry out periodic weeding within the site enclosure Establish an airport waste management policy					
1.5	Aircraft crash	Poor weather conditions Device failure Pilot Inadvertence Lack of fuel	Injuries Human loss	Fast	2	5		Have sophisticated equipment for monitoring weather conditions Inspect the condition of the aircraft before takeoff and landing Check the fuel supply Insure yourself against people working on the plane	2	Mobilize emergency resources Implement the emergency plan Securing the area	4		Significant damage
System 2: Internal and external circulation													
2.1	Malicious act Sabotage	Human action Failure to comply with airport security Lack of vigilance by security guards	General panic Accidents Airport closure	Fast	3	4		Provide space for Customs, Police, Gendarmerie, Health Services Provide the airport with the latest generation equipment to ensure safety Make periodic external and internal rounds	2	Implement the airport emergency plan	3		Panic Limited damage

								Conduct simulation exercises to be prepared in the event of a real threat					
2.2	Collision	Human error Mechanical failure	Fire and fire Injuries	Fast	3	3		Implement traffic plans Require drivers to be authorized Periodically review the condition of vehicles	2	Immediately alert the emergency services Grid the accident area Assist the injured	2		Damages

IX.6.2. SUMMARY OF THE RISK ANALYSIS

The preliminary risk analysis done previously makes it possible to present all the systems on the criticality matrix. Each system is represented by its corresponding number.

The table below is a summary of the risk levels of the identified feared events. Only the final risks were taken into account.

Table 41: Summary of risk levels of identified feared events

		GRAVITY				
		5	4	3	2	1
PROBABILITY	5					
	4					
	3					
	2		1.5 ;	1.2 ; 1.4 ; 2.1	1.1 ; 1.3 ; 2.2	
	1					

Initial risks identified and events deemed unacceptable have been identified. However, the implementation of means of prevention and consequence control makes it possible to reduce the occurrence of events and the severity of phenomena. Some feared events considered important were drawn from the preliminary risk analysis. It is about:

1.2: Presence of FOD in the maneuvring area;

1.4: Invasion of birds or animals on the runway;

1.5: Aircraft crash;

2.1: Malicious act.

There are no events deemed unacceptable after the implementation of preventive measures and risk control barriers. The detailed risk study will not be done since no technological accidents that could lead to a major risk have been identified.

IX.7. RISK PREVENTION AND CONTROL MEASURES

IX.7.1. AIRPORT EMERGENCY PLAN

When an aircraft accident or emergency occurs (sabotage, bomb threat, dangerous goods incidents, fires, natural disasters, public health emergencies, etc.), the first objective is to save human lives. In order to be able to act quickly, response measures must be planned and instructions established that clearly define the responsibilities of the various emergency services involved in rescue operations. Thus, it is imperative to put in place an airport emergency plan. This plan will ensure the coordination of measures to be taken in an emergency situation at or near the airport. Its purpose is to minimize the effects of an emergency situation, especially in terms of saving human lives and maintaining air operations.

It also aims to outline the procedures for coordinating the activities of the various departments of the airport and those of neighboring agglomerations that could deal with emergency situations.

The emergency plan must contain, among other things:

- the types of emergencies it is intended to deal with;
- the bodies to be involved in the plan;
- the responsibilities and role of each body, the emergency operations management center and the command post, for each type of emergency situation;
- the names and telephone numbers of the services or persons to be alerted in the event of a given emergency situation;
- the grid plan of the airport and its immediate surroundings.

The emergency plan should coordinate the response or participation of all existing bodies that, in the opinion of the competent authorities, could help to deal with an emergency situation. These procedures will have to be approved by all authorities whose jurisdiction is exercised both inside and outside the airport.

At the site level, air traffic control organizations, rescue and fire services, airport administration, medical and ambulance services, aircraft operators, security services and police are the bodies concerned. Outside the airport, however, fire services, police, health authorities (including medical, ambulance, hospital and public health services), military units and port or coastal surveillance services are the bodies concerned.

IX.7.2. PREVENTION OF ANIMAL DANGER

Given the context in which the Ourossogui-Matam airport is located, animal risk cannot be ruled out in the aviation business. It is therefore essential to put in place a plan to prevent animal danger.

Prevention of animal danger can be defined as the awareness of the danger that animals represent for airport users and the implementation of appropriate measures to deal with them. This prevention contributes to the safety of flights and, at the same time, of passengers. It aims to reduce the risk of collision between aircraft and animals during take-off and landing operations. It must be exercised within the airport's control and must include:

- all preventive actions aimed at making the environment inhospitable to animals through appropriate management of the natural environment and the installation of fences adapted to the risks and the environment, including the configuration of the land;
- the implementation, on an occasional or permanent basis, of one or more appropriate measures to frighten or remove animals.

For a secure runway, the following measures can be considered:

- installation of a suitable fence in the area not freely accessible to the public to prevent the passage of animals likely to disturb air navigation;

- implementation of scaring measures, i.e. the removal of birds or other pests that pose an immediate danger to runway safety (e.g. closing the airport for a day to make way for hunters to keep pests away from the infrastructure);
- banning all garbage dumping and certain crops from the airport right-of-way.

It is imperative to reduce the airport's attractiveness for animals in this area. The control of bird threat also requires the establishment of procedures to recognize land management around the airport and reduce its attractiveness for birds, and to monitor, in conjunction with public structures and local owners, any development projects that could contribute to the emergence of additional birds.

Land uses that attract birds include agriculture, livestock, aquaculture, storage, waste treatment, recycling or incineration, and golf course operations.

IX.7.3. FOD RISK PREVENTION

In the aeronautics sector, the presence of a foreign element in a component, assembly, system or even aircraft, due to lost or forgotten tools, can have important consequences. FODs can cause many problems in terms of safety but also productivity.

Foreign Object Debris, commonly known as FOD, is any item on an airport that can be sucked up by an aircraft engine or cause structural damage, thus posing a danger to aircraft.

The presence of debris on the ramp represents a potential risk to aircraft safety. The management of this hazard requires comprehensive action to mitigate the risks.

The prevention of FOD risk must be based on a program based on the following points:

- the active cooperation of all airport actors present on the movement area;
- the coordination of actions to prevent risks related to debris by an airport security manager;
- the training of people working on the movement area;
- the organization of awareness and training campaigns.

It is also important:

- to identify the sources of FOD production;
- to insist on staff training and awareness;
- to put in place adequate signage;
- to install FOD bins in places where it is needed;
- to identify areas for the storage of collected debris.

The person in charge of the airport shall:

- set up equipment and trained personnel to clean the movement area;
- set up equipment for collecting FODs;
- provide vehicles for the collection and transport of waste;
- implement a plan for monitoring, tracking and control of airside areas.

S/he is also responsible for implementing principles for the exclusion of foreign bodies. For this purpose:

- all waste must be collected and placed in secure bins before being transported to a location outside the movement areas;
- all bins located on the airside must have a secure lid to avoid any loss of material;
- all operations likely to produce FODs must be governed by procedures that take into account the management of FODs and the clean-up of the site after work;
- storage areas must be designed to store work tools;
- vehicles and equipment using the runway must be regularly inspected to detect any moving objects that may become FODs;
- all operators must keep the areas they serve clean.

One of the actions prior to the implementation of the FOD risk prevention plan is the diagnosis of the inventory in order to identify the factors that contribute to the creation of FOD so that corrective measures can be taken.

The prevention of FOD risk is the responsibility of all airport personnel, including maintenance staff, baggage handlers, cleaning companies, pilots, etc.

IX.7.4. FIRE PREVENTION AND CONTROL

To prevent fires and fight against thermal effects, it is important to install flame detectors. The flame detector serves as a technical prevention barrier and can detect the presence of flames or burning products.

The safety function provided by a flame detector consists in detecting the birth of a fire and transmitting the information to a processing unit, which can trigger an alarm signal and/or watering and securing the site.

The location of the detectors (number, location) depends on the interests to be protected. They must be in an unencumbered area.

It is also important to install smoke detectors in areas where they are needed and to establish rules to prohibit the use of open flames, smoking, nylon clothing, etc.

It will also be necessary to install a lightning rod in the site but also, if necessary, lightning arresters for large electrical equipment at risk.

