REHABILITATION OF THE SENOBA-ZIGUINCHOR-MPACK ROAD AND OPENING UP OF THE SOUTHERN REGIONS

COUNTRY: SENEGAL

SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

FEBRUARY 2018

<table>
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INTRODUCTION

This document summarizes the Environmental and Social Impact Assessments (ESIA) of the Project to Rehabilitate the Senoba-Ziguinchor-Mpack Road and Open up the Southern Regions. In accordance with the Integrated Safeguard System (ISS) of the African Development Bank (AfDB) and national regulations, the project was classified in Category 1. It was subject to two ESIA: the ESIA of the Sénoba-Ziguinchor RN 4 that was prepared in 2014 and validated by DEEC on 21 September 2016; it was updated in 2018 to comply with ISS requirements. The second ESIA concerns 52 km-long rural access roads, constituting the Kalounayes loop. At the request of authorities and the population, this segment, initially considered for access road rehabilitation under related initiatives, was added to the project following the preparation mission. Given it size and anticipated environmental and social stakes, this section has also been subject to a comprehensive impact assessment in 2018. DEEC granted environmental clearance to this assessment on 23 February 2018. The environmental and social impacts of related facilities planned under the project will be taken into consideration by contracting companies in charge of these works under a site ESMP. Provision will be made for the management of potential impacts that may occur during construction. Finally, an Abbreviated Resettlement Action Plan (ARAP) has been prepared to compensate the 177 affected persons, especially by economic relocations at town entrances along RN4. ARAP is the subject of a separate summary. The two ESIA and this summary were prepared in accordance with AfDB environmental and social guidelines and procedures applicable to Category 1 projects.

This summary includes: (1) the project description and rationale; (2) the presentation of the legal, institutional and administrative framework; (3) the description of the main components of the project environment, especially the biophysical and socio-economic components; (4) the presentation of project alternatives; (5) the presentation of the most significant positive and negative impacts; (6) the mitigation and enhancement measures developed; (7) the summary of climate change-related risks and the adaptation and mitigation measures proposed and; (8) public consultations held as well as the complementary initiatives planned in the project.
1. PROJECT DESCRIPTION AND RATIONALE

1.1. Project Description

The Project to Rehabilitate the Sénoba-Ziguinchor-Mpack Road and Open up the Southern Regions consists in rehabilitating National Road 4 between Sénoba and Ziguinchor, and the segment between Ziguinchor-Mpack on the Guinea Bissau border. The project also involves the development and asphalting of 52 km of the Kalounayes loop, made up of the following access roads: Tobor-Ouonk (27 km), Ouonk-Diéba (15 km) and Diéba-RN4 (10 km). The project further involves the rehabilitation of 95 km of related access roads: Tenghory-Kounabano (26 km), Silinkine-Sindian (22 km), Boukiling-Inor (7 km), Bounghari-Bona (7 km), Tobor-Niamone-Colomba (26 km) and Kandialon-CFN4 (10 km). Finally, the project will involve the construction and rehabilitation of sanitation infrastructure, as well as the construction of related facilities. Figure 1 presents the project location.

To sum up, the activities identified were grouped into the following four (4) components:

A- Rehabilitation and/or development of roads and access roads: (i) rehabilitation of 165 km of an asphalt concrete road between Sénoba and Mpack, including 15 km of paved roads in Bounkiling, Bignona and Ziguinchor, development of green spaces and support for securing the area during works; (ii) development and asphalting of 52 km of the Kalounayes loop; (iii) development of 95 km of access roads; (iv) works control and supervision; (v) awareness-raising on HIV/AIDS, social mobilisation, environmental protection and road safety; (vi) planting of 65,000 trees and 30 ha of mangrove; (vii) construction of a weighing station; (viii) employment of young engineers or trainee technicians; and (ix) clearance of rights-of-way and monitoring of ESMP implementation.

B- Development and related measures: (i) development and/or rehabilitation of social and market infrastructure, bus and truck stations, and the management of waste, boreholes and lowlands for rice cultivation and market gardening; (ii) support for youth and women’s associations; (iii) support for the enhancement of youth employability through training sites; (iv) control and supervision of related works; and (v) detailed studies and BDs of related facilities.

C- Transport facilitation and road safety: (i) Support for the Observatory of Abnormal Practices (OPA); (ii) support for road safety by the rapid handling of casualties; (iii) support for axle-load control through procurement of mobile axle-load weighing scales.

D- Project management: (i) monitoring and evaluation of socio-economic and project facilitation impacts; (ii) technical and road safety audit; (iii) accounting and financial audit; (iv) procurement audit; (v) the executing agency’s facilities; and (vi) the executing agency’s operation.
1.2. Project Rationale

The 165-km Ziguinchor-Sénoba-Mpack road is a surface coated road, about 7 km of which are in interlocking paving stones between Tobor and Ziguinchor. This road, constructed in two phases between 1992 and 1998, is in a relatively poor-to-average condition overall, except for the paved section, which is in very poor condition, especially for the untreated sections as part of periodic maintenance. The Ziguinchor-Mpack segment is a double-layer coating reconstructed in 2005. The condition of the road is average and has ruts in rice paddy areas that can be considered as compressible. The related access roads, notably the Tobor-Koubanao-Ndiéba-RN4 segments, have stretches that are in an advanced state of disrepair, especially between Ounk and Diéba, just like the Tenghori-Koubanao segment. These segments are not passable in all seasons due to their advanced state of disrepair.

Since transportation is an essential activity both for agricultural supply and access to markets, the constraints on the road transport system have a significant economic impact. Indeed, transportation cost, which accounts for two-thirds of marketing costs, is largely affected by the state of existing roads and access roads, particularly during the rainy season. The main economic activity of the Ziguinchor and Sédhiou regions, is agriculture, supported by very favourable rainfall, a high availability of suitable farmland and abundant surface and ground water resources. Tourism is also a dynamic sector, especially with the Cap-Skirring tourist area, par excellence, which hosts many hotel chains, inns and guest houses. In these conditions, the evacuation of agricultural produce outside the regions and access to various localities is a challenge.
From the practical point of view, the roads and access roads targeted by the project will provide improved services to seventy-five (75) towns and villages, in the case of RN4, and twenty-four (24) villages, in the case of the Kalounayes loop. At the strategic level, the rehabilitation of the Sénoba-Ziguinchor-Mpack road, the construction of a road instead of access roads constituting the Kalounayes loop, and the rehabilitation of related access roads, will help: (i) improve the level of service so as to facilitate access to the regional capitals of Ziguinchor, Sédhiou and Kolda and traffic inside the city of Ziguinchor, (ii) improve the safety conditions of traffic and the areas crossed, (iii) improve access to social services and facilities, especially for women, (iv) promote economic and social development, (v) increase trade between the various communities in the area and beyond to the country’s major cities, (vi) open up production areas, (vii) reduce poverty and (viii) strengthen the competitiveness of Senegal’s economic activities in relation to the sub-region.

1.3. Planned Works

The rehabilitation of the Sénoba-Ziguinchor segment will consist in laying: (i) a foundation layer; (ii) a cement-improved laterite base layer; (iii) an 8-cm GB bonding layer and (iv) a 5-cm asphalt concrete coating layer.

In the particular case of the Tobor section, technical studies are under way with the aim of confirming the following approach: (i) red-line enhancement and widening through a pre-consolidation system; (ii) the installation of a battery of structures to ensure the hydraulic and hydrodynamic balance of mangrove waters; (iii) the laying of a geo-composite on the subgrade; (iv) the laying of foundation layers and a raw laterite base and (v) the laying of a 10-cm thick layer of interlocking paving stones.

On the Ziguinchor-Mpack segment, this will consist in laying an asphalt bonding layer, an asphalt concrete sheet and, for uneven areas (rice paddy areas), a raw laterite base layer and a pavement layer of interlocking paving stones.

The enhancement of access roads of the Kalounayes loop, will consist in laying: (i) a 20-cm foundation layer; (ii) a 20-cm cement-improved laterite base layer (iii) a 5-cm asphalt concrete coating layer.

Finally, the rehabilitation of related access roads will involve (i) subgrade treatment over a width of 11 to 12m; (ii) the laying of embankments and a subgrade and (iii) the laying of a 20-cm laterite overlay in accordance with the road gauge.

