PROJECT: RICE PROJECT OF SAINT-LOUIS AGRICULTURAL COMPANY
COUNTRY: SENEGAL

SUMMARY OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
(ESIA)

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Project Title: Rice project of Saint-Louis Agricultural Company
Pays : Senegal
Department : OPSD
Project No.: P-SN-AAG-001
Division : OPSD2

1. INTRODUCTION

The Compagnie Agricole de St. Louis SA (CASL SA) initiated this agro-industrial project on irrigated rice farming over 2,024.5 ha in the Municipality of Diama. This project is the first phase of a comprehensive program over 4,500 ha planned in the municipalities of Diama and Gandon. As part of the implementing of this project, CASL requested financial support from the African Development Bank (AFDB). The investments planned under the project are likely to cause adverse effects environmentally and socially, including in the preparation phase, the construction and upon commissioning. An environmental and social impact assessment (ESIA) was conducted to consider all interventions to be carried out, in accordance with Senegalese legislation and AFDB procedures. The current document is a summary of the ESIA of CASL’s rice project. It was prepared according to the requirements of the Integrated Safeguard System (ISS) and Environmental and Social Assessment Procedures of the AFDB, and policies in force in Senegal for Category 1 projects.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

CASL must comply with the policies, guidelines and strategies provided both nationally and at the level of AFDB relating to environmental and social issues and any other policy applicable to the agro-industrial project.

2.1. At the level of Senegal

Senegal has a legal and regulatory arsenal guiding the implementation of projects and programs in environmental and social terms. Based on their potential impact, their nature, scope and location, projects are ranked under Category 1 or 2. According to the Senegalese nomenclature, the current project is classified as Category 1.

The main policies applicable are the following: (i) Law No. 2001-01 of 15 January 2001 on the Environment Code; Decree No. 2001-282 of 12 April 2001 implementing Law No. 2001-01 of 15 January 2001 and some implementing decrees are the basis for the environmental legislation in Senegal; (ii) Decree No.2000-73 of January 31, 2000 regulating the consumption of substances that deplete the ozone layer; (iii) Decree No. 2006-1249 of 15 November 2006 setting the minimum safety and health requirements for temporary or mobile construction sites.

Decrees relating to impact studies are: (i) Order No. 009 471 of 28 November 2001 concerning the terms of reference of ESIA's contents; (ii) Order No. 009470 of 28 November 2001 on the conditions for issuing approval to carry out activities related to environmental impact studies; (iii) Order No. 009 472 of 28/11/2001 concerning the contents of ESIA reports; (iv) Order No. 009468 of 28/11/2001 establishing regulations on public participation in the
environmental impact study; (v) Decree No. 009469 of 28/11/2001 establishing the organization/operation of the technical committee.

Other relevant legal instruments relating to security, resettlement, pesticide use, etc. These are: (i) the Interministerial Order No. 4,862 of 14 July 1999 mandating the establishment of an Internal Operation Plan (IOP) in certain places with preservation order on them; (ii) the Decree 91-748 of February 29, 1991 on relocation, and Decree No. 72-1288 of 27 October 1972 concerning the conditions for allocation and withdrawal of land from national land in rural communities; (iii) Law No. 84-14 of 2 February 1984 on the supervision of agro-pharmaceutical and assimilated specialties, and decree No. 84-503 of 2 May 1984 enforcing that law; (iv) Law No. 71-12 of 25 September 1971 establishing the rules for historical monuments and for excavations and discoveries, and Decree No. 73-746 of 8 August 1973 enforcing Law No. 71-12 determining the site preservation policy; (v) standards for water discharge, primarily Standard NS 05061 (Wastewater: discharge standards dating from July 2001) which specifies discharge limit values for wastewaters and leaching water at the final discharge point in drains or in the environment, and Standard NS 05-062 on atmospheric emissions. The details of the standards applicable to the project are given in the appendix.

International conventions: Senegal is a signatory to most international and regional conventions on environmental protection, the most important of which are: (i) the CITES Convention of 1973; the UN Convention on Biological Diversity (CBD); (iii) the United Nations Framework Convention on Climate Change (UNFCCC); (iv) the Rotterdam Convention on PICs and the Stockholm Convention on POPs (v) (vi) the African Convention on the Conservation of Nature and Natural Resources of Maputo in 2003 to ensure sustainable development of African economies.

Institutional framework for environmental and social management

At the national level, environmental management falls under the Ministry of the Environment and Sustainable Development (MEDD), the mission of which is to ensure the development and implementation of the environmental policy. In the project, the MEDD services involved are mainly:

(i) **The Directorate of Environment and Protected Areas (DEEC).** In the conduct and monitoring of ESIA procedures, the MEDD relies on the Directorate of Environment and Protected Areas (DEEC) and the Technical Committee set up by Ministerial Decree No 009469 of 28 November 2001, that support the MEDD in validating impact assessment reports;

(ii) **The Directorate of Waters and Forestry, Hunting and Soil Conservation (DEFCCS):** Its fundamental mission is to ensure the conservation of the forestry potential and ecological balance, to ensure people’s needs satisfaction in timber and non-timber products.

(iii) **The National Parks Directorate (DPN),** the mission of which is: To identify, create, protect and manage protected areas.

The environmental and social management of the CASL project will involve the following actors at regional and local level: the CASL Project Management providing the project coordination; the services of the Ministry of Agriculture and Rural Equipment (MAER); the Regional Development Agency (ARD); the Directorate of Environment and Protected Areas (DEEC) and the Regional Division of Environment and Protected Areas (DREEC) of St. Louis; the Regional Inspectorate for Water and Forests (IREF) of St. Louis; the Directions of Parks in the region of St. Louis; the Regional Environmental Monitoring Committee (CRSE) of the St. Louis region; the Local Governments involved (Municipality of Diama Municipality of Rose-
Béthio in the department of Dagana, St. Louis Region); the regional and local technical services involved; local organizations and associations, NGOs and all other services and projects involved in rural development issues or social and environmental impact.

2.2. For the AFDB

- The Integrated Safeguards System (ISS) and the requirements of the following safeguards: (i) **operational safeguard 1** - Environmental and Social Assessment; (ii) **Operational Safeguard 2** - Involuntary Resettlement: Land Acquisition, population relocation and compensation; (iii) **Operational Safeguard 3** - biodiversity, renewable resources and ecosystem services; (iv) **Operational Safeguard 4** - Prevention and control of pollution, hazardous materials and efficient use of resources; (v) **Operational Safeguard 5** – Working conditions, health and safety.

- Consolidated Engagement Framework with civil society organizations;
- The Integrated Water Resources Policy;
- The policy on agriculture and rural development;
- Information Dissemination and Accessibility Policy;
- The Gender Policy;
- The Policy on Poverty Reduction;
- The AFDB climate risk management and adaptation strategy.

3. PROJECT DESCRIPTION AND BACKGROUND

**Project Description**

The Rice Project of the Compagnie Agricole de Saint-Louis (CASL), Senegal aims to promote food security in Senegal by producing locally white rice for the local market. It will have the following components: (i) development of four thousand (4,000) net hectares of irrigated rice farming in the Senegal River Delta to produce 56,000 tons of paddy rice; (ii) contracts with farmers for the production of a minimum of 9,000 tons per year of paddy rice; (iii) Storage capacity of 30,000 tons of paddy rice; (iv) production and marketing of 45,000 tons of white rice (plain and flavoured rice) per annum in the local market.