Following proper sizing, fire-fighting equipment should also be installed (RIA network, fire extinguishers, hydrants, fire hydrants, fire hydrants, emulsifiers with a premixing network, fire vehicles, etc.). In addition, it is essential to set up a minimum water reserve of 120 m^3 in order to ensure water autonomy in the event of a fire.

Fire-fighting devices shall be selected according to the types of fire to be fought and placed in strategic locations allowing their quick and easy use.

The fire station within the site must be well equipped and regular training must also be provided. It is necessary to provide a synoptic table for the control and prevention of all risks. Also, a direct line must be established between the airport fire brigade and the BNSP fire brigade to call for backup if necessary.

IX.7.5. AIRPORT SAFETY AND SECURITY

Regarding security and safety at the airport, the latest generation of equipment will have to be put in place. Baggage and passenger screening must be systematically carried out at each departure or arrival. Sanitary control should also be required to rule out any possibility of disease transmission.

Premises must be provided for customs, police, gendarmerie and health services. These bodies will be able to safely and effectively provide security on the premises.

Internal and external rounds should be conducted regularly to identify any potential threats and take appropriate action.

IX.7.6. ORGANIZATIONAL ARRANGEMENTS

The internal organization must be clearly defined through plans and protocols including the worker's behavior, all prohibitions and the reasons for these prohibitions.

A CHST, if required, must be set up in accordance with Decree No. 94 244 of 7 March 1994 laying down the procedures for the organization and operation of occupational health and safety committees.

Each service provider operating at the airport must have an HSE policy with a manager supervising an entire team. HSE managers must ensure strict compliance with all necessary and established safety instructions.

Airport staff must be regularly informed and made aware of the risks related to their profession. They must also be aware of their role and responsibility in reducing these risks and the importance of complying with the wearing of PPE.

They must be aware of and able to implement the first necessary safety measures in the event of an accident; for this purpose, periodic training sessions in occupational health and safety are necessary.

The identification of occupational hazards must be done for each workstation and an accident register must be kept and updated by the safety officer.

Employees must: have safety equipment adapted to their workstations; receive training in the use of PPE. The wearing of PPE must be required under penalty of serious penalties. Employees must also be placed in adequate working conditions in order to avoid as much as possible accidents at work and occupational diseases.

Employees must have periodic medical check-ups in order to monitor their health and prevent occupational diseases.

IX.8. Occupational risk analysis

IX.8.1. Objectives

Occupational risks lead to occupational accidents and diseases. In order to preserve the physical integrity and health of workers, an occupational risk analysis is required at each workstation.

The occupational risk assessment is an important part of safety measures meant to ensure that the necessary precautions are taken to protect the health of employees. It consists in identifying all the risks inherent to each position and working condition and proposing solutions for the prevention of these risks and the protection of exposed persons.

This occupational risk assessment is a regulatory obligation defined in Article 5 of Decree 2006-1256 on the obligations of employers in occupational health and safety. It is used to plan preventive actions and is the basis for any approach to improve safety and working conditions.

It is the responsibility of the employer and must be done at each workstation.

IX.8.2. Methodology

The assessment of occupational risks consists in identifying risks, prioritizing them and then planning prevention actions adapted to each identified risk.

The following methodology was adopted:

1. make an inventory of workstations;
2. identify the risks at each workstation (inventory the intrinsic properties of equipment, products, work methods that could cause damage to employee health);
3. classify risks according to a rating (frequency and severity) in order to prioritize prevention actions;
4. propose effective and appropriate preventive actions to reduce the frequency of occurrence of identified risks and mitigate their severity.

The identification of occupational risks is based on feedback (accidents and occupational diseases occurring in similar sectors of activity) and regulation.

A scoring system has been adopted to prioritize the different risks. It is based on:

- the frequency of the occurrence of the accident, incident or occupational disease;
- the seriousness of the accident, incident or occupational disease.

The levels required for frequency and severity rating are presented in the following table.

Table 42: Occupational risk rating scale

Frequency scale (F)		Gravity scale (G)	
Score	**Meaning of the word**	**Score**	**Meaning of the word**
F1	Once every 10 years or less	G1	Reversible lesions without TA or with TA less than 2 days
F2	Once a year, once a year	G2	Reversible lesions, with AT
F3	Once a month, once a month	G3	Irreversible injuries, permanent disability
F4	Once a week or more	G4	Death

This rating scale makes it possible to establish a criticality matrix represented by different color codes. These colors reflect the seriousness of the facts and provide guidance on the order of priority to be given to the prevention measure.

Table 43: Risk criticality grid

	F1	**F2**	**F3**	**F4**
G4				
G3				
G2				
G1				

The green color represents a low risk. In this case, the priority of prevention actions is of the 3rd order.

The yellow color represents a moderate risk. In this case, the priority of prevention actions is of the 2nd order.

The color red is a high risk. In this case, the priority of prevention actions is of the 1st order.

	High Risk-Priority 1
	Moderate Risk-Priority 2
	Low Risk-Priority 3

All risks that could lead to death are of priority 1 even if their frequency of occurrence is low.

IX.8.3. PRESENTATION OF THE RESULTS

IX.8.3.1. INVENTORY OF WORKSTATIONS AND TYPOLOGY OF IDENTIFIED OCCUPATIONAL RISKS

The division into work units is based on the different activities performed. Activities with similar risk families have been grouped together.

The types of risks potentially faced by workers are as follows:

- risks related to the use of earth-moving machinery;
- risks related to the use of hand tools;

- risks related to noise;
- road risks ;
- risks related to the use of handling equipment;
- risks related to falling objects;
- risks related to the use of machinery;
- risks related to mechanical handling;
- risks related to manual handling;
- risks related to repetitive actions;
- risks related to falls (height, ground level);
- electrical risks ;
- chemical risks ;
- risks related to working on a screen;
- risks related to working in confined spaces;
- risks related to thermal environments;
- fire and explosion hazards;
- risks related to the provision of services (work and operations carried out by external companies);
- risks related to coactivity.

IX.8.3.2. IDENTIFICATION AND ASSESSMENT OF OCCUPATIONAL RISKS

The various risks to which staff may be exposed are presented in the following table.