The criteria for the design of planned structures are summarized in Table 1.
Table 1: Criteria for Design of Structures

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Sénoba-Ziguinchor Section (137 km)</th>
<th>Tobor Section (7 km)</th>
<th>Ziguinchor-Mpack Section (23 km)</th>
<th>Kalounayes Loop (52 km)</th>
<th>Rural Roads (95 km)</th>
<th>Hydraulic Structures (culverts, pipes, etc.)</th>
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<tr>
<td>Width of the platform</td>
<td>10-20 m</td>
<td>10-20 m</td>
<td>10-20 m</td>
<td>10 to 12 m</td>
<td>9-11 m</td>
<td>n.a.</td>
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<tr>
<td>Width of the pavement</td>
<td>7.20 m</td>
<td>7.20 m</td>
<td>7.20 m</td>
<td>7.20 m</td>
<td>-</td>
<td>6 m</td>
</tr>
<tr>
<td>Width of the shoulders</td>
<td>2 x 1.50 m</td>
<td>2 x 1.50 m</td>
<td>2 x 1.50 m</td>
<td>2 x 1.50 m</td>
<td>-</td>
<td>2 x 1 m</td>
</tr>
<tr>
<td>Reference speed</td>
<td>80 km/h</td>
<td>80 km/h</td>
<td>80 km/h</td>
<td>80 km/h</td>
<td>40 km/h</td>
<td>n.a.</td>
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<tr>
<td>Type of coating</td>
<td>5-cm asphalt concrete</td>
<td>10-cm interlocking paving stones</td>
<td>5-cm asphalt concrete and 10-cm interlocking paving stones in compressible areas.</td>
<td>5-cm asphalt concrete</td>
<td>Lateritic gravel or other materials.</td>
<td>Concrete</td>
</tr>
</tbody>
</table>

The works planned under the project will consist in rehabilitating or constructing roads/access roads following the existing route, with special amenities such as parking areas at village crossings or emergency stop areas in the current section. The works will focus mainly on: (i) site installation, (ii) clearance of rights-of-way, (iii) earthworks, (iv) pavement construction, (v) coating, (vi) sanitation and the construction of small structures, (vii) signage for road safety purposes, (viii) construction of related infrastructure and implementation of the environmental measures to be taken into account under the project.

The project cost is estimated at UA 120.58 million, or EUR 145.54 million. It will be financed jointly by the Bank (UA 20 million or EUR 24.14 million from the ADF and EUR 39.40 million from the ADB), the EU (EUR 25 million), the EIB (EUR 20 million) and Government (EUR 3.99 million) and, in parallel, by the IDB (EUR 33 million).

2. STRATEGIC, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1. National Legal Framework

The Constitution of 22 January 2001 affirms its adherence to international institutions adopted by the UNO, the AU and the African Charter on Human and Peoples’ Rights. It guarantees the right to a healthy environment for every citizen. Prime Ministerial Circular No. 009 PM SGG/SP of 30 July 2001 recalls to all structures the need to comply with the provisions of Law No. 2001-01 of 15 January 2001 instituting the Environment Code and Enabling Decree No. 2001-282 of 12 April 2001 stipulating that all development projects or activities likely to endanger the environment, should be subject to a prior environmental assessment, which must be conducted in accordance with procedures defined in the enabling decree of the said law. From the legal point of view, the Government of Senegal instituted a new Environment Code since 2001 by Law No. 2001-01 of 15 January 2001 with its Enabling Decree No. 2001-282 of 12 April 2001.
With a view to protecting the environment, the Environment Code, in its Part II, Section L 48 stipulates that “any development project or activity likely to endanger the environment, just like policies, plans, programmes, regional and sectoral studies should be the subject of an environmental assessment”, and the environmental impact assessment is the procedure for examining the consequences, both positive and negative, that a planned development project or programme will have on the environment, and ensure that these consequences are duly taken into account in project design. Still in its Part II, Chapter I, Section L10 classifies these installations into two categories. Depending on the danger or severity of the disadvantages that their operation may present, they are subject to either authorisation or declaration. This project, as infrastructure works for significant improvement of the road network, is part of Class I and, as such, subject to a comprehensive impact assessment.

Law No. 98-03 of 8 January 1998 instituting the Forestry Code, as supplemented by its Enabling Decree No. 98-164 of 20 February 1998 governing Biodiversity Conservation, indicates, in its Section R.50, the restrictions on clearing in sensitive areas, especially mangroves.

Senegal also has a normative framework reinforcing the environment code through various orders: (i) Standard NS 05-062 relating to atmospheric pollution, (ii) Standard NS 05-061 on wastewater disposal, (iii) Standard NS 05-060 relating to car pollution.

2.2. National Administrative and Institutional Framework

The management of the environment and classified installations concerns several institutional actors, the major ones being:

The **Directorate of Roads**, responsible, among others, for defining a coherent management policy for Senegal’s entire road infrastructure and ensuring the monitoring of its implementation; ensuring road development planning; developing national road regulations and standards; coordinating the national rural transport strategy; promoting the quality approach and applied research in the road sector.

The **Ministry of Environment and Sustainable Development** (MEDD): it is responsible for implementing the national policy for the management of the environment and the living environment. It is the supervisory authority of the **Directorate of the Environment and Classified Establishments** (DEEC), which is responsible for implementing Government’s environmental protection policy, especially against pollution and nuisance. It ensures (i) control of hazardous waste management, expired and obsolete products and their elimination; (ii) monitoring of compliance with relevant international conventions; (iii) the prevention and reduction of pollution and nuisance due to industrial, agricultural and commercial activities, and (iv) monitoring of environmental assessments.

The **Directorate of Water, Forestry, Hunting and Soil Conservation** (DEFCCS) is responsible for implementing the national forestry policy and exercising State prerogatives in the field of forestry and soil conservation.

The **Ministry of Interior**, through the Directorate of Civil Protection (DPC) is responsible for managing security in and around the site as well as in the operation phase of the facility in relation to road accidents.

The **Ministry of Mines and Industry**, which implements the mining policy defined by the State, especially the administration of all provisions of the Mining Code.

The **Ministry of Rural Water and the National Hydrographic Network** responsible for managing water resources.
Local Authorities which, since the advent of Law No. 96-06 of 22 March 1996 transferring powers to local authorities, are at the forefront in environment and natural resource management throughout their respective territories, and must ensure a rational management of these resources, with the support of Technical Services.

2.3. AfDB Safeguard Measures

In addition to these national regulations, the assessment was conducted taking into account the AfDB Integrated Safeguard System (ISS) designed to promote the sustainability of project results by protecting the environment and persons against possible negative impacts. This system comprises four (4) interdependent components:

- The Integrated Safeguard Policy Declaration;
- The five Operational Safeguards;
- Environmental and Social Assessment Procedures (ESAP);
- Integrated Environmental and Social Impact Assessment Guidelines.

Other relevant policies and guidelines remain applicable as soon as they are triggered under the ISS. These mainly are the:

- AfDB Gender Policy (2001);
- Framework for Enhanced Engagement with Civil Society Organizations (2012);
- Policy on Disclosure and Access to Information (2012);
- Handbook on Stakeholder Consultation and Participation in AfDB Operations (2001);
- AfDB Policy on Population and Strategies for Implementation (2002);

The project triggers the following five Operational Safeguards.

- OS1: Environmental and social assessment: Given the scale of the project (rehabilitation of 217 km of roads and 95 km of access roads) and the sensitivity of the environments affected (classified forests and mangroves), the project will generate significant negative impacts. Therefore, a detailed environmental and social impact assessment has been prepared for better assessment of these impacts and identification of appropriate mitigation measures.

- OS2: Involuntary resettlement, land acquisition, population displacement and compensation: The project will lead mainly to economic displacements that will be subject to compensation. An Abbreviated Resettlement Plan has been prepared for this purpose.

- OS3: Biodiversity and eco-systemic services: The project will cross several classified forests. Deforestation should be minimized in sensitive habitats and compensation, through reforestation, should be made. At the level of the Tobor mangrove, the technical road rehabilitation solution will promote the continuity of flows between
the two parts of the mangrove separated by the road. Rehabilitation of the mangrove will be carried out as a mitigation measure.

- **OS4: Pollution prevention and control, ESM, hazardous materials and resource efficiency:** The project will involve the storage and use of hazardous products such as heavy fuel oil and gas oil, asphalt, binders and emulsions that have the potential to pollute soils, runoff and groundwater in the event of a spill. The project will also use water, whose efficient management will be required.

- **OS5: Labour conditions, health and safety:** During works, employees will face various risks: injuries due to machinery, presence of hazardous products (high temperature asphalt and associated fumes), sunstroke, accidental collision or noise from vehicles. Working conditions, in accordance with legislation and international health and safety standards, should be established to minimize or eliminate potential health and safety risks.

### 2.4. International Conventions

To show its commitment to environmental protection, Senegal has acceded to several international conventions relating to the environment. This indicates the country’s acceptance to establish national legal instruments in order to translate into its own legislation the spirit and fundamental principles of these conventions. The international conventions to which Senegal has subscribed and which could have an impact on road infrastructure sector activities carried out in the country are: (i) Convention on Biodiversity and National Heritage (Nairobi, December 1993), (ii) Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification (Paris, October 1994); (iii) the Rotterdam Convention; (iv) the Stockholm Convention, (v) the Ramsar Convention (1971) which aims to protect humid areas (vi) the International Convention on the Conservation of Nature and Natural Resources (Alger, 1968), (vii) the Convention on Climate Change; (viii) the Rome Convention on Plant Protection, (ix) the Paris Convention concerning the Protection of World Cultural and Natural Heritage; (x) the Bonn Convention on the Conservation of Migratory Species of Wild Animals; (xi) the Vienna Convention for the Protection of the Ozone Layer and (xii) the Montreal Protocol on Substances that Deplete the Ozone Layer.