In terms of infrastructure, two separate sites will be developed in the Municipality of Diama:

- Community amenities with total water control channels including a network calibrated to 3,500 ha, a network of drains collectors and electric pumping station of drainage water covering a basin of 4,250 ha, power lines and tracks

- An irrigated area of 2,024.5 hectares for rice farming operated under local authorities control, comprising plots, irrigation canals and drainage network, tracks and farm buildings (farmhouse)

- An agro-industrial site with a dryer, paddy rice storage silos and two milling lines with a capacity of 8 t/h.

Concerning collective amenities and the irrigated scheme, the first phase of investment in the 2013/2015 period includes a water intake from the Gorom downstream area with a flow rate of 7.5 cubic meter/s, the expansion and extension of the Goana channel over 6.5 km, the development of an irrigated area over 1,000 ha net and the construction of a shed of 1,000 cubic meters and an administrative building. The second phase of investment planned over the
2016/2017 period shall extend the surface area of the irrigated perimeter to 1,750 net hectares and includes the construction of a second 1,000 cubic meters hangar.

Concerning the agro-industrial site, the first phase of investment in the 2015/2016 period includes a dryer with a capacity of 25 t/h, storage silos with a capacity of 10,000 t of paddy rice, a machining unit of 8 t/h of paddy rice, and white rice warehouse of 500 t. The second phase of investment planned over the 2016/2017 period includes a second dryer of 25 t/h, an additional storage capacity of 20,000 t of paddy rice, and a doubling of the processing and storage capacity for white rice.

For more details on development and operation strategies, technical itinerary and the site of implantation, see section on the analysis of alternatives.

**Resources needed**

**Irrigation water**: The irrigation network of CASL covers 3,000 ha net (CASL 1750 ha + area to be potentially developed by local residents 1250 ha). The annual consumption is assessed in “high case” to 33,000 cubic meter/ha/year (2 harvests) on CASL’s rice farming perimeter (lower than the estimated average consumption by about 13%) and 30,000 cubic meter / ha / year for residents (1.5 harvests per year). The samples are evaluated at 58 million cubic meter / year for CASL and 37.5 million cubic meter / year for local residents. The maximum flow rates will be 7.5 cubic meters/s. However, because of the presence of a salt water table and also more or less salty soil, it is necessary to perform drainages during cultivation, the volumes of which are measured at 2000 cubic meters /ha/year. From these data, CASL estimates the need for water to 15,000 cubic meters / ha in winter and 18,000 cubic meters/ha during the warm off-season, which corresponds to the “lower side” of consumption announced by SAED and 13% lower than the average consumption estimated by SAED.

**Quantity of fertilizer/pesticides**: The annual consumption of inputs are assessed for fertilizer at 1,050 t of urea and 350 t of DAP and for herbicides at 14 t of pesticides on the irrigated perimeter of CASL. The annual consumption of inputs by residents are also evaluated at 560 t of urea, 190 t of DAP and 7.5 t of herbicides.

**Amount of energy**: In the construction phase, diesel consumption, mainly for the implementation of irrigation schemes is estimated at 1,820 cubic meters. At the operations phase, the annual consumption of diesel, mainly for farming operations, is estimated at 250 cubic meters. Concerning the agro-industrial site, the annual consumption is estimated at 250 cubic meters of diesel, primarily for transporting paddy and white rice, 480 tons of butane gas for drying of paddy rice and 4350 MW of electricity for handling and processing of rice.

The total project cost is about 46 million Euros, including 55% for irrigation schemes on 4,000 ha and installation of industrial equipment for rice milling for the investment. The project will be co-financed by the Bank, the European Investment Bank (EIB) and the West African Development Bank (BOAD).

4. DESCRIPTION OF THE PROJECT ENVIRONMENT

4.1. Location of the site and project areas of influence

Administratively, the project occurs in the Municipality of Diama. Both sites belong to the district of Ndiaye, in the department of Dagana in the region of Saint-Louis. The first farm site in Djeuss Nord is located near the villages of Polo 2, Rone and Diadiam 3 and Abou Assane’s
hamlet. The land is in the River Senegal Delta, in an agro-pastoral zone with agricultural priority. The project’s area of influence is divided into:

- **Restricted zone**: This is the area within which the project is technically feasible: Site1 in Djeuss (2,024.5 ha) and Site 2 in Ross-Béthio (6 ha). It is defined in terms of potential impact sources related to the project construction phase;

- **Extended area**: This area is defined as the receiving area of distant and induced effects where impacts can be observed during the construction and operations. This zone takes into account both the whole area disturbed during the implementation of the engineering work and during operations, and the water intake (Gorom);

- **Area considered for the analysis of cumulative impacts**: This area includes the extended area described above, but also the discharge area of the drainage channel that connects downstream the mouth of the Senegal River, also including the area of intervention of other local projects and programs as PDIDAS, PDMAS, MCA, etc.

### 4.2. Climate

The project area, which is located in the region of Saint-Louis, particularly in the town of Diama, lies entirely in the Sahelian zone. The climate is a coastal, Sahelian one, strongly influenced by the harmattan (hot dry wind from the North) and by the alternation of two (2) distinct seasons: (i) a rainy season (July/August to October) and (ii) a dry season over nine months (November to June/July). The area is characterized by low rainfalls generally on average between 100 and 500 mm. The annual average wind speed is 4.5 m/s.

### 4.3. Soils

A zoning of the different soil types identified in the Delta is as follows: (i) **hydromorphic-type soils** with little humus (falos); (ii) **transition soils** between based soils and hollaldés called “false Hollaldés”. These are former mucky banks made of vertisols and containing 30 to 50% of clay. Some soils are structureless but favourable for rice and other crops; (iii) **heavy soils** formed by the accumulation of fluvial deposits from the settling of flood waters, better known by the local name “Hollaldés”, and containing 50-75% of clay; their structure supports flooding and are favourable for rice farming; (iv) poorly developed soils of sandy clay content (11-30% clay) better known under the name of “based” soil. They represent 33% of the irrigation potential and are favourable to all other crops. Soil erosion is a major issue of concern at the project area. In the dry season, northern winds are the most significant erosion factor, which leads to a decline in soil fertility.

### 4.4. Water resources

Overall, hydrogeological resources in the Senegal River basin are as follows: (i) the deep aquifer known as the Maastrichtian aquifer, and (ii) the surface alluvial aquifer, the facies of which is formed mainly by Nouakchottian sands. The hydrogeological characteristics of the hydrogeological facies of the basin at the Delta limit the recharge of the alluvial aquifer. Indeed, the top layer or roof layer is semi-permeable. In other words, it is made of clay or silt. The hydrology of the Senegal River Valley is described as heavily dependent on rainfall at the upper basin, of the significance of the flood wave, the soil conditions, but also the management of major hydraulic ways. It is the only water supply source for the population for domestic and agricultural uses in the Delta. The functions of the water ways in the Municipality of Diama are essentially for irrigation, drinking water supply and drainage.
State and quality of surface water: As part of this study, qualitative analyzes were conducted in the project area (Table 1) to assess the condition of surface and underground water resources. This will serve as a baseline for later assessment of changes in the water quality, especially in connection with the project activities.