Table 44: Occupational Risk Analysis

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
Construction phase	Demolition work on the structures	Personnel performing the work Machine Operators On-site staff	Risks related to the use of earth-moving machinery	Collision between gear and gear; gear and person Injuries	2	3		Set up signs and a traffic plan on the site Provide audible warnings Train machine operators on safe driving rules Do not obstruct traffic lanes Proper storage of excavated material Assist conductors during excavations	2	1	
			Risks associated with the use of hand tools	Cuts Fractures	3	4		Train staff in the handling of these tools Provide staff with protective gloves	2	2	
			Risks related to manual handling	TMS Muscle pain	2	3		Limit the daily load Train staff in manual handling techniques Provide employees with mechanical aids Establish rest periods	1	2	
			Risks related to repetitive actions	TMS Muscle pain	2	3		Introduce moments of rest Establish rotating teams Provide employees with mechanical aids	1	2	
			Risks related to level falls	Injuries Fractures	2	3		Organize storage facilities Tag and put signs on areas at risk	2	2	
			Noise risks	Temporary or permanent hearing loss	3	2		Use quieter equipment Provide workers with hearing protection and ensure its proper use	1	2	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
			Risks related to working in high heat	Heat stroke Dehydration	2	4		Avoid working in open areas during the hottest hours of the day Provide shelters for workers (e.g. scrap metal workers) Provide refreshments to workers Incorporate breaks into work schedules	1	2	
Construction phase	Transport of equipment on site by trucks and cranes	Driver or staff on site	Road risk	Vehicle/vehicle collisions Vehicle/pedestrian collision Injuries Death	4	2		Train drivers on driving rules Sensitize drivers on the respect of the highway code Use vehicles in good condition Avoid using busy arteries during peak hours	4	1	
			Risks related to the use of handling equipment	Collision between vehicle and vehicle Striking of vehicle/pedestrian Injuries Death	4	2		Implement a traffic plan Delimit and mark the area of influence of the device Train machine operators on driving rules Use persons authorized to operate this type of equipment Identify traffic and work plans Assist the driver when travelling	4	1	
			Risks related to falling objects	Injuries Fractures Death	4	2		Ensure the performance of the machine	3	1	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								Provide on-site staff with helmets and safety shoes Limit storage heights Marking the work area			
			Risks related to working in high heat	Heat stroke Dehydration	2	4		Avoid working in open areas during the hottest hours of the day Provide refreshments to workers Incorporate breaks into work schedules	1	2	
Construction phase	Unloading of material	Personnel performing unloading Personnel present on the unloading circuit	Risks related to mechanical handling	Death Injuries Fractures	4	2		Implement a traffic plan Delimit and mark the area Train machine operators on driving rules Use persons authorized to operate this type of equipment Identify traffic and work plans Assist the driver when travelling	3	2	
			Risks related to manual handling and repetitive movements	TMS Muscle pain	2	3		Limit the daily load Train staff in manual handling techniques Provide employees with mechanical aids Establish rest periods	1	2	
			Risks related to falling objects	Injuries Fractures Death	4	2		Provide personnel on site with helmets, masks and safety shoes Limit storage heights	3	1	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								Marking the work area			
			Risks related to working in high heat	Heat stroke Dehydration	2	4		Avoid working in open areas during the hottest hours of the day Provide refreshments to workers Incorporate breaks into work schedules	1	2	
Construction phase	Pavement construction	Personnel performing the work	Chemical risks (Bitumen emissions, exhaust gases from internal combustion engines) Risks related to atmospheric environments (heat) Noise risks	Burn injuries Injuries Respiratory diseases Eye irritation (conjunctivitis) and skin irritation Allergies Strong sweating and dehydration	3	2		Choose the least dangerous additive products and operating procedures Ensure that the cabins of the equipment used are ventilated and that waste is extracted at source Ensure the automation of workstations Ensure regular maintenance of the equipment to reduce unwanted noise and vibration Provide staff with fresh drinking water and sanitary facilities near the site (including changing rooms, toilets, sinks and showers, hand workshop soaps) Provide medical surveillance for workers exposed to bitumen Provide employees with appropriate PPE:	2	1	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								○ non-flammable clothing covering the whole body ○ cuffed gloves ○ safety boots or shoes, with heat-insulating sole and resistant to the aggressiveness of asphalt mix ○ mask with filter type P3 ○ Hearing protection against noise			
Construction phase	Construction of buildings	Machine operators Pedestrians	Collision between machinery and pedestrians	Injuries Fractures	3	2		Comply with speed limits Comply with the rules of conduct in force on the site Ensure that vehicles are suitable for the intended use, inspected and authorized for use, Assign one seat per passenger Ensure that the seat belt is kept fastened for the duration of the journey Ensure that passengers are not transported in the area reserved for the equipment transported Prohibit the use of mobile phones while driving	2	1	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
		Welders Scrap Metal Workers etc.	Risks related to the use of energy-powered equipment	Electrification Electrocution	3	3		Lock equipment separation devices from energy sources if necessary Ensure that the intervener is of legal age, trained, qualified and instructed on risks Provide suitable PPE	2	2	
		Masons	Risks related to excavation work	Burial of the body Death	4	2		Ensure that workers have appropriate work permits, validated with all appropriate plans Identify, locate, mark, and, if necessary, isolate underground hazards Evaluate and define methods to prevent ground movements (e. g. trench wall collapse)	3	2	
		All workers	Mechanical risks	Injuries Fractures TMS	2	4		Favor the use of ergonomic mechanized machines to limit manual handling and awkward postures Training in manual handling techniques Ensure good work organization Provide employees with adequate PPE: o High visibility warning vest class 3 or 2 o Safety glasses or visor	2	3	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								○ Construction site helmet			
		All staff members	Risks related to work at height	Fractures Death	4	2		Ensure that work at height is always carried out with supervision Ensure that fixed platforms or scaffolding have guardrails and are checked by an authorised person Provide workers with fall arrest equipment Implement secure work procedures	3	2	
		Machine operators Personnel carrying out the work	Risks related to handling and lifting equipment	Injuries Fractures Death	4	2		Ensure that the lifting equipment has been checked by qualified personnel Ensure that workers are trained and qualified Ensure that the machine guards are working properly Comply with the requirements defined by the manufacturer	3	2	
Operation phase	Interventions on the tarmac	Personnel performing work on the runway and on board aircraft	Risks related to moving aircraft	Injuries Fracture Death	4	2		Limit the number of participants Provide workers with appropriate PPE (high visibility vest, safety shoes, hearing protection) Ensure that personnel only cross or work on the tarmac when absolutely necessary	3	2	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								Set up safety instructions Ensure that there are no vehicles or pedestrians in front of a moving aircraft Prohibit vehicles on the tracks Provide staff training Implement emergency plans			
			Risks related to moving vehicles	Injuries Fractures	2	3		Implement organizational measures Implement a traffic plan Raise staff awareness and set up instructions and displays Ensure the availability and effective wearing of high visibility clothing in the external areas of airports Ensure that drivers have appropriate training Provide conductors with suitable PPE (hearing protection, seat belt, vest)	1	2	
			Risks related to the presence of dangerous equipment (aircraft engines and propellers, helicopter rotors	Injuries Death	4	2		Ensure that personnel working on the tarmac have good training and work at a safe distance from aircraft engines Set up safety instructions in case of intervention: o Always approach from an angle of "one hour"	3	2	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								(assuming that the pilot faces "noon") ○ Make sure you stay down ○ Hold all objects that may fly away securely			
			Risks related to aircraft noise emissions	Temporary or permanent hearing loss	3	2		Provide personnel working on the tarmac with hearing protection, mainly earmuffs. Limit the time spent by staff in a noisy environment Marking areas where the wearing of Noise Protection Equipment (EPB) is mandatory	2	2	
			Risks related to lighting	Injuries Fractures Death	4	2		Ensure that all precautions are taken around aircraft in poorly lit areas to ensure the safety of responders	3	2	
			Risks related to slips and falls on the ground	Injuries ; Fractures	2	3		Provide workers with appropriate safety shoes Ensure that equipment and vehicles are free of leaks	2	2	
Operation phase	Maintenance of stopovers	Civil or military mechanics	Risks related to noise, weather, traffic and movement of vehicles and aircraft Risks related to exposure to chemicals	Hearing impairment Eye irritation Injuries Fractures	3	3		Provide mechanics with noise protection equipment (earplugs and earmuffs) Implement chemical management procedures Ensure effective ventilation of the premises Provide stakeholders with appropriate PPE	2	3	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
			Risks related to work at height Risks related to the use of flames					Install fall protection devices Train personnel in lifting techniques Use mechanical lifting equipment Ensure a new ergonomic design of the equipment			
Operation phase	Intervention on board an aircraft	Personnel performing cargo inspection work, etc.	Risks related to access to aircraft	Injuries Fractures	2	2		Ensure that access equipment is safe Use the bridges provided for passengers and on-board staff Provide personnel with adequate PPE (safety shoes, vests) Set up safety instructions Establish secure working procedures for baggage handlers	2	1	
			Risks related to chemical, biological agents and soiled objects	Contaminations Diseases	3	2		Implement pest control campaigns Wear suitable safety clothing and equipment, mainly gloves, when searching toilets Ensure that hygiene requirements are applied	2	2	
			Risks related to the presence of sharp objects	Injuries ; Contaminations	3	2		Provide personnel with suitable PPE gloves when searching passenger areas Implement safety procedures and instructions	2	2	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
			Risks related to falling objects	Injuries	2	2		Staff training Implement safety procedures and instructions	2	1	
			Risks related to electrical equipment and heat sources	Burn injuries Electrocution Electrification	4	2		Ensure that operations on electrical installations are carried out by authorised personnel Isolate heat sources	3	2	
			Risks related to falls from a height and from the ground	Injuries Fractures	3	2		Raise awareness and train staff on the risks associated with movement in the bunkers Provide suitable PPE operators with access to suitable PPE operators	2	2	
Operation phase	Air Controls	Air traffic controllers and aeronautical information service	Risks related to working on the screen	Eye fatigue Mental fatigue Stress	2	3		Use electronic data screens arranged in a vertical or near-vertical plane at control centers Provide workers with glasses that absorb 80% of the light Reduce working time Ensure task rotation Ensure the ergonomics of workstations Ensure that employees are in good physical condition	2	2	
Operation phase	Inspection and maintenance of ground equipment	Ground installation and equipment technicians	Noise risks	Damage to the hearing system Deafness	3	3		Provide PPE (earplugs or earmuffs) to respond to operations near emergency generators or reactors	2	2	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
			Risks related to electrical equipment	Electrification Electrocution	4	3		Install devices to prevent access to the radar antenna when it is in operation Train staff on safety procedures, deconsignment and deconsignment procedures Provide personnel with appropriate personal protective equipment	3	2	
			Chemical risks	Diseases Burn injuries	3	3		Ensure that the duration of interventions on radar microwaves is reduced to a minimum Provide appropriate PPE to stakeholders	2	2	
			Risks related to working at height	Injuries Fractures Death	4	3		Equip radar control towers with standardised guardrails around stairs and platforms Provide personnel with equipment to prevent falls	3	2	
Operation phase	Passenger orientation, ticket sales, passenger and baggage check-in	Commercial agents	Ergonomic risks Stress related risks	TMS Mental illnesses and disorders	1	4		Provide elastic floor mats and seats to mitigate the effects of standing up Limit manual handling operations Ensure that carousels and baggage belts have emergency stop and protection devices	1	3	