### 3. PROJECT ENVIRONMENT

#### 3.1. Project Impact Area

Relating to the environment, the direct project impact area is made up of the direct road right-of-way concerned by the works. At the social level, the impact area is more extensive to the extent that RN 4 and the Kalounayes loop segment are situated in the Ziguinchor and Sédiou regions, particularly in the Bounkiling, Bignona and Ziguinchor Divisions. These three divisions, at the socio-economic level, make up the Direct Project Impact Area (DPIA). In addition, since RN4 is part of the Dakar-Lagos No. 7 Trans-African road corridor, the Extended Project Impact Area (EPIA), at the socio-economic level, covers the Dakar, Thiès and Kaolack regions in Senegal, as well as The Gambia and Guinea Bissau.
3.2. Physical Environment

Climate: The sub-Guinean tropical-type climate is characterised by a long dry season, running from October to May and a rainy season over four and a half months. The summary of data from the Ziguinchor weather station from 2001 to 2010 covering the project area, indicates an annual average temperature of 30°C, relative humidity of about 49.1% per year, total evaporation of 786.6 mm and average annual rainfall of 1,613 mm.

Relief: The geological substratum (bedrock) of the DPIA is mostly made up of tertiary and quaternarian formations (Continental terminal), covered in basin depressions by recent alluvia. The main soil types encountered are: (i) hydromorphic soils in valleys, used for rice cultivation and market gardening; (ii) the soils are acidic and unsuitable for agriculture in the lower part of the Department, where sea water evaporates, leaving salt deposits and (iii) on plateaus and terraces, ferruginous tropical and ferrallitic sandy or sandy clay soils, used for rain-fed crops (groundnut, cow pea, rice, etc.) and covered by woody formations, most often palm groves. Soil degradation has become a major constraint to the optimum development of land capital. The phenomenon is due to the salinization/acidification of the soils of lowlands and bolongs, which are marshlands losing fertility due to repeated bushfires, erosion of plateaus and terraces, silting up of paddy fields, and the receding bank along the coast following marine erosion that is coupled in places with dune formations.

Hydrography: the DPIA hydrographic network consists essentially of the Casamance River and its tributaries, the main ones being the Soungrougrou (considered for water resource collection during works), the Thiango Dianguina, the Khorine, and the Bignona and Nyassia marshlands. In the estuary region, the hydrographic network has many ramifications, known as bolongs. They split the delta area into many islands, whose soils are often marshy. The main branch of the stream is 350-km long. As regards groundwater, the rainfall level and the existence of a network of faults, allows for groundwater renewal. The use of groundwater resources is usually limited to meeting domestic water needs from traditional wells. However, there is significant freshwater potential (semi-deep and deep aquifers), except in coastal areas and in the shallow aquifers in valleys, where the water is salty.

3.3. Biological Environment

Flora: In the DPIA, flora is found in various plant formations as follows:

- Dense dry forest is found in the form of isolated patches in the area, with dominant Guinean flora whose main species are: *Daniellia oliveri* (Santan), *Khaya senegalensis* (Bastard mahogany), *Ceiba pentandra* (Kapok tree). This is the case of the Tobor classified forest, which extends in the same direction from the Kalounayes forest to Marsassoum or from the Kourouck classified forest observed from Badiouré village between Ziguinchor and Senoba and finally, after Diabir village, the Djipakoum classified forest.

- Wooded savannah: almost all the species involved are from the Sudano-Guinean domain, notably: *Afzelia africana; Prosopis africana; Burkea africana, Daniellia oliveri."

- Palm grove is found in areas in the project area in the form of oil palms (*Elaeis guineensis*). The surface areas of these groves vary according to edaphic conditions and anthropogenic pressure.
- *Borassus aethiopium* grove: *Borassus aethiopium* is also found in areas in the project area on the Silinkine-Sindian access road. This species is now highly threatened, among others, by palm wine tapping and bushfires.

- The mangrove is found particularly in Ziguinchor and its vicinity, on both sides of the Emile Badiane Bridge on River Casamance and, not far from Tobor village, on the Ziguinchor-Sénoba segment. This is a brackish ecosystem, composed of *Rhizophora racemosa* on the edges and *Avicenia nitida* mudflat. The mangrove is of some economic importance for the population: production of fuel and construction wood, use of leaves (salty) for livestock farming, availability of fish and shellfish, etc.

**Protected Areas:** The Ziguinchor region has a total of about thirty classified forest massifs, including some twenty in Bignona Department, of a total area of 100,524.3 ha with 20 classified forests in Bignona, 6 in Oussouye and 4 in Ziguinchor. Bignona also has the largest forest massifs with the Djignaki mangroves (30,000 ha) and the Narangs and Kalounayes massifs, of 20,820 ha and 15,100 ha, respectively.

**Wildlife:** Gallery forests and some classified forests have thus become preferred habitats for furry wildlife, notably bushbucks, red-backed duikers, yellow-backed duikers and *Cercopithecus* (green monkeys, patas and colobuses), hare, African ground squirrel, porcupine, civet, genet, wildcat, duiker, hyena, etc. Well-represented riparian vegetation is the habitat of choice for green monkeys. The coastline is an important stage in the migration of Palearctic bird species. The hyena has become a rare species in the area. According to Senegalese legislation, partially protected species are the warthog, patas, *Cynocephalus*, *Cercopithecus* monkey and green monkey. The bushbuck is an entirely protected species.

### 3.4. Human Environment

**Population:** The DPIA is home to a population estimated in 2016 at 666,551 inhabitants, or nearly 4.5% of the country’s population. The proportion of women in the DPIA is 48.79%. The proportion of the population living in rural areas represents 57.74%. Breakdown by age shows that the proportion of the 15-35, commonly called young people, is 67.50%. The incidence of poverty in the DPIA (66.70%) is above the national average (46.70%).

**Ethnic Groups and Religions Practised:** The population of the Ziguinchor region is characterised by great ethnic diversity. More than half of the population is made up of the Diolas (61%), then followed by the Mandingues (9%), the Peulhs (7%), the Wolofs (5%), the Manjaques (4%), the Mancagnes (3%), the Balantes (2.5%), the Sérères (2.4%), and the other ethnic groups (5.18%). This ethnic mixing makes this region one of Senegal’s most cosmopolitan. As for the Sédhiou region, the population is composed 60% of Mandingues, 20% of Diolas, 10% of Peulhs, 2% of Wolofs and others. The main religions are Islam and Christianity.

**Economic Activity:** The DPIA’s economy is mainly agricultural. The DPIA has several soil types suitable for agriculture. With its rich forest resources, agricultural production, and livestock and tourism potential, the DPIA is often considered as Senegal’s breadbasket. More than four-fifths of households engage in agriculture. The dominant crops remain peanuts, millet and rice. Logging and arboriculture, particularly fruit trees, constitute an alternative source of income for the population.
**Tourism:** The Ziguinchor and Sédhiou regions are touristic because of their luxuriant nature and their rich historical and cultural heritage. The tourist area, par excellence, is that of Cap-Skirring, which is home to many hotel chains, inns and guest houses.

**Transport:** Trade in the project area use three modes of transport, including road, river-sea and air networks. The road network is on the whole degraded. Although the means mobilised for rehabilitation and routine maintenance of some roads are significant, many efforts are needed to promote the development of land transport.

**Education:** Senegal has devoted about 40% of its budget to education. At the level of project area regions (Ziguinchor/Sédhiou), school structures are changing regularly from year to year, attesting to the constant improvement of the educational system and attendance rates. However, gross enrolment rates are higher at the primary level than at the secondary level: 97% and 99.8% against 22% and 31.8% in Ziguinchor and Sédhiou, respectively.

**Health:** Generally, the health situation in the project area is still marked by low infrastructure and staff coverage. The level of use of existing infrastructure is also low, especially in the Silinkine-Sindian area. The most common diseases in the DPIA are malaria, intestinal diseases, STIs including HIV/AIDS, with a prevalence rate of nearly 2% in the Ziguinchor region, for a national average of 0.7%.

4. **PROJECT ALTERNATIVES**

The analysis of alternatives does not concern the route, since the project consists in rehabilitating a national road following the existing route and improving rural access roads also following existing routes. Therefore, the analysis concerns the project and no-project alternatives.

The “project” and “no-project” alternatives are assessed considering their impacts on the environment, the human environment and the economy.

*The “no-project” alternative:* This option is equivalent to leaving the situation in its current state with the inconvenience it poses to users and residents. This option would undoubtedly be a hindrance to the development of the area. This solution implies that the people of the area concerned will continue to experience difficulties in travelling to urban centres, where the administrative, health, educational and commercial infrastructure they need is concentrated. From the environmental point of view, the option of not constructing the road will not have any negative impact on the environment: no nuisance (dusts, pollution) and disturbance of the living environment (noise) by works, no demolition, no deforestation, no filling of depressions and other runoff, no disturbance of the living environment of local people; no impact on mangroves, classified forests, community forests and defences. Overall, the “no-project” situation has disadvantages from the point of view of socio-economic development. In this respect, it is not a preferred option.