Table 1: Sampling sites

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Location</th>
<th>Sampling Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Krankaye Channel</td>
<td>1.9 km from the Eastern boundary of the plot.</td>
<td>Abou Assane village water collection point</td>
</tr>
<tr>
<td>2</td>
<td>Delta Drainage Outfall</td>
<td>4.7 km downstream of the outfall</td>
<td>Drainage water discharge</td>
</tr>
<tr>
<td>3</td>
<td>Yves Capitaine Channel</td>
<td>2.3 km from the South-western limit of the plot</td>
<td>Maraye aquaculture farm</td>
</tr>
<tr>
<td>4</td>
<td>Gorom downstream</td>
<td>Channel water intake</td>
<td>Irrigation water source</td>
</tr>
<tr>
<td>5</td>
<td>Polo section channel</td>
<td>100 m from the site quarters</td>
<td>Groundwater</td>
</tr>
</tbody>
</table>

Note:
N°2: downstream end of existing drainage outfall
N°3: East end of the section supplying the Maraye fish farm ponds
N°5: Sample collected before the commissioning of the channel (height of the water layer = 50 cm)

The national standard NS 05-061 provides for the limits for wastewater discharge values established between 5.5 and 9.5 pH and below 50 mg/l for total suspended solids (TSS), 40 mg/l for Biological Oxygen Demand (BOD 5), 100 mg/l for Chemical Oxygen Demand (COD), 30 mg/l for total nitrogen and 10 mg/l for total phosphorus. Against this baseline, analyzes carried out in January 2014 complied with the limit values in 5 samples for pH (6.99 to 7.93) and in 4 samples for phosphorus (0.9 to 3.6 mg/l). The sample collected at the Yves Capitaine channel near the aquaculture farm (stopped for rehabilitation) exceeds the limit (13.7 mg/l), without the cause of the pollution being identified.

Regarding the TSS, BOD5, COD and nitrogen, since the laboratory analysis procedure of the Senegalaize des Eaux does not comply with the standard, new results of analyzes carried out by a private laboratory recommended by the DEEC will be communicated early August 2015 and will serve as a new baseline.

4.5. Biological Environment

4.5.1. Flora and vegetation

The shrub layer is represented by Tamarix senegalensis, Acacia tortilis, Acacia raddiana, Balanites aegyptiaca at the project site and its surroundings. As regards the herbaceous stratum adapted species such as: Sesvium portulacastrum, Sueda frusticosa, Artrocnemium glaucum, Philoserus vermicularis, Cressa cretica are found. However, in flooded and swampy areas, there are Thyphea australis, Sporobolis sp, Phragmites sp, Nymphaea lotus, Typha domengensis, Jussiea repens, Oryza bartii, Eragostis sp.

4.5.2. Problem with invasive species

Experts relate this problem to the construction of the dam (Diama) on the one hand, and to irrigation schemes on the other. The issue is about the infestation of fresh water by aquatic plants, mainly Typha and Salvinia molesta, classified among the major environmental impacts of the delta (at least 121,000 hectares of water areas invaded). The project site and its surroundings do not contain any of these species. For species fully protected by the Forestry Code, none is found there. Similarly, no species listed in Annexes I and II of the CITES are identified on the project site and surrounding area.
4.5.3. Wildlife

Wildlife resources at the project area like the rest of the Delta derive from the presence of the Sanctuary. The various animals belong to various systematic groups: reptilian fauna, mammalian fauna, avian fauna, fish fauna, etc. Many species of palaeartic migratory birds (especially the Anatidae, Ardeidae and shorebirds such as doves, pigeons, quails and sandgrouse, ducks (pintail and white-backed shovelers), snipe, and Egyptian geese...) are coming to nest there, like birds such as the White Pelican, cormorants, the Night Heron, the white-faced whistling duck, fulvous whistling duck, Glossy Ibis, pink Flamingo and Lesser Flamingo. The impressive number of birds (1.5 million) in the Djoudj sanctuary raises the issue of invasion by seed-eating birds. Among the species of seed-eating bird invaders encountered in the Sanctuary, the *Quelea Quelea* is the dominant one. The impact of the *Quelea Quelea* on crops can reach 40% of the yields.

The Wildlife (mammal and reptile) is quite rare due to the destruction of the natural environment and hunting. However warthogs and jackals, which benefit from a socio-religious protection, are found in high numbers. There is also a strong colony of monkeys that are major predators. Some aquatic plants (*Typha australis*) are nesting areas for birds. They provide shelters for some animal species such as monitor lizards and boa. Fairly interesting numbers of crocodile populations are also noted in the Djoudj sanctuary (and 2 Manatee according to the Director of the Park).

The fish resources are still significant, but they are depleted due to overexploitation. It seems that since the commissioning of the dams, species like the threadfish reappeared.

4.5.4. Protected areas and hunting area of interest (ZIC)

The Djoudj National Bird Sanctuary (PNOD)

The PNOD, created in 1971, covers an area of 16,000 hectares. Since its inception, the PNOD has generated interest in the conservation of biodiversity, which earned it to be listed as a site of the Ramsar Convention in 1977 and in 1981 as a World Heritage site. Each year, about 3 million birds are passing through the Park where nearly 400 species were counted. The Djoudj National Park – World Heritage of UNESCO - is full of whole colonies of pelicans and flamingos. Other bird species found there are the purple heron, egret, the jacana, spatula, cormorant, the marabou. Between November and May, migratory birds avoiding the European cold, including wading birds and several species of ducks are coming to nest there. There are also mammals and reptiles, including jackals, monkeys, hyenas and gazelles. The main biotopes are composed of fresh or brackish water wetlands and Sahel savannah. Regarding mammals, the most representative are the serval, the African wildcat, the Civet, the Mongoose, Warthogs and Jackals, the population of which increased sharply, posing a real threat to some avifauna species. Some manatees are also reported (2 according to the Director of Sanctuary Park, visual observation that has not been confirmed by a scientific study report); the dominant primates are pata monkeys.

Leased area Northern and Southern of Djeuss

An area of hunting interest (ZIC) represents part of the area where game and hunting are of major economic interest, and where wildlife is likely to increase to a level as high as possible in view of its scientific study or its rational exploitation for tourism and hunting purposes sensitive without substantial inconvenience to other sectors. Within the general framework, the ZIC are areas established at the limit of the parks, and are therefore playing an indispensable role, regulating wildlife surplus, and providers of game.
On behalf of this project, the surrounding environment or limits of the PNOD, the ZIC areas or leased areas are identified. These are Northern Djeuss (20,000 ha), Southern Djeuss and Djeuss Surplus (20,000 ha) North and South (16,500 ha). In these areas, only unprotected or partially protected species are hunted, according to an annual list decided by the Ministry of Water and Forests upon advice by the Higher Council for hunting and wildlife protection.

4.6. Human Environment

4.6.1. Demographic and administrative situation: The Municipality of Diama is located in the District of Ndiaye, in the Department of Dagana, in the Administrative Region of St. Louis. It has 67 official villages and several hamlets. The scattered settlements that characteristic of the Municipality are reflecting the desire of space occupation by people close to their areas of activities, mainly livestock breeding and farming. The Municipality of Diama has a population of 46,416 inhabitants, including 51% of women. Furthermore, there is a majority of young people with 56% under 20, and 22% in the 20-35 age group. The settlement consists mainly of Pulaar and Wolof.