Project phase	Activities	Exposed position or personnel	Risks identified	Potential damage (injuries, health damage)	Gi	Fi	Ri	Preventive measures	Gr	Fr	Rr
								Ensure the training of personnel on handling techniques and postures Install anti-reflective devices for screens Plan breaks and work organization methods			
Operation phase	Flight operation	Flight crew	Stress related risks Physical risks Psychological risks Risks related to biological agents Risks related to ambient air	Discomfort (dry eyes, nose and throat) Dehydration Dizziness, malaise and vomiting	2	3		Ensure that sufficient liquid (water and fruit juice) is available for personnel during flight operations Ensure that equipment meets standards Determine the extent of exposure to cosmic radiation in flight Implement work organization procedures Recruit specialists for psychological and physical stress management Ensure periodic medical check-ups for each crew member	2	2	

IX.8.4. RECOMMENDATIONS FOR ACTION

The assessment of occupational risks reveals the existence of high risks, for which prevention actions are a top priority. Moderate and low risks were identified.

Recommendations have been made for the construction and operation phases to minimize the severity and frequency of risk occurrence.

IX.8.4.1. RECOMMENDATIONS DURING THE CONSTRUCTION PHASE

The persons in charge of the construction will have to carry out:

- an analysis of occupational risks at each workstation;
- a plan for the prevention of occupational risks.

This risk analysis and the prevention plan are not fixed. They should be revised periodically according to changes in equipment, processes or work phases.

Employees must be made aware of professional risks and the importance of respecting the preventive measures in place.

These documents must be presented to any subcontractor involved in the rehabilitation phase.

IX.8.4.2. RECOMMENDATIONS IN THE OPERATIONAL PHASE

During the operational phase, an occupational risk analysis at each workstation will also be required. Subsequently, a plan for the prevention of occupational risks will be required to be submitted.

The risk analysis should be updated periodically according to any changes that may be made.

All site employees, as well as subcontractors, are concerned and must be made aware of the risks involved and the means of prevention to be adopted.

It is necessary to set up a CHST if the number of workers required is reached or exceeded and to ensure that the 9 principles of prevention prevail:

1. Avoid risks
2. Assess the risks that cannot be avoided
3. Combating risks at source
4. Adapt the work to the man
5. Take into account technological developments
6. Replace what is dangerous with what is not or with what is less dangerous
7. Planning prevention
8. Give priority to collective protection measures
9. Train and inform employees about risks and their prevention.

In general, it is important for management and employees to be involved in the process of reducing occupational risks. The management methods to be developed must comply with the rules of ethics and professional conduct.

Transparency in the procedures and procedures is a major asset allowing the appropriation of the rules implemented. The objectives must be clearly defined.

The chief of staff sets an example for his employees. Thus, for the management system to succeed, he must be the first to show his commitment and determination. He will have to be actively involved in the development and supervision of the prevention approach and its implementation.

The realities of working situations and conditions must be taken into account in the development of rules and procedures. Communication sessions on occupational health and safety are also necessary to raise awareness and develop a risk culture among employees.

Employee buy-in is a key condition for implementing a risk prevention policy. To this end, their opinion must be taken into account before any decision is taken concerning them and they must be involved in the choice of PPE to guarantee their safety.

Social dialogue must be integrated into the institution's routine. It involves employees and employee representatives in the implementation of the prevention policy.

X.ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

X.1. PREAMBLE

The Environmental and Social Management Plan (ESMP) aims to ensure the correct and timely implementation of all measures to mitigate negative impacts and improve positive ones.

The ESMP relies on the regulatory measures in force concerning this project to establish guidelines that the promoter is required to comply with in order to comply with Senegalese legislation.

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 environmental management plan includes various measures:

- those to be included in the various specifications of the contracting companies for the works as part of the contractual measures which will therefore not be evaluated financially because they are included in the works CADs;
- accompanying measures to be carried out in addition to the technical and/or environmental actions that will be evaluated financially, for example awareness-raising and training actions (institutional strengthening of the actors).

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.

X.2. REGULATORY MEASURES AND PROCEDURES

It is a question of ensuring compliance with the regulations in force and administrative procedures.

X.2.1. REGULATORY MEASURES

X.2.1.1. FOREST REGULATIONS

For any deforestation, clearing or reforestation activity, the project promoter must approach the water and forest services.

The start of any activity that may affect existing vegetation will require prior compliance with all procedures established by the Forest Code and logging taxes will have to be paid in advance.

X.2.1.2. ENVIRONMENTAL REGULATIONS

Both in the rehabilitation and operational phases of the airport, the activities must comply with the standards for the management of pollutant discharges (Standards NS 05-061 on waste water and NS 05-062 on air pollution) and, at a certain level, those of the Environment Code and the World Bank (General and Specific Directives in HSE management). They must also comply with standards and procedures concerning hygiene and site waste management.

X.2.1.3. AUTHORIZATION TO OPERATE AN INSTALLATION CLASSIFIED FOR THE PROTECTION OF THE ENVIRONMENT (ICPE)

In accordance with the provisions of the Environmental Code, the operator must, before commissioning, submit an application for an operating permit in five (05) copies to the Minister responsible for the environment (art. R. 5 of the Environmental Code). The said request must be the subject of a public inquiry by order of the Governor of the Matam Region for a period of 15 days (art. R.6 of the Environmental Code).

All recommendations and provisions of this report shall be implemented by the promoter after approval by the Technical Committee and issuance of the certificate of compliance.

X.2.1.4. AUTHORIZATION TO BUILD

In accordance with the provisions of the Town Planning Code, Act No. 2008-43 of 20 August 2008 on the Town Planning Code and Decree No. 2009-1450 of 30 December 2009 require the developer to obtain a building permit before starting any activity.

This authorization is issued after consultation with the services responsible for health, the environment, spatial planning and civil protection

Any application for a building permit must include the following information (art. R368):

- the nature of the establishment;
- the land registry plan of the land base certified by a surveyor and approved by the cadastral services and the architectural plans certified by an approved architect;
- the class in which it is to be placed;
- an impact study for first-class schools;
- a detailed description of the work;
- a safety notice;
- the method and conditions of treatment of the waste generated;

- the means of relief against the effects of a possible disaster and any measures taken to comply with the measures provided for by the regulations in force.

It is also necessary to submit to the authority responsible for issuing the authorization to build an execution file before the work begins.

X.2.2. ADMINISTRATIVE PROCEDURES

X.2.2.1. LAND ALLOCATION PROCEDURE

The land that materializes the land base dedicated to The Ourossogui-Matam airport is covered by the Ourossogui Land Title. The Ministry of Air Transport and Airport Infrastructure (MTADIA) shall identify the operators of agricultural land, trees, vegetable activities and other property located within the airport right-of-way who are likely to suffer damage. The regulatory provisions to be respected in the context of this operation are related to:

- Decree No. 77 - 563 of 3 July 1977 implementing Act No. 76 - 67 of 2 July 1976 on expropriation in the public interest;
- Decree No. 81 - 557 of 21 May 1981 implementing the State Domain Code with regard to the private domain;
- Decree No. 88 - 074 of 18 January 1988 repealing and replacing Decree No. 85 - 906 of 28 August 1985 on the price scales for bare and built-up land applicable to rent and expropriation in the public interest;
- Decree No. 91-838 of 22 August 1991 allowing all occupants to be compensated.