*The “project” alternative:* This option prefers the rehabilitation of the Sénoba-Ziguinchor road and related access roads. However, the option also has some effects and impacts at the environmental and social level. The construction of the road will have significant negative impacts on the environment. Indeed, works will generate dust emissions and noise that will inconvenience people living near the road. With construction activities, risks of pollution of soils and water resources are to be feared. Deforestation and clearing will be done on the targeted roads as well as encroachment on classified forests, especially for the implementation of detours.
This option will ensure better service for the localities situated in the road right-of-way area. The rehabilitated road will enable all farmers to take advantage of the project area’s potentials. At the end of works, we could expect a better popularization of agricultural production, increased tourism, craft and industrial activities. These effects will be further amplified by the delivery of the Trans-Gambian Bridge.

The comparative analysis of the two alternatives helps to highlight the need for the facilities planned. “Not doing anything”, in addition to the consequences described above, is consistent neither with the transport sector policy letter nor with the objectives of the Emerging Senegal Plan. The status quo will constitute a major constraint to the development of the area’s production and the development and economic growth of the localities. Thus, the “with-project” option is to be preferred although it also has negative impacts. Appropriate measures will be proposed to mitigate the negative impacts and enhance the positive impacts of the project.

5. **MAIN POTENTIAL IMPACTS**

5.1. **Positive Impacts**

In the construction phase, positive impacts concern jobs and commercial activity.

- **Increased Commercial Activities along the Roads Concerned**: the project will have as impact the stimulation of commercial activities. The presence of worksites and their staff will temporarily fuel commercial activity in the localities crossed, especially through the sale of consumer and food products and the rental of accommodation. The works will improve the living conditions of the population through the development of income-generating activities.

- **Job Creation for Young People during Construction**: for the needs of worksites, temporary labour will be recruited in the localities crossed. The creation of between 1,500 to 2,000 jobs is expected during construction, while some 400 to 500 jobs are expected during operation. Special emphasis will be placed on job creation for young people through the establishment of training sites during works. In addition, related projects will boost support for training structures for young people.

In the operation phase, the presence of new or rehabilitated infrastructure will have significant impacts at the socio-economic level. The impacts described below concern the EPIA, whose implementation will generally improve trade between the various divisions of Ziguinchor and Sédhiou and the capital Dakar and, at a larger scale, with The Gambia and Guinea Bissau.

- **Opening up of the Ziguinchor and Sédhiou Regions and Access to Socio-economic Infrastructure**: RN4 is part of the Dakar-Lagos No. 7 Trans-African road corridor, identified as the backbone of the sub-region’s economic and social development. Its rehabilitation will facilitate sub-regional and domestic trade. Indeed, the population near the asphalted roads and related access roads will have more rapid and less costly access to social and health facilities: schools, health posts and hospitals, administrative buildings, among others, as well as to commercial places such as daily or weekly markets (loumas) and shops. Another major advantage will be better penetration among the riparian population of governmental and non-governmental development programmes, especially water supply, public health, education, rural and fishery production and women’s promotion. Road infrastructure rehabilitation will facilitate
children’s access to schools, especially those of the Silinkine-Sindian and Tenghori-Koubanao segments. In addition, the construction of fences and sanitary facilities, especially for roadside schools, will have a positive effect on the safety, hygiene and health of children.

- **Increased Marketing of Rural and Maritime Production**: improved circulation of inputs and agricultural produce, as well as that of development agents will help increase agricultural incomes in the project area. In addition, rehabilitated infrastructure will facilitate the movement of livestock and fishery support project development agents, as well as the supply of complementary foods, vaccines and veterinary products that are necessary for the proper development of this subsector. The evacuation of fishery products and dry fish from Ziguinchor to Sénoba will also be facilitated. This will ultimately contribute to improving the living conditions of the population in terms of food and health.

- **Increased Commercial Activities**: traffic surge on the rehabilitated sections will lead to increased demand from travellers, especially in terms of catering and sales of local agricultural (palm oil), livestock (meat) or craft products. On the other hand, the supply of traders will be facilitated and enhanced by greater availability of a variety of products.

- **Improved Access to Tourist Areas**: the rehabilitation of roads and access roads will have a beneficial effect on local and international tourism, inasmuch as it will help to better develop the eco-tourism resources of the Ziguinchor and Sédhiou regions.

- **Gender and Women-specific Activities**: during the construction phase, female caterers and traders will witness a significant increase in their income. The presence of the road will facilitate the transport of goods and persons. This will help to lighten women’s tasks, especially as they are primarily concerned by the transportation of agricultural produce to the points of sale. This dynamic will be able to continue with the new outlets that they will certainly find for the sale of their products. Overall, the increase in women’s incomes will improve their living conditions and facilitate their financial participation in local development. Similarly, the evacuation of pregnant women to maternities in urban centres will be done more quickly and comfortably.

5.2. **Main Negative Impacts**

5.2.1. **Sources of Impacts**

The sources of potential impacts are the various activities planned under the project that will, possibly, affect various components of the biophysical or socio-economic environment in various phases of the project: preparatory works, rehabilitation and operation.

In the **site preparation and rehabilitation** phase, the main sources of impact will be as follows: (a) installation of the base camp and worksite; (b) right-of-way clearing and cleaning; (c) earthworks and pavement works; (d) asphalt preparation and spreading; (e) construction of sanitation facilities and drainage systems; (f) opening and operation of borrow pits and quarries; (g) transportation and storage of materials; (h) installation of detours and signage structures; (i) presence of labour.
In the **operation** phase of rehabilitated infrastructure, the expected sources of impact are: (a) the presence of the road and vehicle traffic; (b) periodic maintenance works.

### 5.2.2. Impacts in the Preparation and Construction Phase

The main impacts presented are those of high or medium importance.

#### 5.2.2.1. Physical Environment

- **Modification of the Soil Structure**: soils will be subject to significant disruptions due to: (a) widening of the right-of-way at the level of tracks (of 3 m on average), in accordance with the development standards adopted for the tracks, (b) the opening of borrow pits, and (c) the setting up of base camps and fixed installations. At the level of rock quarries, considering the inexistence of appropriate sites in the project area, contracting companies will be supplied from the Thiès region (Diack) or from Kédougou (Mansadala) on existing quarries. The estimated surface areas for borrow pits are about 104 ha, for RN4 needs, and 42 ha, for the Kalounayes loop. For the Ziguinchor-Mpack segment, no borrow pit was found. This will entail falling back on the Gonoum borrow pit 25 km from Ziguinchor on RN6 being operated. Widening possibilities are estimated at 3 ha. In addition, soils will be more or less compacted on a strip of 20 m to 40 m wide on each side of the roads and access roads, because of the circulation of construction machinery and equipment. Nevertheless, the generally sandy-loam nature of soils will mitigate this impact. In addition, the excavated surfaces of borrow pits, base camps and fixed installations will be, particularly, vulnerable to erosion from rainwater, which could result in increased gully erosion, especially on sloping surfaces.

- **Chemical Soil Pollution**: soils may also be polluted by waste from base camps, as well as the supply and handling of chemical products on the construction site. The products that are likely to be the source of this pollution are lubricants, hydrocarbons, aggregates, inert and organic solid wastes, etc. The pollution can be more or less significant in the absence of adequate management and mitigation measures.

- **Impact on Water Quantity**: Projected water needs under the project are estimated at about 700,000 m³. Water collection by contracting companies should be carried out mainly in permanent watercourses after checking the physicochemical criteria (Soungrougrou for example), in order to reduce the impact on available water resources. Boreholes constructed in base camps may, nevertheless, impact the borehole flows of the people around, thus disrupting their water supply more or less significantly during the project implementation phase.

- **Water Pollution**: surface water flowing near worksites, workers’ camps and borrow pits could be contaminated by varied waste and discharge from works: waste oils, hydrocarbons, detergents, etc. In addition, rehabilitation and road and access road construction works and many hydraulic structures may disrupt the flow of surface water and cause pollution from deposits of excavated material or debris from old structures along the road. On the other hand, soil and/or surface water pollution may be partly transferred to the surface aquifer, especially as soils and bedrocks are most often permeable. Significant nuisance can be caused by leaks or accidental spills at the level of light hydrocarbon (fuel) tanks that seep very rapidly.
- **Air Pollution**: the opening and operation of borrow sites and diversions, clearing and cleaning works of the right-of-way, base camps and worksites, and earthworks and the movement of machinery, will degrade the quality of the air because of dust emissions. In addition, the asphalt plant will generate unpleasant odours from hydrocarbons that cause discomfort and headache. If it is not controlled, atmospheric pollution could have consequences on visibility, as well as on the health of workers and the local population.

- **Noise Pollution**: the use of worksite machinery on the segments under construction from/to borrow sites, and for the transportation of materials, will disturb the usual tranquility that reigns in the villages along the roads and access roads.

5.2.2.2. **Biological Environment**

- **Destruction and Degradation of Vegetation**: the rehabilitation of the road will lead to the destruction of vegetation in the entire right-of-way area and partial destruction on the edge of the latter, due to the circulation of machinery and persons, especially on access roads of the Kalounayes loop. Furthermore, fuel wood demand will increase because of the presence of the worksite. The most significant losses concern, particularly, large trees on the access roads of the Kalounayes loop, notably the Tenghor-Koubanao access road running through a teak forest along both sides of the road for about 7 km. The plant formations concerned are mainly wooded savannah, herbaceous formations, the teak forest and some fruit tree plantations composed essentially of mango trees, orange trees and guava trees. The estimated calculations of vegetation cover lost in the opening of borrow pits, the setting up of base camps and fixed installations and compliance with the right-of-way, stand at 170 ha.