4.6.2. Education: The municipality of Diama has several schools covering the level of early childhood, preschool, intermediate and secondary education. Literacy and Koranic education are widespread with four literacy centres and 25 Arabic teaching schools identified.

4.6.3. Health: The town of Diama has 04 health posts (Diama, Ross-Bethio, Savoigne and Djoudj) and 26 health centres which depend on the Health District of Richard Toll, located in the department of Dagana. The most commonly encountered diseases in the region are Acute Respiratory Infections (ARI), injuries (wounds), diarrhea, High Blood Pressure (HBP), haematuria, Helminthiasis and flu. Diseases controlled by large state-funded and partners programs include among others: HIV/AIDS, malaria, schistosomiasis and tuberculosis. For malaria, morbidity declined from 30.8% to 0.52% and malaria-related mortality has followed the same trend. Waterborne diseases may also expand due to the establishment of the Project, which in its implementation and in the operational phase may entail potential development risks of waterborne diseases throughout the area of influence.

4.6.4. Water and sanitation: In the Municipality of Diama, drinking water remains a major concern for the population. The access rate to safe water within a radius of one (1) km from a borehole, a water purification station or fountain, was 49% (Source: PLD 2010-2015). The lack of drinking water supply pushes people to fetch water directly from watercourses (River, backwater, channel) with all the health consequences. The use of groundwater is relatively low due to the salinity of the water table. In terms of sanitation, there is no organized garbage management solution (wild dumping and, eventually, burning as a final treatment, despite the presence of the Gandon municipality landfill). In addition, there is the threat of faecal peril (25% of households do not have latrines and defecate in the open air).

4.6.5. Economic activities: Irrigated agriculture is practiced in the Walo area where the huge availability of water provides for the development of an irrigable area of around 45,000 ha. Livestock is a key activity in the area. It is practiced by all ethnic groups present in the area and everywhere across the municipality. All forms of animal rearing are practiced in the area, namely, small ruminants, cattle breeding, poultry farming.
4.6.6. Gender and vulnerability: Women represent 51% of the total population of the Municipality of Diama. In the agricultural sector, women are present in the production of rice, tomato and onion, vegetable growing and rice selling. The production of Bissap (hibiscus) is basically done by women. In the field of livestock, women are more active in selling milk and in dairy processing. In the fisheries sector, women are active in the processing of fishery products. Women are much involved in marketing of rice (paddy and white rice), onion and tomatoes in this area. The report on the economic and social situation in 2011 in the region of St. Louis estimated the percentage of households living below the poverty line at 23.10% in the department of Dagana. The vulnerability affects mainly children under five (20% of the population), the elderly people over 60 years (6%), people with disabilities (1.8%), orphans and poor widows without family support.

5. PROJECT ALTERNATIVES

The variants were analyzed below according to (i) the situation “without project”; (ii) the project development and management strategies; (iii) possible technical itineraries; (iv) the CSAL project interventions in the areas of Diama; (v) the choice for the establishment of the agro-industrial plant.

5.1. Option 1: Situation “without project”

Positive effects of the situation “without project” From a purely biophysical perspective, the option “without project”, which consists in carrying out no project activities will have no major adverse impact on the biophysical environment and the human environment: no degradation of natural resources, wildlife habitats, wetlands; no disturbance of pastoral activities; no nuisance and disturbance of the living environment by engineering work; no outbreaks of water-related diseases, etc.

Negative effects of the situation “without project”: the situation “without project” would mean: no development of rice farming potential in the project area; continued dependency on rice import policies and currency losses; no investment in the rice agribusiness sector that can boost local development dynamics in the area. Such a “do nothing” position would be an obstacle to the engagement and objectives of the agricultural policy of the country, especially towards fighting food insecurity and rural poverty. The situation “without project” will also result in the continuation of abandonment and non-recovery of the salty land in the area.

5.2. Option 2: possible strategies in intervention sites

During its establishment in the Senegal River valley, the company considered several strategies as shown in Table 2 below.

Table 2: Options in the project design

<table>
<thead>
<tr>
<th></th>
<th>Facilities operated by rice farmers</th>
<th>Facilities operated under control of local authorities with participation of population in the capital</th>
<th>Facilities operated under control of local authorities with compensation of rights holders and production contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Acceptability</td>
<td>+</td>
<td>-</td>
<td>=</td>
</tr>
<tr>
<td>Financial profitability</td>
<td>-</td>
<td>+</td>
<td>= / +</td>
</tr>
<tr>
<td>Financial risk control</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

(+): high; (-): low; (=): moderate
Possible technical routes: Irrigated rice can be produced using different technical itineraries, of which the most common are: (i) By flooding with the transplanting method commonly used on small family farms in Asia; (ii) Back flooding through by direct seeding by broadcasting in the presence of a water runoff curve number method commonly practiced on large farms in Western countries; (iii) By flooding, intermittently during the vegetative phase with transplanting or direct seeding with seeders using the technique called Rice Intensification System (SRI); (iv) By sprinkling on pivots, as is sometimes practiced in Brazil and the USA.

Choice of agro-industrial plant of implantation sites

**Site 1: Medina Gandiaye** This site is located in the Municipality of Diama, 600 m from the main road and 200 meters from the village of Gandiaye Peul. The main constraint for this site is about whether or not it is part the protected forest of Thilène. Therefore, due to concerns of compliance with forestry regulations, but especially for the preservation of natural resources, this site has not been selected.

**Site 2: Raynabé 1 Ouest:** This site is located in the town of Ross-Béthio, 480 m from the village of Raïnabé 1, 250 meters from a single residence and 520 m from a high school project site. The main constraint for this site is its closeness to existing homes and a housing site of the Town Hall for residential use.

**Site 3: Raynabé 1 Est (also called Gouye-gui)** This site is located in the Municipality of Diama, about 7 km from the town called Gouye Gui, near the drains of SAED. It is located in the border area of the Municipality of Diama and that of Ross-Béthio. This site was chosen because it entailed no social, property or environmental constraint.

**Table 3: Summary of the major choices made technically**

<table>
<thead>
<tr>
<th>Option chosen</th>
<th>Reason for the choice</th>
</tr>
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<tbody>
<tr>
<td><strong>Project development and operation strategies</strong></td>
<td></td>
</tr>
<tr>
<td>Exploit in a temporary basis the land allocated to company by compensating the rights holders (financial or in-kind by developing irrigated areas) and participating in the development of family farming by awarding, among others, production contracts.</td>
<td>It represents a compromise between the Project requirements, relating to financial risk control, and the requirements of populations, seeking compensation enabling them to develop their economic activities (rice farming and others)</td>
</tr>
<tr>
<td><strong>Technical itinerary</strong></td>
<td></td>
</tr>
<tr>
<td>Flood irrigation with direct seeding by in a layer of water.</td>
<td>This technique was chosen because it is adapted to:</td>
</tr>
<tr>
<td></td>
<td>- the type of soil</td>
</tr>
<tr>
<td></td>
<td>- the climate</td>
</tr>
<tr>
<td></td>
<td>- large farms</td>
</tr>
<tr>
<td><strong>Agro-industrial plant establishment site</strong></td>
<td></td>
</tr>
<tr>
<td>Raynabé 1 (also called Gouye-gui)</td>
<td>This site is chosen because it entails no social, land or environmental constraint</td>
</tr>
</tbody>
</table>

6. POTENTIAL IMPACTS

6.1. Impact analysis

The receiving environment of the project is facing major challenges, which can be summarized as follows:

- In environmental terms: (i) preservation of water and land resources; (ii) Preservation of plants and wildlife; (iii) The issue of the invasion by seed-eating birds and aquatic plants;
• On socio-economic terms (i) Development of waterborne diseases; (ii) Protecting the health and safety of people and workers in the project area; (iii) Land disputes related to the withdrawal of the land; (iv) Preservation of pastoral activities in the project area; (v) Strengthening Agricultural organizational dynamics in the project area; (vi) involvement of women in agricultural activities of the program.