Order No. 003/CO/18 of 06 March 2018 closing the garbage dump site behind the airport was issued by the Mayor of Ourossogui because the landfill is not compatible with airport activity.

X.2.2.2. PROCEDURE FOR RECEIVING AND FOLLOWING UP COMPLAINTS AND GRIEVANCES

It seems important to develop a grievance procedure that will enable the entire population affected by the potential nuisances resulting from the airport's rehabilitation and operating activities to report to the project team the problems encountered in their co-location with the airport.

The most frequent complaints that could be the most frequent concern:

- the emission of noise and/or dust in the vicinity of construction site activities and on the route of trucks transporting various materials;
- complaints relating to non-compliance with the commitments initially made by the promoter.

Three (03) systems can be put in place to allow complaints to be traced back to the project promoter:

- the opening of a complaints booklet at each site entrance, where complainants can write their complaints. This document will be collected each week by the person in charge of the social aspect for possible processing;
- the provision of a complaints booklet at the level of the Commune of Ourossogui in order to receive complaints;
- the identification of problems during regular site visits by the inspection mission.

The recorded complaints and solutions will be presented in a monthly activity report from TRANSCON, which is in charge of the control and monitoring mission of the rehabilitation project.

The results will be communicated to the complainants (by posting in villages, neighborhoods, town hall, construction sites, etc.).

X.2.2.3. INFORMATION AND COMMUNICATION PROCEDURE FOR SERVICE PROVIDERS' STAFF

During the rehabilitation phase, the study recommends the implementation of information and communication measures for service providers' staff, including training in environmental, health and safety issues. This information campaign may cover:

- methods for the management of hazardous products and site waste and emergency procedures in the event of spills of hazardous products;
- environmental awareness and responsibility in relation to the reception area and the local population;
- the environmental and social risks associated with the project and the recommended mitigation measures and implementation of the ESMP;
- the provider's staff should be sensitized/trained periodically in order to maintain a high level of HSE knowledge.

X.2.2.4. INFORMATION AND COMMUNICATION PROCEDURE WITH THE PUBLIC

The execution of the project work can cause inconveniences such as: traffic obstructions, safety or health risks, etc.

As a result, an information and awareness campaign among the populations living in the vicinity of the site is becoming a necessity.

Indeed, this information campaign will make it possible, among other things, to:

- raise awareness among the population about the beneficial effects of the project;
- to allow the acceptance of this project by the populations;
- raise awareness among the population about the schedule for the release of the works;
- raise public awareness of the safety measures to be taken during all phases of the project;

- raise awareness and train site agents and ad hoc teams in rapid intervention techniques in the event of an accident;
- define a security perimeter around the site of the worksites.

X.2.2.5. WASTE MANAGEMENT PROCEDURE

Optimal management of the waste generated will make it possible to limit its impact on the environment.

Waste will be sorted according to its nature and dangerousness, which will make it possible to:

- separate hazardous waste from non-hazardous waste;
- separate recoverable waste from non-recoverable waste;
- monitor the volume of production by type of waste;
- maintain a waste generation register;
- sorting, collecting and disposing of waste by a specialized body in accordance with national legislation.

The HSE team will set up a disposal slip to keep the waste management register up to date.

X.2.2.6. ACCIDENT PREVENTION PROCEDURE

In order to limit the number of accidents occurring during the rehabilitation and operation phases, a risk study must be carried out for each workstation.
This will determine the risks inherent to the work carried out as well as the personal and collective protective equipment necessary to limit the risk of accidents.
The necessary awareness and training in relation to the level of risk associated with the work to be performed shall be provided by TRANSCON or an approved body.
The study recommends that only trained workers with their PPE should perform the work under this project. Workers will have to be punished for non-compliance with health, safety and environmental measures.
TRANSCON is responsible for monitoring the applicability of this rule.

X.3. IMPACT MANAGEMENT PLAN

X.3.1. PREAMBLE

The airport's rehabilitation works and operating activities will inevitably generate positive or negative impacts.

These impacts will have to be managed through enhancement, mitigation or compensation measures in order to optimize or reduce them.

- **Optimization measures**

They are applicable to positive impacts and aim to give added value to positive impacts and to ensure the sustainability of the positive actions that emanate from the project.

- **Mitigation measures**

These measures consist of modifying certain aspects of the project in order to eliminate or reduce as much as possible its negative effects on the environment and socio-economic environment.

Changes may include, but are not limited to, three (03) aspects of the project: its design, implementation schedule and location.

- **Compensation measures**

They are concerned with significant residual negative impacts that occur after the implementation of the recommended mitigation measures. They occur when no possibility of eliminating or reducing the impacts of a project has been identified. Their implementation makes it possible to replace or restore the initial conditions.

X.3.2. IMPROVEMENT AND IMPACT REDUCTION PLANS

The environmental management plan is summarized in the tables below. It takes into account the positive and negative impacts during the construction and operation phases. This plan also proposes accompanying measures by integrating the costs of implementation and those responsible for implementation.

Table 45: Measures to improve positive impacts

Component	Impact-causing activities	Potential impact	Bonus measure	In charge of implementation	Period of time
Improvement of impacts during the rehabilitation phase					
Socio-economic activities	Rehabilitation work	Direct job creation	• Recruit local workers as a priority • Set up a local recruitment committee • Paying decent wages to workers • Involve IWHSS in the declaration and identification of workers • Declare the opening of the site to the labor inspectorate; • Ensure the protection of workers, especially day laborers, by declaring them to the Social Security Fund (CSS); • Ensure that social dialogue is respected on the site.	TRANSCON	Before starting work
		Indirect job creation Purchase of goods and services	• Develop and secure spaces around the airport • Define with the local populations the rules of good conduct for peaceful coexistence • Frame entrepreneurship ambitions around the airport perimeter • Raise awareness among workers, service providers and merchants of the importance of hygiene and safety instructions	TRANSCON	Rehabilitation phase
		Business opportunities for SMEs	• Provide national companies with the opportunity to accelerate their development • Promote access by local companies to goods and services offers • To offer, for office and other furniture, the opportunity for national craftsmen; • Develop subcontracting in favor of local medium-sized companies	TRANSCON	Rehabilitation phase

Component	Impact-causing activities	Potential impact	Bonus measure	In charge of implementation	Period of time
Improvement of impacts during the operating phase					
Socio-economic activities	**Airport Operations**	• Job creation • Purchases of goods and services	• Use local companies for outsourced services • Favor local companies for the purchase of goods and services • Focus on local employment • Fostering the female workforce	Airport operator	Operation phase
		Strengthening regional air services	• Rehabilitate and equip the airport with the most modern technologies • Revitalize and increase attractiveness of the services provided to passengers on departure and arrival: waiting platform, passenger escort, cafeteria, wifi • Equip the airport with the latest generation of hygiene equipment • Assign qualified personnel and specialists to the various workstations • Authorize and make available vehicles for shuttle service between the airport and travelers' final destinations	MTADIA Airport operator	Operation phase
		Revitalizing tourism and economic activities	• Create relaxation areas, dining areas for airport staff and airport users • Create tours and tourist itineraries • Initiate projects to develop and equip tourist sites in the Matam Region • Create agencies and train tourist guides • Develop the ground transportation network to facilitate access to the airport • Strengthening the security, safety and protection of airport space	MTADIA Airport operator Ministry of Tourism SRAT	Operation phase

Component	Impact-causing activities	Potential impact	Bonus measure	In charge of implementation	Period of time
			• Light up the surroundings of the airport for a better security of the area		

Table 46: Mitigation measures for negative impacts

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
Mitigation of impacts during the rehabilitation phase					
Air quality	• Transport, storage and use of construction materials and equipment • Operation of construction machinery and vehicles • Civil engineering works • Demolition and reconstruction activities • Waste generation	• Localized deterioration of air quality due to dust emissions • Emissions of pollutants • Olfactory nuisances	• Water the site soil and traffic lanes to minimize dust generation • Restrict the speed of vehicles and machinery in residential areas, sensitive areas and on the construction site • Cover construction site material transport trucks with tarpaulins • Implement demolition methods that minimize dust emissions • Reduce open sand storage to a strict minimum or cover it if necessary • Stop unused vehicles and equipment by avoiding the standby position such as idling engine • Ensure preventive and curative maintenance of exhaust emission equipment • Ensure the control and maintenance of vehicles to minimize pollution related to combustion problems • Inform and raise awareness among local populations	TRANSCON	During the entire rehabilitation phase