- **Disturbance of Wildlife and Destruction of Habitat**: vegetation loss, the movement of vehicles and persons, and noise emitted by the worksite, scare away wild animals. Some natural habitats will be destroyed along with vegetation on rights-of-way and borrow pits. This loss of habitat could have effects on bird colonies with a risk of interspecific competition.

5.2.2.3. **Human Environment**

- **Economic Displacements**: the crossing of towns by RN4 and right-of-way widening at the level of access roads of the Kalounayes loop, will affect daily or weekly markets. For the most part, road works will lead to a significant loss of incomes for 145 persons. These are mainly women engaging in a daily or weekly commercial activity in the road right-of-way with semi-permanent installations (tables with sheds and canteens). This situation required the preparation of an Abbreviated Resettlement Plan, including compensation for losses and social support estimated at CFAF 242,335,500. The summary of the abbreviated RAP is prepared separately as an annex to the ESIA.

- **Impacts of Works on the Quality of Life**: the project’s physical impacts that will have effects on the well-being of the riparian population are noise, dust and odours. Dust emissions may be a source of discomfort and also cause slight respiratory and eye health problems among the population residing in the villages crossed. In addition, machinery operation noise will disturb the usual tranquility that reigns in the villages. The odours emanating from asphalt products could cause olfactory nuisance and
headaches in workers and the people residing in the immediate area around the asphalt plant. The widening of the wearing course and clearance of the right-of-way, particularly at the pavement level, may justify the felling of fruit alignments, shade or utility trees. These trees often have an important role in the well-being and even social life of the community by creating popular shading areas. They sometimes constitute harmonious alignments that signal the presence of the village to those coming, before the settlements. They can also be used as sources of food or cosmetic or medical products.

- **Impacts of Works on the Health of the Population:** during the rainy season, waterborne diseases could occur considering the presence of water stagnation sites left by the worksite, a source of proliferation of vector insects. On the other hand, the presence of worksite staff could lead to increased non-protected sexual relations with multiple partners, leading to a possible increase in cases of HIV/AIDS infections and various other sexually transmitted diseases, with already worrying prevalence rates in the project area.

- **Impact of Works on the Movement and Safety of the Population:** during works, the movement of worksite machinery and vehicles, borrow excavations and deposits of materials on the right-of-way, increase the risk of accidents among the persons transported along the roads under construction. This aspect will be particularly critical during the rehabilitation works of Road 54 on the Ziguinchor-Mpack segment, which is found in the urban area.

- **Impact on Cultural Heritage:** the graveyards and mosques identified along the roads and access roads should not be threatened by works, since they are all situated at some distance from the road corridor. However, the opening of borrow sites could affect some sites outside the villages. A discovery procedure will be established as part of the works.

- **Conflict Risks:** the presence of staff of contracting companies during works will be at the origin of cultural mix that can generate conflicts if adequate preventive measures are not implemented. The causes of conflicts could be non-respect of the practices and customs of the people, lack of information on project activities, non-compliance with the terms or amounts for compensation for property destroyed during works, the absence of consultations before the choice of sites for borrow pits, quarries, workers’ camps, diversions, etc. It should be noted that the damage caused by works, not taken into consideration by the Abbreviated Resettlement Plan, will be taken into account by the contracting company that will establish a damage management plan.

5.2.3. **Impacts in the Operation Phase**

5.2.3.1. **Biophysical environment**

- **Impacts on Soils and Water:** along the rehabilitated roads and access roads, soil pollution will result from waste and spills deliberately or accidentally dumped by users that have become more numerous. In the longer term and indirectly, new constructions of housing and markets will lead to soil pollution by increasing untreated solid and liquid waste dumped into the wild and into gutters. Erosion by runoff, on its part, will be marked in a few rare places, where the slopes are more or less remarkable, for example on RN4, in the vicinity of the villages of Mandouar and
Fangoumet and on the Tangori-Koubanao access road. Given the heavy rains recorded in these localities, erosion risks can be significant.

- **Impact on Vegetation and Wildlife:** generally, experience has shown that the rehabilitation of a road or an access road can lead to increased population, which will, in turn, lead to increased demand for forest products, a reduction in fallow time, etc., with the resulting increase in deforestation. In the wildlife-rich area, as is the case of the Silinkine-Sindian access road area, greater ease of road traffic could result in increased hunting.

5.2.3.2. **Human Environment**

- **Noise Nuisance:** the level of noise nuisance during the crossing of villages will, on the one hand, increase due to increased traffic and, on the other hand, reduce due to the disappearance of potholes and other obstacles that cause noisy braking and acceleration.

- **Safety and Accident Risks:** the good state of roads and access roads will encourage motorists to drive at high speeds. Thus, considering the state of the vehicles (age often advanced) and frequent overload, there is often an increase in traffic accidents.

5.3. **Cumulative Impacts**

The various ongoing development projects in the region are the Casamance Development Pole Project (PPDC), with the rehabilitation of access roads like the Mampalago-Sindian-Balandine-Djibidione road, and the rehabilitation of the Ziguinchor-Tanaff road. The proposed projects will have similar impacts to this project, in the construction phase, especially with the displacement of workers looking for jobs or other economic activities, increased road traffic or increased exploitation of natural resources. However, RN4 is part of the Dakar-Lagos No. 7 Trans-African road corridor. Thus, its rehabilitation will improve the sub-regional road network and facilitate the movement of goods and persons. This advantage will be further amplified by the commissioning of the Trans-Gambian Bridge, thus providing Senegal and The Gambia with a direct and rapid route between the north and south of the country.

6. **MITIGATION/ENHANCEMENT MEASURES AND COMPLEMENTARY ACTIVITIES**

6.1. **Contractor Selection and Worksite Preparation Phase**

- **Choice of Contractors:** as part of the preparation of bidding documents (BD), environmental clauses will be included in the documents to optimize the protection of the environment and socio-economic environment. These clauses will relate to roads, access roads and ancillary projects (markets, parking areas, schools, health centres, rural access roads, etc.). The project should ensure compliance with the laws and national regulations on the environment, land regulations and AfDB requirements. The control firm should ensure that contractors in charge of each lot obtain the various permits and authorisations required for works execution.

- **Contractor’s Commitment:** contracting companies will be bound to submit a Worksite Environmental and Social Management Plan (WESMP). This Plan should be validated by AGEROUTE within 45 days following award of the contract. For
each of the lots identified, the contracting company will develop, as the WESMP’s content, a Site Environment Protection Plan (SEPP). The SEPP or SEPPs are annexed to the WESMP. The latter constitutes the only reference document in which the contracting company defines in detail all the operational and technical measures that it will implement to meet the obligations of clauses relating to the environment, hygiene, health and safety. The WESMP should contain the following elements: (i) the environmental and social management system; (ii) the environmental management plan; (iii) the hygiene, health and safety plan; (iv) management plans for relations with employers and the population, including local recruitment, damage management during works, complaints management or traffic and signage management.

- **Prior Compensation**: project affected persons identified in the Abbreviated Resettlement Plan should be compensated in a just and fair manner before the commencement of works.

### 6.2. Measures during Works

#### Biophysical Environment

- **Protection of Soil Structure**: the following measures will be implemented by the contractor to minimize the impacts on soils: (i) level the temporarily exploited quarries so as to avoid soil erosion and water flow to the pavement; (ii) reforest the, temporarily, exploited quarries with appropriate species; (iii) give preference to the exploitation of existing quarries so as to minimize deforestation and soil erosion; (iv) revegetate slopes and edges.

- **Maintenance of Soil Quality**: the contractor is responsible for the collection and appropriate management of various waste materials; he should (i) collect oils and other chemical products; (ii) store asphalt products on a cemented platform so as to minimize any form of degradation and pollution of soils and groundwater by chemical spills; (iii) install outlets (ditches/channels) outside residential areas in order to prevent the risk of flooding of surrounding dwellings; (iv) dump solid waste materials in authorised locations and (v) establish a recovery and treatment procedure for contaminated soils in the event of a spill.

- **Water Resource Management**: the contractor should (i) rehabilitate existing and failed boreholes; (ii) construct new boreholes to improve population water coverage; (iii) provide for the installation of water tanks and construction of storage ponds. As concerns runoff, drainage works will be integrated with road infrastructure to ensure the road’s protection.

- **Air Quality**: to limit the effects of exhaust fumes, alignment plantations will be set up, especially when crossing localities.
• **Atmospheric Pollution Management**: to minimize the effects of dust, the following measures will be implemented by the contractor: (i) information and prior sensitisation of the local population; (ii) watering of work surfaces and access routes; (iii) provision of personal protection equipment to worksite staff and the local population; (iv) health monitoring of workers and the local population; (v) regular monitoring of the effective implementation of these measures. The choice of the location of asphalt plants, which generate gas emissions, noise and fumes, should avoid residential areas and be subject also to authorisation.