For the identification of the Project’s impacts on the environment, the two (2) following periods were distinguished: (i) the engineering work phase and (ii) the operations phase.

During the construction phase, the following actions will have impacts on the environment: (i) establishment of the construction site and living quarters (cleaning and excavation of the area of influence, etc.); (ii) the release of site for works; (iii) the presence of gear (motor graders, compactors, trucks, cement mixers, etc.); (iv) the earthworks, stripping, excavation and compaction; (v) masonry work; and provisional and quarry sites; (vi) the presence of labour.

During the operations phase, the risks will stem from: (i) agricultural machinery (risk of accidents, etc.); (ii) phytosanitary activities (pesticide and fertilizer use); (iii) permanent presence of water (breeding sites; aquatic plants); (iv) the activities of the agro-industrial unit (ensiling, dust, accidents, etc.).

6.2. Potential Positive Impacts

At the environmental level, the project will result in: better water and land management and improved management of irrigation potential in the project area; good water control with suitable and adequate facilities (complying with standards and the charter of irrigated areas) and with irrigation and drainage systems; preservation of natural areas and wetlands currently uncontrolled and under strong threats. The technical guidance on irrigation methods and rational distribution of water to the plot will help farmers better manage land and water resources by limiting overexploitation and wastage. The introduction of modern storage techniques and machining will result into increasing agricultural production capacity. The development of new facilities with total mastery of water will result in the decrease in the degradation of irrigated land, water and land conservation, thus contributing to the increase in agricultural land, and thus the productivity of the area.

Positive impacts on food security and nutrition: The project will contribute to reducing food insecurity (24.8% in the department of Dagana and 12.8% in that of St. Louis) and malnutrition (11.1% in the department of Dagana and 8.1% in that of St. Louis), first locally, then nationally. Indeed, the project will increase agricultural productivity and therefore households’ cereal stocks. It will contribute to poverty reduction, dietary diversification and strengthening the resilience of households and local communities that will also be supported by CASL (technical support to farmers; training and/or information from the producer; etc.).

Positive impacts on land management: Before the project, the land of the lower delta were not cultivated due to lack of proper planning to harness water resources from the river and downstream Gorom; so these soils with high salinity were neither developed nor cultivated; the possible catchment areas were very remote from farming areas (7-8 km). The mobilization of water resources from the Gorom downstream catchment area to production areas will contribute to enhancing all of the contiguous land or downstream of the CASL amenities.

Positive impacts on jobs: The Project will enable the creation of 120 direct, permanent, full-time equivalent jobs, and 50 temporary, direct jobs over 18 months for the construction of infrastructure. Subcontracting also represents 36 permanent and 66 temporary jobs over 18
months. In addition, the Project will hire primarily unskilled labour from the local municipalities (after training them if necessary) and create an endowment fund, to be later transformed into a Foundation, annually replenished by the company, with the following missions (i) support for training natives of the municipalities in the following areas: maintenance and repair of agricultural equipment, tractor drivers, plant and animal production (ii) support for the creation of businesses: young farmers, transport, maintenance, and construction companies; (iii) support to municipalities for the implementation of social projects in the areas of access to drinking water, health and education, in consultation with municipalities.

6.3. Adverse Impacts

6.3.1. Negative Impacts at engineering work preparation and implementation phase

The major impacts assessed for this phase relate to the irrigation schemes, farmhouses, factory and related facilities:

- **Impact on vegetation following the clearings on the site of Djeuss**: Clearing for the needs of 2,024.5 ha of agricultural development will contribute to the reduction of forest and biological resources (prior clearing; disruption of habitats and sensitive ecosystems may cause a decline in biodiversity; etc.). In a sample of 625 square meters (one square of 25 m on each side), the services of IREF in St. Louis have counted 21 trees with a diameter less than 5cm. The afforestation rate corresponding to the area to be cleared is 2% of the 2,024.5 ha plot, meaning 40.5 ha. The total number of trees is estimated at 336 trees per hectare, representing 13,600 trees for 40.5 ha of woodland. The volume of firewood found in the sample is 0.01 cubic meter, representing 16 cubic meters per hectare; Thus the overall volume of firewood on 40.5 ha is estimated at 650 cubic meters;

- **Impact on Water Resources**: Regarding surface waters, the potential impacts are about the development works and connection of the feed at the downstream Gorom intake. Indeed, one might fear the erosion of the banks, increased turbidity, silting of rivers with the gear, the infiltration of liquid waste into groundwater, accidental pollution related to oil leaks, fats or hydraulic fluids from vehicles. The work will have no impact on the environmental flows of the River Gorom for at least two reasons: (i) the regulation of the river is provided at the Manantali dam; (ii) samples taken by CASL are subject to authorization by the sub-regional River Senegal Valley Authority. These measures will enable the river to be in good conditions to ensure the upkeep functions of aquatic ecosystems, and for domestic and agricultural needs;

- **Social risks with reduced pasture and movements of livestock to the areas**: The project area had become the winter and dry season fallback zone for livestock. The development work of the agricultural areas (Channels, irrigation canals, drains) could also result in the reduction or even loss of pastures, and this can cause conflicts between herders and farmers. The work could also restrict access to water resources (River Senegal and downstream Gorom River);

- **Impact on soil during engineering works (perimeters, factory and farmhouse)**: The construction of irrigation networks (Channels; primary channels; facilities; etc.), drainage network and communication channels (30 km laterite tracks), overhead power lines implanted on a 7.2 km long and the buildings of the farmhouses can have negative effects in terms of destructuring of soil (especially in case of uncontrolled movements...
of machinery) and polluting neighbouring sites if the clearing and stripping residues are discharged haphazardly;

- **Risks related to manual or mechanical handling:** During the construction phase, there will be risks of accidents related to machinery/construction tools and the presence of construction materials poorly protected or misused. Fall risk exists for all persons authorized and unauthorized on site at the narrow and congested traffic areas. There are also risks linked to road traffic accident for the delivery of construction materials (movement of vehicles: collision, skid, bumping, overturning during operations; etc.);

- **Risk related to faecal peril:** This is a risk associated with non-compliance with basic rules of personal and collective hygiene by workers that may cause faecal peril or the occurrence of diarrheal diseases.

### 6.3.2. Negative impacts during operation

**Adverse impacts from the operation of irrigation schemes**

- **Impact on aquatic fauna and the birds of the Djoudj Sanctuary:** The Djoudj Park and part of the buffer zone are outside the project site. However, irrigation and drainage canals could be used by aquatic fauna (crocodiles and manatees Djoudj Park), which would harm local biodiversity. To avoid such risks, the project will implement protection measures (fences) and a monitoring device. It should be noted that the accidental use of irrigation channels by aquatic fauna could lead to its “extinction” or destruction because they will end up in agricultural areas. That is why the use of physical barriers (wire fencing) could prevent this phenomenon. While the risk is clear for crocodiles and lizards that may be less the case for manatees that have little access to drainage channels. Besides, there may be fear of poaching by the site staff. Measures will also be taken with the bird bangers with the proximity of the Djoudj Park to avoid habituation of birds.