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
Soil	• Demolition activity, • Civil engineering works • Traffic and parking of vehicles and construction machinery • Use of hazardous chemicals • Waste generation	• Localized modification of the soil structure • Erosion of the soil • Soil waterproofing • Soil compaction	• Conduct a soil survey • Define heavy vehicle routes (work lanes) and work areas in such a way as to limit rolling surfaces and soil compaction • Limit the site's footprint to the strictly necessary area • Rehabilitate the site after the work	TRANSCON	During the entire rehabilitation phase

Soil, surface and groundwater	• Storage and handling of construction materials
	• Use of hazardous chemicals
	• Generation of solid and liquid waste
		• Soil and surface water pollution
		• Groundwater pollution
		• Decrease in the rate and speed of infiltration of runoff water
			• Provide a water drainage system before the rainy season to ensure that runoff water flows to 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 NS 05-061 on waste water before discharging effluents into the natural environment
			• Limit spills and accidental leaks by:
			  ○ the provision of anti-pollution kits
			  ○ storage of oils and other hazardous products in sealed retention basins
			• Collect solid and liquid waste according to a waste management plan in accordance with national and international regulatory provisions
			• Raise awareness and train staff on solid and liquid waste management
			• Limit the site's footprint to the strictly
				TRANSCON	During the entire rehabilitation phase

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
			necessary area ● Implement an HSE policy		
Water resources used by the population	● Rehabilitation activities (civil engineering, soil watering, cleaning operation, etc.) ● Health needs	● Decrease in resource ● Increase in water requirements in the project area	● Collect and use rainwater to water the slopes if the work is carried out during the rainy season ● Implement a rational water management policy ● Repair in time any degradation that may cause water leakage ● If necessary, use water tarpaulins in good condition to prevent water leaks. ● Raise employee awareness of the importance of the resource and the need to preserve it	TRANSCON	During the entire rehabilitation phase
Hinterland Who's Who	● Brushing ● Excavation work ● Use of hazardous chemicals ● Presence and circulation of labor	● Loss of vegetation ● Degradation or loss of wildlife habitat	● Limit the site's footprint to the strictly necessary area ● Establish an effective system for the management of excavations and waste resulting from the work ● Use machinery, vehicles and equipment that comply with noise emission standards ● Prevent the wandering of animals inside the site ● Implement an off-site reforestation plan and ensure follow-up, in collaboration with the Matam forest sector	TRANSCON	Before the development work During the work

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
			• Notify the IREF before any deforestation or clearing activity • Support community nature reserves in the project area • Avoid killing species encountered on site		
Land use and allocation	Release of the site	• Loss of agricultural land and housing	• Implement support measures for affected populations • Comply with IFC Performance Standard 5 for involuntary displacement of economic activities • Compensate the impacted people • Establish with the land registry the real boundaries of the airport and install a barbed wire fence	MTADIA	Before the start of the work
Living environment	Rehabilitation work	Noise pollution	• Use equipment and tools with low noise levels and respect the limit of 85 dB at 1 m • Carry out acoustic measurements in the noisiest areas and at property boundaries and implement corrective measures • Provide workers with adequate PPE to fight against noise pollution • Perform timely maintenance of pneumatic tools, machinery and equipment to keep the noise level generated at an acceptable level • Ensure that certain very noisy equipment such as site diesels, compressors, etc. is covered. • Set up a screen wall towards residential areas, especially in the nearest neighborhoods	TRANSCON	From the preparation phase to the end of the construction site

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
		Waste generation	• Set up a waste disposal center as soon as the rehabilitation 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 mixed waste is placed in storage in "all coming" bins or containers and disposed of in authorized landfills • Create a buffer zone between the airport and the houses • Raise staff awareness of waste management	TRANSCON	From the preparation phase to the end of the construction site
		Traffic densification	• Inform stakeholders (municipalities, populations, AGEROUTE, etc.) about the date of the convoy (by radio, newspaper, telephone, mail), 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 working order for technical inspection for transport to the site and suitable container platforms / doors • Limit speed to 30 km/h to the right of the population and make drivers aware of the importance of respecting the rules of good conduct	TRANSCON	From the preparation phase to the end of the construction site
Mitigation of impacts during the operational phase					
Air quality	• Operation of equipment • Operating activities • Increase in road traffic	• Impaired air quality • Global warming	• Identify emission sources and implement an air quality management system • Work on measures to reduce polluting emissions	Airport operator	During the entire operating period

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
	• Increase in air traffic		• Assess air quality in the area of influence of the project in the operational phase • Ensure long-term monitoring of ambient air quality in the various sites identified as potential receptors • Create green spaces (grass) away from the track • Conduct off-site reforestation campaigns • Ensure compliance with the requirements of current standards in terms of emissions • Minimize dust emissions		
Soil and water resources	• Maintenance and cleaning activities for aircraft, pavements, etc. • Waste generation • Leaks or accident spills	• Soil pollution • Contamination of runoff and groundwater	• Implement a stormwater management plan • Treat waters likely to be polluted by hydrocarbons • Comply with NS 05-061 Wastewater Standard before any effluent discharge • Establish procedures for responding to accidental spills or leaks • Sort and store waste in a sealed storage area • Regularly monitor solid and liquid waste likely to be polluting • Find approved channels for the transport, storage and disposal of waste in accordance with current standards • Implement a good HSE policy	Airport operator	During the operating period
Water resources used by the population	• Airport Operations	• Decrease in resource • Increase in water requirements in the project area	• Collect and use rainwater to water green spaces (lawn, flowers) • Implement a rational water management policy	Airport operator	During the entire operating period

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
			• Put signs on toilets and sinks to raise awareness among employees and travelers about the importance of water conservation • Repair in time any failure that could cause a water leak • Favor preventive maintenance of pipes and water points (taps, flushes, washbasins, etc.) • Reuse treated wastewater if possible		
Hinterland Who's Who	• Noise generation • Light emission • Aircraft Overflight	• Wildlife Disruption • Collision between birds and aircraft	• Avoid the divagation of animals in the airport; • Create a buffer zone between the airport and natural areas • Avoid the development of vegetation in the airport and its surroundings • Ensure the reduction of engine noise through regular maintenance and technical visits • Taking noise control into account in airport management • Develop an action plan to reduce aircraft noise pollution • Act on flight schedules and/or limit night flights • Use machinery, vehicles and equipment that comply with noise emission standards	Airport operator	Throughout the duration of the airport's commissioning
Living environment	Airport Operations	Noise pollution	• Carry out regular acoustic measurements in the noisiest areas and on the property line and implement corrective measures	Airport operator	During the entire operation phase

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
			• Provide workers with adequate PPE to fight against noise pollution • Act on flight scheduling and choose time slots that limit night flights; • Favor airlines that regularly renew their fleets • Encourage airlines to raise awareness and train their pilots in flight techniques to reduce noise emissions • Create a framework for functional consultation between airport managers, local populations, administrative and local authorities, certain technical services		
		Waste generation	• Set up a solid waste management procedure and provide all companies on the platform with an area dedicated to the sorting of non-hazardous and hazardous waste • Optimize the recovery of different materials by sorting waste as much as possible at source • Place garbage cans and skips within the airport and protect them from waste spills (lids, nets, screens, etc.) • Inform and raise awareness among staff of airport infrastructure assistance and maintenance services about waste management • Regularly empty septic tanks by an approved body • Work to reduce waste at source and avoid	Airport operator	During the entire operation phase

Impacted component	Impact-causing activity	Potential impact	Mitigation measure	In charge of implementation	Implementation period
			landfilling of recoverable waste as much as possible		
Water and energy consumption	Airport Operations	Excessive water and energy consumption	• Re-evaluate the files on the electrical energy needs of airports 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	Airport operator	During the entire operation phase

Table 47: Measures to manage impacts on hygiene, health and safety during the rehabilitation phase