• **Natural Resource and Wildlife Protection Measures**: the contractor should take measures to prevent bushfires, in collaboration with Water and Forestry officers. In addition, diversions inside classified forests will be avoided as much as possible. The contractor will execute works by half-pavement in places where diversion routes are likely to disturb classified forests, especially at the crossings of the classified forests of **Tobor, Kalounayes, Kourouck** and that of **Djipakoun** after Diabir village, which are all located on RN4. A surveillance programme will be established and carried out jointly by the Water and Forestry department and vigilance committees to ensure the protection of forest resources in the project area. All loss of vegetation under the project will be subject to compensatory reforestation at the ratio of 5 for 1, in classified forest, and 2 for 1, in the rest of the affected surface areas.

**Human Environment**

• **Expropriation**: ARAP implementation, especially payment of compensation and submission of related evidence, is a condition for the start of the road segments concerned.

• **Discovery of Archaeological Sites**: if archaeological sites are discovered during works, the contractor must immediately notify the competent administrative authority (Services in charge of Cultural Heritage) relating to the procedures to be followed. He/she will take reasonable precautions to prevent any element of these objects from being removed or damaged; he/she must also inform the contracting authority about this discovery and carry out its instructions as to how to handle them. It is up to the State to decide on the measures to be taken with regard to real estate discoveries made by chance.

• **Measures Relating to the Health and Safety of the Population**: to ensure the safety of workers and the population, the contractor will take the following measures: (i) Implement a worksite staff awareness-raising programme on the safety measures to be taken and observed, including what to do and the precautions to be taken in the transportation of materials; (ii) Systematise the wearing of personal protection gear (mask, helmet, safety footwear, etc.); (iii) Carry out campaigns to sensitise the population on accident risks; (iv) Conduct a campaign to measure the initial sound environment before the commencement of works; (v) Avoid working during rest hours when crossing towns and villages; (vi) Work in half-pavement in places where diversion routes may disturb houses or farms; (vii) Carry out adequate signage of works and establish a diversion plan, where required, to minimize accident risks during works; (viii) Install a speed limit device and inform staff on accident risks; (ix) Provide for animal passage areas to limit accident risks; (x) systematically provide staff with dust masks during laterite reloading operations, to limit the effects induced
by dust emissions; (xi) Construct speed bumps at the crossings of localities and also at schools close to the road (less than 50 m). Within the framework of HIV/AIDS control, a specific information campaign will be implemented targeting the staff and population, with the support of health districts and local NGOs working in the sector.

Considering the special security conditions in the area, a management plan for acts of rebellion and robbery, will be established. Contracting companies will be required to work in close collaboration with the army to avoid any holdup risk on the worksite and delay or suspension in works execution.

- **Conflict Management**: several types of conflict may occur in the project preparation and execution phase. The following mechanisms will be implemented by the contractor to resolve conflicts: (i) organization of information sessions for the population; (ii) recourse to the arbitration of notables of the community (traditional and religious leaders, etc.) in case of conflicts and (iii) recourse to courts as a last resort.

6.3. **Measures during the Road’s Operation**

- **Accident Risks**: the road will comprise vertical and horizontal signage, as well as speed brakes when crossing localities so as to limit accident risks. Awareness-raising campaigns on the use and respect of the road infrastructure will also be developed.

- **Maintenance Works**: AGEROUTE will carry out inspection measures to monitor the quality of the road and provide maintenance, if necessary. These maintenance works will cover, among others, the cleaning of gutters to ensure good drainage and protection of the road, as well as the replacement of dead trees.

6.4. **Residual Impacts and Environmental Risk**

6.4.1. **Residual Impacts**

No negative residual impact of moderate or high importance is expected after the implementation of mitigation measures. The negative residual impacts are minor and are not subject to special measures.

6.4.2. **Environmental Risk**

Environmental risk involves the possible spill of asphalt products, hydrocarbons or other chemical substances present on the worksite. The measures recommended to prevent these risks are as follows: (i) regular maintenance and preventive inspection of equipment; (ii) staff training and sensitisation of the population on risks related to dangerous areas; (iii) the setting up of a dispensary in the workers’ camp; (iv) fuel storage in accordance with regulations. At the level of mitigation measures, this involves (i) having an internal operation plan (needs in extinguishing equipment: water, emulsifier and pumping); (ii) setting up watering rings on the tank that allow the tank walls to cool in case of fire; (iii) having enough foam boxes; (iv) installing foam weirs on the edge of the retention bowl, etc. All the measures will be formalized in an Emergency Measures Plan.
6.5. Ancillary Facilities and Local Development Support Measures

In addition to infrastructure rehabilitation, road projects are understood as development projects that provide support for socio-economic infrastructure rehabilitation (construction or repair of boreholes and wells, repair of health facilities, repair and/or fencing of existing schools, markets, production access roads; women’s houses, etc.) situated along the roads concerned. The localities crossed by the right-of-way, notably Bignona, Bounkiling and Ziguinchor will benefit from these related measures. These include projects in the educational (classrooms and administrative buildings), safety (rescue centre), health (health unit, and maternity) and social (fences, toilet blocks, checkpoints, daily markets, women’s relief equipment, bus stations, etc.) sectors. The total amount earmarked for this related infrastructure is estimated at CFAF 3,920,000,000, or 4.16% of the project amount.

6.6. Climate Risk

6.6.1. Adaptation Measures

As regards climate change, the project is sensitive to climate fluctuation effects, namely floods, and to wind deposits of sand. Consequently, its design provides for the installation of sanitation networks and some extensions to the outlets, as well as appreciable lengths of paved tracks permitting infiltration into sandy areas. Infiltration wells will also be recommended.

6.6.2. Mitigation Measures

The road construction will help increase average traffic speeds in relation to the no-project situation, giving rise to more free-flowing traffic and generally lower emission ratios than those with current speeds (atmospheric emission ratios are, generally, inversely proportional to traffic speeds). However, the project will also generate increased traffic likely to increase CO₂ emissions.

To compensate for losses related to carbon sequestration potential due to tree-cutting during works and traffic-related emissions, there are plans for reforestation/compensatory restoration of about 65,000 trees as well as restoration of borrow pits and quarries after operation. In addition, as part of the rehabilitation of the paved section of Tobor, there are plans to restore the mangrove over an area of 30 ha. As such, the project will contribute to mitigating greenhouse gas emissions. A Reforestation Plan is required for bidding companies as well as for NGOs in charge of the plantations and long-term monitoring by competent Water and Forestry authorities. The cost of vegetation restoration and its monitoring is estimated at CFAF 692,504,000.

7. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

AGEROUTE will establish an environmental unit to support and facilitate the mission of the Regional Environmental Monitoring Committee (CRSE/DREEC), set up at regional level.

7.1. Environmental Monitoring

Environmental monitoring seeks to ensure compliance with: (i) measures proposed in the impact assessment, especially mitigation measures; (ii) conditions laid down in the Environment Code; the enabling decree and the orders relating to EIAs; (iii) commitments to local authorities and ministerial authorities; (iv) requirements for other laws and regulations related to hygiene and public health, management of the population’s living environment as well as protection of the environment and natural resources. Environmental monitoring will also concern both the construction and operation phases. It is ensured by the Control Firm (works phase) and AGEROUTE (works and operation).
7.2. Monitoring Plan

Environmental monitoring seeks to ascertain, on the ground, the accurate assessment of certain impacts and the effectiveness of mitigation or compensation measures planned by the ESIA and for which there is still some uncertainty. Information from environmental monitoring will help to correct mitigation measures and, if necessary, revise some environmental protection standards. The monitoring programme describes: (i) the elements that will be subject to monitoring; (ii) the monitoring methodology used; (iii) monitoring responsibilities; (iv) monitoring period. Environmental monitoring is ensured by the DEEC/DREEC and CRSEs.

7.3. Institutional Capacity Building Plan

AGEROUTE must deploy an Environmental Unit to facilitate the mission of Regional Environmental Monitoring Committees and Regional Divisions of the Environment and Classified Establishments (CRSE/DREEC). This Environmental and Social Unit will be responsible for ensuring compliance with environmental and social criteria in the assessment finalisation and validation process, and participate in the environmental and social supervision of works. It will coordinate the implementation and close monitoring of the environmental and social aspects of activities, instruct supervision firms to ensure close environmental monitoring and serve as interface between the project, local authorities and local actors concerned by the project.

Within the framework of a Project Assistance Protocol, DEEC will monitor the ESMP at national level. It could delegate its mandate to the regional environmental services (DREEC) of Ziguinchor and Sédhiou. The implementation of the environmental monitoring plan will require the procurement of logistics for DEEC and, consequently, for DREEC and the CRSE. The cost of institutional capacity building, including procurement of equipment and training, is estimated at CFAF 60,000,000. AGEROUTE will establish a protocol agreement with DEEC for the terms and financing of monitoring.