- **Impact of taking water from surface water and on the environmental flow of the Gorom:** water collection related to agricultural activities mainly involves surface water. Water consumption of the Northern Djuss farm is based on an estimate of 15,000 cubic meters/ha in winter and 18,000 cubic meter/ha in hot season for an annual consumption of about 60 million cubic meters for 2,024.5 ha. Though significant, the collection volumes are largely bearable by the potential of surface water, including the water volume of the hydraulic system of the Gorom. Besides, this impact represents 7% of the theoretical flow rate of the structure supplying the Gorom. Adding to the fact that the regulation of the river flow is provided by the Manantali dam, we can say that the impact on the environmental flow will be minor. However, the level of the risk may change to moderate risk (or even major) in case of declining rainfall and high temperatures due to climate change.

- **Impact of chemical fertilizers and drainage on the environment:** Fertilizers are causing pollution in the event of intensive farming. Excess nitrogen and phosphates can leach into groundwater or flow into surface waters. The presence of a high concentration of nitrate, phosphate, sodium chloride, etc. in drain waters may lead to the proliferation of algae and invasive weeds (water hyacinth, Salvinia molesta, etc.) along with a significant consumption of oxygen (eutrophication). These waters could significantly affect water and soil if released haphazardly. Importantly, the project
considers connecting and rejecting all drainage water in the delta drainage channel being finalized by the MCA project.

- **Impact of the development of aquatic plants and invasion by seed-eating birds**: The new facilities will establish favourable environmental conditions for the development of invasive plants in softened water bodies. The development of Typha will create conditions for an increase in the population of seed-eating birds (favourable habitats) that will impact adversely on rice production or increase production costs through the development of more intensive control measures; this bird control (chemical control, scaring cannons and kites) will surely disturb migratory birds of park in protected areas. The invasion of water bodies in protected areas and buffer zones (Djoudj Park) could affect the natural habitats of migratory birds, warthogs, and all biodiversity. The mobility and reproduction of those animals could be disrupted with the negative impacts on biodiversity, the preservation of which is a requirement for maintaining or developing tourism activities in the area.

- **Impact of pesticides on the quality of air, soil and water**: When operating the rice farmlands, the impact on the quality of air, soil and water would come from particles from the application of pesticides. The staff will be particularly exposed. Local populations, who are remote enough, will be less exposed.

- **Risks of waterborne diseases and STIs/HIV/AIDS**: With the farm, one might fear a development of water-related diseases (schistosomiasis, schistosomiasis, malaria, etc.).

- **Social risks with reduction of pastures and livestock movement towards the farms**: The project area had become the fallback area for livestock in winter and in dry season. The presence of agricultural areas could also result in the reduction or even loss of pastures, and this can cause conflicts between herders and farmers. An indirect impact on the environment could be the cattle moving through the development of new irrigation plots. The planned development of new irrigation areas should take livestock needs into account. In the health area, cattle could be exposed to the risk of waterborne diseases caused by agricultural activities (Chystosomonose and distomiasis).

**Adverse impacts of the farmhouse operation**

- **Risks related to pesticide storage**: Storage of pesticides involves risks, including for operational personnel.

- **Risks of accidents related to the farm house activities**: The operation consisting mainly of heavy machinery farm includes accident risk especially for staff.

**Negative impacts of the exploitation of the agro-industrial plant at Raïnabé 1**

- **Air pollution and soil by rice dust**: Machining and rice bagging operations will result in high production of dust that can damage the health of staff and residents if appropriate measures are not taken;

- **Nuisance from noise and waste from the factory**: The operation of machinery may disturb the operating staff and local residents (Raynabé 1 or Gouye-gui) in terms of noise pollution. Regarding the village, the impact will be relatively low because the site is located 620 m from the village.
7. MITIGATION MEASURES AND ADDITIONAL INITIATIVES

Two types of mitigation measures will be provided to reduce the potential impacts during the implementation of the different components and activities planned under this project: (i) legislative measures that the Promoter and their service providers must respect; (ii) specific mitigation measures for the reduction of suspected negative effects on the environmental and social components that are sensitive to project activities.

7.2. Standards-Related Measures

This is to ensure project compliance with applicable regulations, including:

- **Compliance with environmental regulations**: CASL will also ensure compliance with national and the AfDB environmental regulations both in the construction phase of the operation. The environmental compliance certificate was issued on November 11, 2014 by the DEEC.

- **Compliance with land regulations**: As the project required land acquisition, CASL conducted consensual compensation (in the form of overhead expenses) for individuals and legal entities that enjoyed plot allocation at the project site (agricultural area).
  
  *These elements are included in the Resettlement Action Plan (RAP) prepared in a separate document.*

- **Compliance with the land allocation protocol by CASL**: The implementation of the ESMP is subject to the Protocol entered between the Municipality of Diama and CASL, but also strict compliance with the local government code and the land law.

- **Compliance with forestry regulations**: The implementation of the activities considered under the project is subject to compliance with forestry regulations. The necessary permits have already been obtained from the Water and Forestry services. Tree felling taxes were also paid in advance and the clearing license was issued on October 24, 2013.

- **Obligations of compliance with the environmental and social specifications by companies**: CASL and contractors should also comply with the requirements of the environmental and social specifications, particularly regarding compliance with the following requirements: prevention of pollution and cleanliness of the site; noise prevention; the safety of people (near the construction site, on site and on transport routes of materials).

- **Compliance Measures vis-à-vis OMVS, the Water Charter and OLAG**: CASL transmitted on June 4, 2015 a water collection statement to the High Commissioner of OMVS (through the national authority in charge of hydraulics) that will decide in this regard. In addition, CASL filed a request on February 7, 2014 for OLAG approval. CASL is awaiting the approvals.

- **Establishment of Committees on Hygiene and Safety**: According to the labour legislation, CASL has a Committee on Hygiene and Safety at Work since February 4, 2015 (provided once the staff is more than 50 workers). The formation of the Committee is determined by Decree No. 2006-1261 of 15 November 2006 laying down the general measures of hygiene and safety in any kind of workplace.

Mitigation measures for the impacts of works (development, farm and factory)
• **Management of impact on quality of air:** All measures must be taken to protect the neighbourhood and staff against the impacts of atmospheric emissions arising during the preparatory phase (release of sites and earthmoving operation/levelling). Preventive measures against dust goes through the implementation of best practices such as: covering of trucks carrying construction materials to minimize the dispersion of fine particles and falling during transport; limiting truck speeds to 30 km/hour; etc.

• **Management of noise-related nuisance:** For neighbouring residents, the noise causes discomfort, which is sometimes severe. The project must comply with the noise limits allowed at the limits the projects area, and shall reduce pollution at source (preferably the noise level should not exceed 75 dB at the site level). Noise standards are particularly targeted at: construction equipment and machinery, motor vehicles, trailers and safety equipment (loaders, excavators, etc.). Nuisance prevention measures related to noise and vibration are as follows: avoiding night work; wearing personal protective equipment; equip engines with silencers as much as possible.