Mitigation of impacts during the rehabilitation phase					
Impacted component	**Impact-causing activity**	**Potential impact**	**Mitigation measure**	**In charge of implementation**	**Implementation period**
Health and working conditions	Demolition and construction of structures: • Repetitive actions • Heavy load ports • Vibration of tools • Climatic conditions • Etc.	• Noise generation • Dust generation • Waste generation	• Ensure the sorting and elimination of site waste and monitor it on a daily basis • Recycle and recover non-hazardous waste • Establish strict hygiene rules to be respected by any person working on the site • Favor wet working processes • Use a dust collection device • Perform noise measurements • Provide the PPE adapted to the measured values • Choose less noisy machines • Avoid as much as possible the use of manual handling with the risk of injury • Train workers in load handling techniques • Provide workers with handling and lifting equipment • Use visual warning devices instead of audible warning devices	TRANSCON	During the rehabilitation phase
Public safety and security	Demolition and construction of structures: • Working at height • Use of electrical equipment • Coactivity • Traffic flow • Etc.	• Fractures • Open wounds • Handicap • Inability to work	• Implement a traffic plan • Establish safety procedures regarding coactivity on the site • Appoint an HSE manager in charge of supervision and prevention against occupational risks • Require or have a diagnosis made before work is carried out	TRANSCON	During the rehabilitation phase

Mitigation of impacts during the rehabilitation phase					
Impacted component	**Impact-causing activity**	**Potential impact**	**Mitigation measure**	**In charge of implementation**	**Implementation period**
			• Identify and detect networks before intervention • Materialize the electrical risk in situ • Set up collective protections • Issue compulsory electrical authorizations to workers requiring them and give them the prescription booklet and specific PPE • Regularly check the work platforms • Limit the speed of cars and machinery • Put hazard pictograms, protective markers and prohibition and warning signs in all areas where there is a risk • Conduct information and awareness campaigns for the population		

Table 48: Measures to manage impacts on health, safety and hygiene during the operational phase

Mitigation of impacts during the operational phase					
Impacted component	**Impact-causing activity**	**Potential impact**	**Mitigation measures**	**In charge of implementation**	**Implementation period**
Health and working conditions	Airport operation: Transit Welcome and orientation Work on the screen	• Waste generation • TMS • Visual disorders • Noise generation • Air	• Establish a procedure for managing the various types of waste • Carry out special and appropriate treatment for the disposal of hazardous waste containing toxic substances that are harmful to the environment and people • Provide a sufficient number of adequate and hygienic toilets for men and women • Contract with specialized cleaning services in good standing for the management of the site's sanitation	Operator	During the airport operation phase

Mitigation of impacts during the operational phase					
Impacted component	**Impact-causing activity**	**Potential impact**	**Mitigation measures**	**In charge of implementation**	**Implementation period**
	Working at the runway level	pollution • Diseases	• Encourage shift work to allow team rotation to reduce the risk of cumulative noise exposure • Make noise measurements and provide PPE adapted to the noise level required by the tests • Carry out the pre-recruitment medical check-up and periodic check-ups every 06 months • Conduct risk assessment at each workstation • Require passenger health screening		
Public safety and security	Airport operation: • Carrying heavy loads • Repetitive movements • Work on the track • Airport traffic • Coactivity • Traffic flow	• Fall from height • Bodily injury • Electrical risks • Fire risks • Animal peril • FOD risks	• Install safety signage • Mark pavements to facilitate traffic and avoid the risk of collision • Identify safety areas in high-risk areas • Ensure that safety procedures are controlled by the agents in charge of handling aircraft support equipment • Provide the screening bodies with the latest generation equipment to ensure the screening of baggage and passengers • Have sufficient equipment and materials for firefighting • Provide training on terrorism warning and security • Promote regular maintenance and periodic track checks to identify and remove FODs • Use herbicides in the vicinity of the trails to prevent vegetation growth • Collaborate 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	Operator	During the operation phase

Mitigation of impacts during the operational phase					
Impacted component	**Impact-causing activity**	**Potential impact**	**Mitigation measures**	**In charge of implementation**	**Implementation period**
			• Raise awareness of the importance of not having vegetation, birds or landfills in the vicinity of the airport • Create a high fence surmounted by barbed wire with the ends facing outwards • Make regular indoor and outdoor rounds		

X.3.3. RISK MANAGEMENT PLAN

The technological risk management plan is presented in the tables below.

Table 49: Risk Management

Risk Management						
Risk facilities or activities	**Feared events**	**Potential risks**	**Preventive measures**	**Persons in charge of implementing the measures**	**Implementation period**	**Protective measures**
Aeronautical platforms	Runway accident Presence of FOD Collisions Invasion of birds or animals on the track Aircraft fire	Aircraft fire Injuries Spreading fuel Destruction of equipment Animal risk	Adopt air traffic control and management systems and processes Implement a debris risk prevention plan Provide secure bins for the collection of FODs Establish procedures for each activity Implement a plan to prevent animal danger In collaboration with the municipality, avoid the establishment of cultivation and landfill fields in the vicinity of the airport Setting up an SSLI	Airport Manager Airport Security Officer	Before the airport is put into service	Provision of ambulances and fire-fighting vehicles Regular and daily inspection of the runways Collaboration with external emergency services Use of frightening techniques Rescue for the wounded

Risk Management						
Risk facilities or activities	**Feared events**	**Potential risks**	**Preventive measures**	**Persons in charge of implementing the measures**	**Implementation period**	**Protective measures**
			Provide adequate fire-fighting means and equipment			
Internal and external circulation	Malicious intent Panic	Accident Injuries	Provide space for Customs, Police, Gendarmerie, Health Services Provide the airport with the latest generation of equipment to ensure safety and security Make periodic external and internal rounds Plan a traffic plan Fencing the airport	Airport Manager	From the design stage of the project	Implement the airport emergency plan Security forces intervention

X.3.4. ENVIRONMENTAL MONITORING AND SURVEILLANCE PLAN

X.3.4.1. MONITORING PLAN

Environmental monitoring concerns the rehabilitation and operational phases of the airport. Its purpose is to ensure that the measures concerning the administrative, regulatory and environmental aspects recommended in the ESIA and ESMP are applied.

Table 50: Summary of monitoring measures

Components of the system	Recommended action	Implementation timescales	Cost[13]
Noise	• Check the sound power level of noisy equipment • Check the noise level at the airport property limits	From the beginning of the work and during operation	CFAF 2,000,000 (purchase of measuring equipment)
Waste products	• Collect and dispose of waste • Find an agreement with approved companies for waste disposal	From the beginning of the work and during operation	To be defined
Air quality	• Measure the concentrations of the main air and fine particulate pollutants	Before the work and during operation	CFAF 1,500,000 per measurement campaign
Sewage water	• Set up a pre-treatment system • Take samples and analyze them	During the construction phase and during operation	300 000 FCFA per sample
Water (use and consumption) and energy	• Install counters	During the construction phase and during operation	Rates ASUFOR, SENELEC
Local employment	• Monitor recruitment at the local level	Before the start of the work	No specific cost
Loss of agricultural land and housing	• Ensure compensation for losses	Before the start of the work	To be defined with CDREI

[13] This cost is indicative and serves as a basis for determining the expenses to be incurred in connection with the environmental and social management of the project

X.3.4.2. SURVEILLANCE PLAN

Environmental surveillance makes it possible to assess the relevance and effectiveness of the measures implemented for environmental management. The observations made during the surveillance will make it possible to readjust, redefine if necessary the mitigation measures, and also to revise certain provisions taken concerning the management of environmental impacts, taking into account new developments on the site (if necessary) and the evolution of techniques.