7.4. ESMP Costs

The ESMP cost is presented in the table below. It stands at **CFAF 5,711,294,000**, excluding ARAP and at **CFAF 6,030,728,500** including ARAP. The ARAP cost will be financed by the national counterpart contribution while other ESMP costs will be financed by the project.
<table>
<thead>
<tr>
<th>Specific Measures</th>
<th>Total</th>
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<tbody>
<tr>
<td>Compensation (ARAP)</td>
<td>319 434 500</td>
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<tr>
<td><strong>1. Works phase</strong></td>
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<tr>
<td>Sénoba-Mpack segment</td>
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</tr>
<tr>
<td>Environmental measures</td>
<td>1 002 790 000</td>
</tr>
<tr>
<td>Reforestation</td>
<td>450 640 000</td>
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<tr>
<td>STD/HIV-AIDS/EBOLA awareness-raising</td>
<td>16 000 000</td>
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<tr>
<td><strong>Kalounayes Loop</strong></td>
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<tr>
<td>Environmental measures</td>
<td>34 000 000</td>
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<tr>
<td>Reforestation</td>
<td>145 864 000</td>
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<tr>
<td>STD/HIV-AIDS/EBOLA awareness-raising</td>
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<tr>
<td><strong>Works ESMP costs</strong></td>
<td>1 659 294 000</td>
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<tr>
<td><strong>2. Operation phase</strong></td>
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<tr>
<td>Road safety measures (adequate signage, cleaning of gutters, etc.)</td>
<td>52 000 000</td>
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<td><strong>3. Environmental and social monitoring</strong></td>
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<td>Capacity building</td>
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<td>Environmental monitoring by DEEC and the CRSE</td>
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<td><strong>Monitoring cost</strong></td>
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<tr>
<td><strong>4. Related facilities (Markets, school infrastructure, support for women, etc.)</strong></td>
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<tr>
<td>Total ESMP excluding ARAP</td>
<td>5 711 294 000</td>
</tr>
<tr>
<td>Total ESMP including ARAP</td>
<td>6 030 728 500</td>
</tr>
</tbody>
</table>

### 8. PUBLIC CONSULTATION AND INFORMATION DISSEMINATION

Public consultations were organized in the localities (towns and villages) crossed by the Ziguinchor-Sénoba roads, and the Silinkine-Sindia and Tenghori-Koubano access roads during the following periods: from 8 to 14 July and then from 20 to 23 July, and subsequently from 24 to 29 August 2014. Public consultations activities were then completed in the Sédhiou region from 6 to 9 June 2015. With regard to the Kalounayes loop ESIA, consultations were held in August 2017 and public audiences in January 2018. In addition, as regards ARAP, consultations were held with affected persons in January, February and March 2018.

Public consultations were conducted in the main localities crossed by the roads/access roads (Ziguinchor, Bignona, Django, Mampalago, Sénoba, Sédhiou, Kounaya mankagne, Ndiende, Ndiama, Diaroume, Kounaya Manding, Medina Wandifa, Missira, Nimzatt, Silinkine, Sindian, Tenghory, Diobour, Boulandien etc.).

Some 350 people, including about 30% of women, were contacted during the consultations for two ESIAs on the Sénoba-Ziguinchor-Mpack segment and the Kalounayes loop segment. The categories of actors consulted were as follows:

- People of the localities crossed;
- Women’s groups;
- Youth associations;
- Occupants of bus stations;
- Market delegates;
- Village chiefs;
• Regional and national administrative authorities;
• The fire brigade;
• State technical services (Environment and Classified Establishments, Water and Forestry; Livestock, Hydraulics, Town Planning and Housing, Labour and Social Security, Rural Development, etc.).

These public consultations helped to publicise the project and present its potential environmental impacts to the people as well as record the latter’s concerns and expectations. In addition, the preparation mission fielded by the AfDB in December 2017 allowed for the holding of a series of public consultation sessions in Bounkiling, Bignona and Ziguinchor. These sessions facilitated contacts with the population, administrative authorities and technical services. The consultations enabled people to have a better knowledge of the project, assess its potential human and natural impacts as well as express their concerns and recommendations. Generally, the population is in support of the project and want it to start, as soon as possible, given the high deterioration of access roads especially. For the population, having quality roads and access roads constitutes a fundamental element of economic and social development. Materialisation of the project will help open up the towns and villages served by these road segments by facilitating the sale of farm produce, the mobility of persons, especially with easier access to health facilities for vulnerable groups such as women and children, and reduced travel time and transportation cost.

The expectations and recommendations seek to make the project viable through compliance with rules, mitigation of negative impacts and enhancement of the positive aspects. They contribute to strengthening the project’s social acceptability and sustainability. These recommendations, among others, are:

• Have quality roads and tracks;
• Provide for regular watering of the road under construction and diversions;
• Budget for the implementation of the ESMP, its control and monitoring;
• Consider operating borrow pits in accordance with the environment and appropriate security measures;
• Involve local elected representatives in the recruitment of staff (young people, drivers, women);
• Install speed limit road signs and speed bumps especially around schools to secure the movements of people, including the entry and exit of students in schools;
• Consider, at the request of several villages, the installation of rural electrification;
• Establish a fund for the compensation of persons and property that will be affected by the project.

Most of these recommendations are included in the project’s mitigation measures or in the proposed related facilities. Certain measures, such as the operation of borrow pits, will be included in the worksite ESMP and implemented by contracting companies.
As part of the Bank’s consultation requirements and in accordance with the ISS, this summary will be published on the AfDB website for a period of 120 days, before presentation of the project to the Board of Directors.

9. CONCLUSION

The ESIAs have helped to show that the project will not generate irreversible environmental impacts either in its direct impact area or extended impact area. The impacts identified will be contained through the implementation of appropriate mitigation measures or compensation measures, as the case may be, as described in the ESMP. On the other hand, significant positive effects are expected from the project at sub-regional, national and regional level. In these conditions, the project is deemed acceptable at the environmental and social level.

10. REFERENCES AND CONTACTS

Updated Environmental and Social Impact Assessment for the Project to Rehabilitate the Sénoba-Ziguinchor-Mpack Road and Open up the Southern Regions.

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For AGEROUTE:

- Alioune Mané, Project Coordinator: amane@ageroute.sn
## Annex 1: Environmental and Social Management Plan

<table>
<thead>
<tr>
<th>Specific Works Activities</th>
<th>Potential Negative Impacts</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsibilities</th>
<th>Implementation Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksite installation</td>
<td>Environmental pollution by site development waste, maintenance of machinery and equipment, and solid and liquid waste</td>
<td>Consult with the Local Authority for the choice of the site of installation of the workers’ camp to avoid conflicts</td>
<td>Consultation meeting</td>
<td>Contracting company</td>
<td>At the beginning of the project</td>
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<td></td>
<td></td>
<td>Collect oils and other toxic products in appropriate tanks and send them to recycling and hydrocarbon companies</td>
<td>Collection system set up (bins)</td>
<td>Contracting company</td>
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<td></td>
<td></td>
<td>Set up toilet blocks</td>
<td>Existence of latrines and water points</td>
<td>Contracting company</td>
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<td></td>
<td></td>
<td>Dump solid waste in sites authorised by authorities</td>
<td>Management system established and effective</td>
<td>Contracting company</td>
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</tr>
<tr>
<td>Social conflicts with the occupation of private land</td>
<td>- Inform/negotiate with the population; - Identify the affected persons and property and compensate them.</td>
<td>- Number of conflicts; - Number of persons compensated</td>
<td>Contracting company</td>
<td></td>
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<tr>
<td>Pressure on local drinking water resources</td>
<td>- Ensure the load capacity of water points to be used - Provide for optional supply and storage tanks - Negotiate the use of water points with Local Authorities/ASUFOR</td>
<td>Survey conducted Supply options established</td>
<td>Contracting company</td>
<td>Environmental Consultant/Local Authorities/ Hydraulics Service</td>
<td>At the beginning of the project</td>
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<tr>
<td>Deforestation</td>
<td>Seek the authorisation of the Regional Forestry Service, the Mining Service and the Local Authority concerned, before any deforestation operation Identify and compensate affected farmland</td>
<td>Number of authorisations granted Number of fields affected and persons compensated</td>
<td>Contracting company</td>
<td>Environmental Consultant/Local Authorities/Forestry Service/Mining Service</td>
<td></td>
</tr>
<tr>
<td>Opening of borrow pits</td>
<td>Deforestation Deterioration of farming areas</td>
<td></td>
<td></td>
<td>Environmental Consultant/Mining Service/Local Authorities</td>
<td>At the beginning of the project</td>
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<td>Specific Works Activities</td>
<td>Potential Negative Impacts</td>
<td>Mitigation Measures</td>
<td>Monitoring Indicators</td>
<td>Responsibilities</td>
<td>Implementation Schedule</td>
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<tr>
<td>Worksite staff</td>
<td>Risk of transmission of infectious diseases (STI-HIV/AIDS)</td>
<td>Sensitise worksite staff and local people</td>
<td>Number of staff sensitised</td>
<td>Contracting company/NGO</td>
<td>At the beginning of the project</td>
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<tr>
<td></td>
<td>Non-respect of practices and customs</td>
<td>Organize worksite staff information and sensitisation sessions</td>
<td>Number of staff sensitised</td>
<td>Contracting company/NGO</td>
<td>DREEC/Local Authorities</td>
</tr>
<tr>
<td></td>
<td>Social conflicts related to the movement of labour</td>
<td>Give preference, as much as possible, to the recruitment of local labour; Publish job opportunities locally</td>
<td>Number of persons recruited on the spot</td>
<td>Contracting company</td>
<td>DREEC / Local Authorities</td>
</tr>
<tr>
<td>Transportation and storage of inert materials (gravel, laterite, sand, etc.)</td>
<td>Obstruction of runoff flow Degradation of private land by storage of materials</td>
<td>Avoid storing materials on natural drainage paths and on private land</td>
<td>Number of water channels obstructed</td>
<td>Contracting company</td>
<td>DREEC/IREF/Local Authorities</td>
</tr>
<tr>
<td></td>
<td>Dust emissions</td>
<td>Protect loads (tarpaulins) Require the wearing of dust masks Water the laterite platform regularly Sensitise operators to tip materials gently Create alignment plantations to serve as a dust screen when crossing villages</td>
<td>Existence of PPE Respect for the wearing of PPE Number of trees planted when crossing villages</td>
<td>Contracting company</td>
<td>DREEC/DRT/Local Authorities /IREF</td>
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At the end of works