• **Management of impacts related to solid and liquid waste:** The generation of waste (garbage, debris/rubble, etc.) from construction and its effects in terms of pollution will be controlled through the application of the following basic measures, among others: the contractor shall set a common-place household waste collection system on the site from outset, and provide for their transport and storage on a site approved by local authorities and technical services (avoid burning on site); recycling certain types of waste could be made a priority, especially waste paper, wood and ferrous metals; waste must be neither abandoned nor discharged into the natural environment or burnt in the open air; when emptying the gear is performed on site, a collection device must be provided and used oil should be carried to an approved facility. A monitoring sheet should be established for the management of hazardous waste and related products.

• **Management of socio-economic impacts:** To mitigate potential negative reactions of local communities, CASL shall (i) develop an information/awareness campaign on the project issues and objectives; (ii) give priority to local people in the recruitment of labour; (iii) ensure wide dissemination of recruitment criteria. Regarding the loss of land, CASL shall conduct a comprehensive evaluation of those affected by the project and conduct fair and equitable compensation in accordance with the Resettlement Action Plan. The planned site for rice farming activities had already been assigned to 94 individuals and legal entities. In addition, CASL has proposed additional measures for social quid pro quos affecting the social needs of communities (Municipality of Diama and the Rone Village Section). Furthermore, it is also important to enforce the following measures for the safety and health of the local population but also the staff assigned on site: delimiting and restricting access to sites to local people; provide for the construction of adequate health infrastructure for the site staff (water, sanitation, changing rooms, first aid kit, etc.); sensitize residents to protect their personal property and their food against dust. It is recommended that priority be given to hiring local residents for (unskilled) labour. The choice of local suppliers is also preferred.

• **Occupational hazard management:** The company shall: have a staff register; have a staff medical monitoring record; have a workplace accident record; have a safety register; put at the disposal of workers PPEs; develop a security plan, before opening the site; set up a traffic plan within the site and ensure that traffic rules are defined; training of drivers and empower them to drive gear; ensure maintenance and regulatory and/or preventive inspections of gear, equipment and site facilities; build sufficient and consistent bathrooms; limit the construction noises, which could seriously annoy local
residents; maintaining a site diary. A security plan should be developed to deal with emergencies that may occur during construction. The plan should describe the organization, intervention methods, means and equipment to implement the fight against any major accident (fire, etc.) and to protect staff and residents, including alarm and alert measures.

7.2.1. Mitigation measures during the operating period of irrigation schemes

- **Development of a manual of rice farming and pesticide management good practices**: The project shall prepare procedures of good rice farming practices to accompany the implementation of activities (environmental-friendly farming techniques; storage and use of pesticides, used packaging and fertilizers, etc.).

- **Pesticide management measures**: technical annexes have been prepared on measures recommended for this purpose (measures of use; accident prevention and management measures; handling of products and appliances; user training; protection of staff and populations; etc.). A specific pesticide management plan will be prepared and implemented in September 2015.

- **Soil resource-related measures**: For the preservation of land resources at the project area, it is recommended to protection irrigation schemes, and in general, crops against wind and water erosion. Moreover, in order to mitigate the alkalizing soil phenomena, some measures must be enforced, such as the construction of drainage network to limit the accumulation of carbonates in the upper soil horizons; the levelling of plots to avoid water stagnation.

- **Seed-eating bird invasion control measures**: This will be focussed on natural ways to control grain-eaters, taking into account their ability to adapt to mechanical control measures, the concern for preserving the species in the ecosystem, the regional dimension of the problem, risks related to the use of bird killing chemicals; etc.

- **Controlling invasive aquatic plants**: the proposed mitigation measures are: (i) Strengthening weed cutting programs and cleaning of waterways invaded by Typha and other *Cyperus*; (ii) industrial valorisation of residues from the mechanical control of Typha for production of alternative fuels (briquettes, coal etc.); (iii) Preventive measures against other invasive plants such as water hyacinth. This will involve developing a program for mechanical maintenance of canals and water bodies fighting against aquatic invasive plants. The project could also consider and support the valorisation of those residues (coal briquettes; etc.).

- **Protection and integrated water resource management measures**: Those measures involve: searching for optimal efficiency and rational management of water resources through complying with irrigation standards recommended by the Charter on the irrigated areas; intensification of information, training and awareness; monitoring the quality of surface water and groundwater through piezometric measurements, periodic sampling and analysis of water (on site and in a laboratory) at selected stations. One of the basic steps to consider would be respecting the Charter of water for the Senegal River Basin OMVS.

- **Measures for compensation or mitigating the impact of farming activities on livestock**: it is important that the project supports the sector, including building water points for livestock, delineating rangeland, determining corridors of access to pastures
and water points, compensating for losses of grazing areas, and especially by facilitating access to livestock feed from rice straw. Furthermore, jointly with the Livestock Services, the project will develop a specific action plan to prevent social conflicts with farmers. Besides, for access to the areas after harvests, CASL has set up a committee with herders to identify different herds and implement compensatory measures (distribution of rice straw, production of ponds...).

- **Project support for health and education, and for drinking water supply**: This project will study the possibility of assisting people in the field of health, education and socio-economic development. The health support from the project will focus on: the intensive control of water-related diseases (malaria, bilharzia, diarrhea and other water-related diseases); information, training, awareness and other preventive measures against STDs/AIDS; equipment (ITNs) and strengthening health infrastructures.

- **Measures to prevent and fight against waterborne diseases and health-related vulnerability factors**: The implementation of agricultural facilities should go along with supporting measures for health and social aspects, to eliminate some vulnerability factors related to activities such as HIV/AIDS, malaria and other waterborne diseases. The project will support the health infrastructure and also the regional health authorities of the area in the prevention and management of those diseases (medicine supplies; treated nets; vector control; information and awareness of staff and populations; etc.). Preventive measures shall also focus on occupational hazards and accidents at construction sites of development works, insecurity and degradation of morals (prostitution, banditry, etc.). In addition, the project shall include pesticide management measures, in the context of future environmental and social impact assessments of subprojects to be implemented.

**Mitigation measures during the operating period (farm and agro-industrial plant)**

- **Development of a manual of good practices of rice storage and milling**: The project will prepare procedures of good practices of rice storage and milling to accompany the implementation of activities (quality, hygiene and Safety measures in the operation of the farm and rice processing plant; etc.).

- **Elimination of dust**: All stations or parts of installations likely to generate dust emissions must be provided with treatment measures for such emissions. To prevent fugitive emissions, all roads and vehicle parking areas must be paved (concrete, asphalt, etc.) and properly cleaned. In addition, surfaces should be grassed where possible. At the factory, CASL has already planned dust control equipment. However, it is recommended to install alarms on dust suppressants to warn in case of malfunction of the facilities provided for treatment.

- **Noise limitation**: Fixed workstations at checkpoints must be soundproof. If the permanent noise level remains above 85 dB (A), CASL must provide employees with hearing protection, which must be worn from 90 dB (A) to prevent hearing disorders. In these areas, the use of ear protection is mandatory even for brief interventions. CASL will also provide for protective measures against noise (sound insulating enclosure, etc.). To avoid disturbing local residents (nearest villages), the future plant must respect a minimum distance of 160 m from populated areas (recommended distance by the hazard survey). The noise level in residential areas in the vicinity should not exceed 50-60 dB (A) during the day and 35-45 dB (A) at night.
• **Implementation of an Environmental Management System (EMS):** this is about establishing high quality environmental management system within CASL, to be operational in June 2016, in order to better play their role in promoting sustainable development in the sectors of water and energy. CASL shall also develop an “agribusiness/environments” database.