Table 51: Summary of surveillance actions

Component	Methods/Activities	Surveillance location	Surveillance indicator	Frequency
Noise	• Noise measurements by integrating sound level meter • Noise mapping	On site and within property boundaries	• Number of measurements performed • Noise measurement results • Number of noise protection devices installed	Monthly
Waste products	• Monitoring the level of implementation of the waste management plan	On the site	• Quantity and type of waste generated • Volume of waste disposed of per day • Waste tracking forms	Weekly
Air quality	• Concentration measurement by diffusion tubes • Measurement of air quality at the edge of the runway, where reactor thrust is at its highest	On site and in the vicinity of the airport	• Results of concentration measurements • Number of deviations between the measurement results and the ELVs of the NS 05 062 Standard	Quarterly
Sewage water	• Sampling and analysis of wastewater	Upstream of the discharge point	• Results of the sample analyses	Monthly
Water (use and consumption) and energy	• Installation of the meters • Consumption monitoring	On the site	• Quantity of water consumed • Energy consumed	Bi-weekly

Local employment	• Monitoring of local recruitment	IHSS/City	• Number of local employees • Number of fixed-term and permanent contracts	Bi-weekly
Loss of agricultural land and housing	• Monitoring of compensation payments	Prefecture	• Report of payment of indemnities • Number of persons compensated	-

X.3.5. SURVEILLANCE SCHEDULE

Environmental monitoring and surveillance will begin with the rehabilitation phase and will be carried out periodically throughout the life of the airport.

X.3.6. ESMP IMPLEMENTATION PLAN

X.3.6.1. IMPLEMENTATION MANAGERS

Responsibility for implementing the measures recommended in the ESMP is shared between the project promoter, the contracting company for the work, the airport operator and other stakeholders in the community.

X.3.6.1.1. Project management team

- **Promoter (MTADIA)**

Throughout the entire process from rehabilitation to operation, the promoter is the first supervisor of the implementation of the measures. It must ensure strict compliance with environmental and social closures by project implementers.

During the operational phase, the operator designated by the latter must set up an HSE unit to ensure regulatory compliance regarding health, safety and security at the airport.

- **Contracting company of the project (TRANSCON)**

The company in charge of the works will be obliged to comply with the clauses of the Contract and the Environmental and Social Clauses Notice that will be sent to it.

Compliance with these practices will in particular condition the final acceptance of the site and the payment of the related financial deadline, if provided for.

- **Design and control office**

The recommended strategy for the successful implementation of the accompanying measures is based on their monitoring by a design and control office, under the supervision of **TRANSCON** in collaboration with the relevant government departments (DEEC, DREEC, IREF, IRTSS, etc.).

This approach takes into account the circumstances prevailing at the time of implementation of the measures recommended in the ESMP.

Indeed, the companies in charge of the works are not always specialized in the implementation of certain actions such as reforestation, awareness raising, and subcontract to SMEs.

Finally, the design and control office recruited to carry out certain project support actions must comply with the terms of reference drawn up by the promoter for the actions to be carried out.

- **DEEC, DREEC and the Monitoring Committee**

State responsibility for controlling the environmental management of the project is officially entrusted to the DEEC through the Division of Environmental Impact Assessments (DEIE).

In principle, copies of monthly environmental activity and monitoring reports should be sent to the Matam DREEC, which is the regional body responsible for monitoring the environmental compliance of projects.

Structures such as NGOs, associations and local SMEs may also be called upon as neutral actors in the monitoring and evaluation of the ESMP.

The committee will be composed of the following members, but not limited to:

- local authorities (the Governor and the Prefect);
- municipal authorities;
- representatives of the population;
- the Directorate of Environment and Classified Establishments (DEEC);
- the technical services of the relevant State;
- the HSE consulting engineering firm;
- relevant stakeholders (NGOs, representatives of women's groups; youth representatives,);
- representatives of MTADIA and the Ministry of Interior, etc.

The committee will be supported technically and financially by MTADIA, which is responsible for the institutional supervision of this project, in order to ensure effective monitoring of the management plan. It will meet periodically to evaluate the experts' reports on the company's environmental, health and safety monitoring.

On this basis, the committee will make recommendations to be implemented.

X.3.6.2. Capacity building of the Monitoring and Surveillance Committee

For the proper implementation of the measures recommended in the ESMP and the monitoring of their implementation, it is necessary to take into account the fact that the technical capacities to implement the various negative impact mitigation and monitoring measures are not the same for all categories of actors.

Therefore, to enable all actors to play their role, it is necessary to strengthen their capacities on environmental issues related to the project.

Thus, to ensure that environmental and social issues are properly taken into account when carrying out the activities planned in each component in accordance with the ESMP, MTADIA will have to develop a programme to strengthen the capacities of the external structures involved in monitoring the implementation of the ESMP.

This capacity building program should also take into account the internal structures involved in the management of the airport.

The following table presents the different activities to be carried out as part of the capacity building of the members of the Monitoring Committee and airport staff.

Table 52: Capacity Building Program

Activities	Responsible Entity	Beneficiaries of the training sessions	Deadlines and duration	Indicative costs (FCFA)
Training of airport space management administrators	HAAS	National Police	As soon as operations start up	10,000 F/ participant/ day + coffee break
	MTADIA	Airport Customs		
Training on airport fire safety	ASECNA	Airport Fire Brigade	As soon as operations start up	10,000 F/ participant/ day + coffee break
Training on HSE management of a rehabilitation site	MTADIA	Members of the Regional Environmental Monitoring Committee + members of the Technical Committee	Before starting airport operations 1 day	10,000 F/ participant + coffee break
Training on Health, Safety, Hygiene, Health and Security standards in the airport environment		Airport hygiene and sanitation officers	Before airport operation and during the operation phase 2 days	5000 F per participant + coffee break
Training on solid waste and liquid discharge management at airports	Airport operator	Surface technicians provided by the service provider in charge of airport hygiene and cleanliness	As soon as airport operations begin 1 day A training session that can be replicated 3 times a year	5000 F per participant + coffee break
		Service providers authorized to operate in the airport area	As soon as airport operations begin 1 day A training session that can be replicated by the trainees.	5000 Frs per participant Coffee break + Coffee break

X.3.6.3. OPERATIONAL MEANS AND PROCEDURES

To confirm its willingness to take the environment into account, the Ministry of Air Transport and Airport Infrastructure Development (**MTADIA)** will be asked to

- recruit/design one (or more) competent manager(s) responsible for the management of environmental aspects as well as **HSS** aspects;
- draw up a Site Environmental and Social Action Plan highlighting in particular the conditions for treating solid and liquid discharges from the site and equipment, the conditions for restoring the site, the traffic conditions of vehicles and construction machinery, the regulatory constraints in force, and/or the commitments made with third parties;
- integrate into the environmental and social action plan a Health, Safety and Hygiene Plan that it will undertake to respect for works likely to produce impacts, namely: pollution of the environment by rubble, noise pollution (noise from machinery), risks of accidents, disruption of the movement of goods and people;
- comply with national regulations on worker health and safety and to comply with ILO and STD conventions.

X.3.6.4. IMPLEMENTATION TIMESCALES

The monitoring and surveillance phase will begin with the work phase but will last at least one year beyond that.

During the years of operation, the activities supervised by the operator will be evaluated and the operator will be required to submit regular monitoring reports to the DEEC and DREEC, in accordance with legislation.

X.3.6.5. BUDGET

The cost of environmental and social measures for the implementation of the ESMP is difficult to estimate at this stage of the project.

It should be noted that this budget may be updated and reassessed as the project progresses.

Table 53: Operating budget of the monitoring committee

	Activities	**Frequency**	**Actors**	**Prices**
Operating budget of the environmental monitoring committee	Monitoring the implementation of the ESMP	Quarterly in construction phase Semi-annual in operation phase	CRSE	10,000 CFA francs/day/person Transport fuel package 15 000 FCFA Saint-Louis city-airport
			Members of the National Technical Committee	40,000 CFA francs/day/person Transport fuel package 200 000 CFA francs

XI.CONCLUSION

This project to rehabilitate the Ourossogui airport will mark a new era in civil aviation in Senegal. In the long term, it will provide a better environment for aeronautical activity and will encourage the growth of air traffic in this area. In addition, this project is a business and job creation opportunity. It will have many positive impacts on the socio-economy and will encourage the arrival of investors for the implementation of large-scale projects since the accessibility of the region will be easier.

Beyond the positive aspects, this environmental assessment prior to the execution of the project made it possible to identify negative impacts that could affect various environmental components. Noise and waste generation, pollution (soil, water, air), accident risks are generally the likely impacts that may result from project activities.

To mitigate all these negative effects and optimize the positive ones, the study proposed impact management measures as well as prevention and protection measures against possible risks related to the rehabilitation and operation of the airport.

The ESMP developed in this report will allow for the monitoring and follow-up of the implementation of these measures. For its successful implementation, the involvement of all stakeholders is necessary.

APPENDICES