At the end of works

At the beginning of and during the project

At the beginning of the project

During works

During works

During works
<table>
<thead>
<tr>
<th>Specific Works Activities</th>
<th>Potential Negative Impacts</th>
<th>Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Responsibilities</th>
<th>Implementation</th>
<th>Supervision</th>
<th>Monitoring</th>
<th>Implementation Schedule</th>
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<tbody>
<tr>
<td></td>
<td>Accident risk</td>
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<td>During works</td>
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<td>Works signage and speed bumps</td>
<td>Number of road signs installed</td>
<td>Contracting company</td>
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<td>Installation of reflective bands</td>
<td>Number of speed bumps installed</td>
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<td></td>
<td>Deterioration of farmlands</td>
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<td>At the beginning of the project</td>
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<td>Inform owners of the fields concerned</td>
<td>Number of persons informed</td>
<td>Contracting company</td>
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<td></td>
<td>Compensate victims in case of deterioration of farms and other property</td>
<td>Number of properties destroyed</td>
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<td>Number of persons compensated</td>
<td>Project/AGEROUTE</td>
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<td>Preliminary works</td>
<td>Deterioration of private land by excavation residues</td>
<td>Dispose of waste in authorised locations</td>
<td>Compliance of earth dumping sites</td>
<td>Contracting company</td>
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<td>During works</td>
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<td>Environmental Consultant/Local Authorities</td>
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<td>Risk of deterioration of residential fences</td>
<td>Optimize the choice for expansion of the platform to limit losses</td>
<td>Number of properties destroyed</td>
<td>Project/AGEROUTE</td>
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<td>At the beginning of the project</td>
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<td>Compensate victims in case of deterioration of farms and other property</td>
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<td>Risk of bushfires by burning weed residues</td>
<td>Control grass burning</td>
<td>Number of fires registered</td>
<td>Contracting company</td>
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<td>During works</td>
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<td></td>
<td>Felling of tree plantations</td>
<td>Reforest (village wood) and plant alignment trees (2 trees planted for 1 tree felled) and 5 for 1 in classified forest</td>
<td>Number of trees planted</td>
<td>Contracting company</td>
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<td>After works</td>
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<td>Environmental Consultant/Local Authorities/Forestry Service</td>
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<td>Specific Works Activities</td>
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<tr>
<td><strong>Execution of platform works:</strong></td>
<td>Accident risks during works</td>
<td>Protect loads&lt;br&gt;Require the wearing of safety equipment (dust mask, helmets, safety shoes)&lt;br&gt;Ensure works signage (signs, reflectorized bands)&lt;br&gt;Have a pharmacy box for first aid;&lt;br&gt;Post a hygiene and safety notice for the construction site&lt;br&gt;Develop public transport parking spaces in the crossing area of localities&lt;br&gt;Install speed limitation signs&lt;br&gt;Install speed bumps (speed brakes) when crossing localities&lt;br&gt;Post a traffic/diversion plan&lt;br&gt;Carry out an awareness-raising campaign for operators</td>
<td>Number of trucks covered out of the total number of trucks&lt;br&gt;Number of staff equipped with PPE&lt;br&gt;Existence of a pharmacy box for first aid&lt;br&gt;Existence of a posted hygiene notice&lt;br&gt;Existence of parking and works signs&lt;br&gt;Number of speed bumps installed</td>
<td>Contracting company&lt;br&gt;Environmental Consultant</td>
<td>At the beginning of and during works</td>
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<td></td>
<td>Disturbance of the living environment by gas and dust emissions</td>
<td>Cover transportation trucks for materials&lt;br&gt;Observe ICPE development standards&lt;br&gt;Wearing of protective equipment (mask, etc.)&lt;br&gt;Regular watering of the work area including access roads to quarries and borrow pits</td>
<td>Respect of ICPEs;&lt;br&gt;Number of complaints&lt;br&gt;Existence of PPE&lt;br&gt;Respect of the wearing of PPE&lt;br&gt;Number of complaints</td>
<td>Contracting company&lt;br&gt;Environmental Consultant/Local Authorities</td>
<td>DREEC/DRT</td>
<td>At the beginning of and during works</td>
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<td></td>
<td>Disorderly disposal of demolition/earth products</td>
<td>Dispose of waste in authorised sites</td>
<td>Respect of dumping sites</td>
<td>Contracting company</td>
<td>DREEC/DRT/Local Authorities</td>
<td>During works</td>
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<tr>
<td><strong>Preparation, transportation and implementation of asphalt products:</strong></td>
<td>Degradation and pollution of soils and aquifers (wells) by asphalt products</td>
<td>Handle asphalt products on stabilized areas</td>
<td>Level or number of cases of contamination of work areas</td>
<td>Contracting company</td>
<td>During works</td>
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<tr>
<td>Specific Works Activities</td>
<td>Potential Negative Impacts</td>
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<td>Responsibilities</td>
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<td>(binders and asphalt emulsions; asphalt)</td>
<td>Specific activities: dumping of toxic products</td>
<td>Avoid storing products on private or agricultural land</td>
<td>Level or number of cases of contamination of private or agricultural land</td>
<td>Contracting company</td>
<td>Environmental Consultant/Local Authorities</td>
<td>During works</td>
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<tr>
<td></td>
<td>Negative Impacts: Mitigation measures</td>
<td>Clean up soils and asphalt products that are dumped accidentally</td>
<td>Soil quality after cleaning</td>
<td>Portfolio Manager</td>
<td>DREEC/DRT/IFET/Local Authorities</td>
<td>During works</td>
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<tr>
<td>Sanitation facilities</td>
<td>Risks of flooding of surrounding dwellings</td>
<td>Road sanitation (drainage gutters) Chock ditch/channel outlets outside residential areas</td>
<td>Existence of an efficient rainwater drainage system</td>
<td>Contracting company</td>
<td>Environmental Consultant</td>
<td>During works</td>
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<tr>
<td></td>
<td>Degradation of fields by divergent ditches</td>
<td>Install outlets outside private land (orchards, fields, etc.)</td>
<td>Existence of an efficient rainwater drainage system</td>
<td>Portfolio Manager</td>
<td>DREEC/Local Authorities</td>
<td>During works</td>
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<tr>
<td></td>
<td>Erosion of earth ditches</td>
<td>Regular maintenance of ditches and pipes</td>
<td>Regular cleaning</td>
<td>Portfolio Manager</td>
<td>DREEC/Local Authorities</td>
<td>During works</td>
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<td></td>
<td>Disorderly disposal of cleaning products</td>
<td>Dispose of cleaning residues at authorised locations</td>
<td>Compliance of earth dumping sites</td>
<td>Portfolio Manager</td>
<td>DREEC/Local Authorities</td>
<td>During works</td>
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<tr>
<td>Diversion and signage</td>
<td>Disturbance of houses and cropland by diversion routes</td>
<td>Execute works by half-pavement</td>
<td>Number of conflicts or complaints</td>
<td>Contracting company</td>
<td>Environmental Consultant</td>
<td>During works</td>
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<td>Site pollution and alteration</td>
<td>Clean up before closure of the worksite at the end of works</td>
<td>Site compliance and acceptance after works</td>
<td>Contracting company</td>
<td>Environmental Consultant</td>
<td>During works</td>
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<tr>
<td>Closure of the worksite</td>
<td>Site pollution and alteration</td>
<td>Clean up before closure of the worksite at the end of works</td>
<td>Site compliance and acceptance after works</td>
<td>Contracting company</td>
<td>Environmental Consultant</td>
<td>During works</td>
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</tbody>
</table>

**OPERATION PHASE**

| Vehicle traffic | Risks of accidents for persons | Install vertical and horizontal signage/speed bumps | Signage efficiency Number of passages developed Number of accidents recorded | Contracting company | Environmental Consultant/Local Authorities | After works |
|                | Risks of accidents for animals | Develop passage areas for animals (at the level of water points) | Signage efficiency Number of passages developed Number of accidents recorded | Contracting company | Environmental Consultant/Local Authorities | After works |
|                | Air pollution by exhaust fumes | Create alignment plantations when crossing villages | Number of trees planted | Contracting company | Environmental Consultant | After works |