Furthermore, a strategic environmental and social assessment (SESA) was performed for the investment needs on other potential sites. The SESA will facilitate consideration of environmental and social concerns of future project activities from planning to implementation and monitoring/evaluation.
8. RESIDUAL IMPACTS AND ENVIRONMENTAL RISK MANAGEMENT

In accordance with the “hazard analysis methodological guide” of Senegal, an analysis of project danger factors as a whole was made. Risk analysis aims, firstly, to identify situations that may be the cause of an accident, and secondly, to analyze safety barriers (preventive measures, means of protection and response) associated therewith. This is ultimately to examine (i) internally failures: risks related to the products, intrinsic failures linked to dysfunction of facilities, poor design or operation of the equipment; (ii) externally failures that result from equipment failure resulting in turn from external aggression (other outdoor activities, natural hazards). The table below shows the initial risks (IR) unacceptably high that will require a detailed study of major accident scenarios. The site must have immediate reduction measures by developing means of prevention and protection.

<table>
<thead>
<tr>
<th>Dangerous occurrences</th>
<th>Causes</th>
<th>Consequences</th>
<th>IR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SILOS AND STORAGE SHEDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The dust in storage facilities (warehouses, silos)</td>
<td>Cleaning Fault / maintenance failure</td>
<td>Fire in storage facilities</td>
<td>34</td>
</tr>
</tbody>
</table>
| Containment silos and airborne dust | • Electrical sparks/Lightning/Static Electricity  
Abnormally high temperature  
Explosive dust concentration, operating error | Explosion at silos | 34 |
| **DIESEL STORAGE TANK** |        |                                   |    |
| The presence of flammable vapours in the gas overhead, and sufficient energy to initiate the explosion (diesel tank) | • Electrical sparks /Lightning/Static Electricity  
• Work by hot spot | Explosion of fuel tank | 44 |
| Diesel presence in the bowl and temperature above the flash point or enough energy to initiate fire | Working by hot spots  
Lightening | Fire at the retention tank | 34 |
| Loss of containment in fuel storage tanks | • Overfilling of the containment tank of reservoirs  
• Corrosion/Maintenance Operations/projectile shock  
• Overpressure due to fire nearby |  
- Heavy fuel spreading  
- Pollution  
- Fire after ignition | 34 |
| Inflammation of a diesel ply following a spreading during unloading | – Presence of source of ignition | Fire | 34 |
| Electrical failures on installations | • Fault protection/insulation equipment  
• High winds/Lightning Internal failure of the generator or SENELEC  
• Bad connection/projectile shock  
• Presence of high voltage/Wet areas | • Short circuit  
• Fire  
• Loss of property  
• Electrocution (deaths) | 43 |
Prevention measures: In order to control those risks, preventive measures will be implemented at the site. These include (i) organizational measures, with the consideration of security on a daily basis and in emergencies formalized by the establishment of a safety management system; (ii) operational measures with the integration of safety at all levels of operations and the prevention of risks associated with operations; (iii) technical measures using equipment or instruments to limit any deviation that could lead to an accident (fire safety check valves, fire dampers, sensors of liquid and gaseous hydrocarbons, etc.) in accordance with the regulations in force. Note that: the staff involved should be trained in operating the equipment present on the sites and the management of emergencies; safety guidelines have been established for each operation at risk; ban smoking in some area of the site; the whole site must be protected against lightning and handling.

- Implementation of Internal Operations Plans (IOPs), hazard analysis and their implementation: Faced with exposure to fugitive dust, noise, material handling or rice storage processes, but also to the high frequency of accident (or lack of knowledge and skills), CASL will develop for the rice plant and the farm, an Internal Operation Plan (IOP) to be operational in February 2016 for the farmhouse and in June 2016 for the plant and conduct hazard assessment in accordance with the regulations on protected areas. this will involve putting in place health and safety plan (in rice mills) to identify, assess and control the risk to the health and safety of workers, and which sets in detail, how to respond and which specifies the rules for their protection. Moreover, the IOP should specify the fire control strategy (fire hydrant and land inventories) and protective equipment for staff. The bases of the security measures set out below and the terms of implementation of the internal security plan (staff training) are defined in the Interministerial Order No. 4862 of 14 July 1999 mandating the establishment of an IOP.

On site safety measures
Fire safety system: (i) fire detection system; (ii) Detectors: optical smoke sensor, thermovelocimetric detector; (iii) Equipment: alarm, instructions guide, etc. Trigger manual; (iv) Exit: instructions, point of rally.
Controls measures: (i) Fire extinguishers: types of devices depending on the nature of the risk; (ii) water spray extinguishers with additives (6 litters or 25 kg on wheels); (iii) CO2 extinguishers: 2 kg, 5 kg or 10 kg on wheels; (iv) Dry chemical ABC 9 kg; (v) fire-hose stations; (vii) All point of developed site should be reached by a fire-hose station jet; (viii) Minimum reserve for fire; (ix) Booster pumps on backup storage supplies; (ix) Means of communication available (cell phone, direct line, special line, GPS, etc).


10.1. Internal audit work already done by CASL

In its annual environmental and social report covering the period from July 2013 to May 2015, CASL described the actions undertaken in the design phase and engineering work phase and an update on the implementation of the Resettlement Action Plan. In the design phase, the technical service are using various measures such as the optimization of land movements (using the Covadis software) to limit the impact on the carbon footprint, including environmental and social clauses in subcontracts, communicating and informing residents and local authorities before starting work and obtaining authorizations (land clearing, quarrying authorization, building permits, ...).
In the construction phase, CASL uses various hygiene and security measures such as access to clean water on construction sites, compulsory wearing of PPEs adapted to each occupation, the implementation of a training program in hygiene and security, and developing traffic plans... They also established extinguishers on all sites and on high risk machines. Environmentally speaking, the company has built a filling station equipped with a collecting container, collecting household waste, which is transported to an approved landfill. Waste oils and other hazardous wastes (filters of engines, batteries ...) are currently stored in collecting containers pending the finalization of a protocol in August 2015 with a company authorized for the collection of waste. A consultation was undertaken with the villages affected and the Regional Inspectorate for Water and Forestry to define an operational protocol for reforestation. The first reforestation campaign will be launched in October 2015. On the social level, CASL connected the village Rainabé 1 to the drinking water network in the town of Ross-Béthio (standpost). In social terms, the first pond was cleaned and a second pond will be built by the month of August 2015.

The Action Resettlement Plan has been fully implemented, with 93 PAPs compensated in cash and 1 PAP that received irrigation facility for 60 hectares. The company also connected 8 operators or groups of neighboring farmers to water and drainage network, who are cultivating 92 hectares in winter 2014 (370 t of paddy rice produced) and 70 ha in the 2015 hot, dry season (harvest in progress). About 200 hectares are scheduled for the 2015 winter season, including 60 ha in the Rone Village Section. They also provided ad hoc support for the rehabilitation of canals or hydro-agricultural facility development to benefit local residents.

10.2 Internal Audit in the operation phase already completed by CASL
In the exploitation phase (370 ha in hot, dry season in 2015), in addition to health and safety measures outlined in the work phase, phytosanitary product packaging are stored in a locked enclosure, waiting to be disposed of by an approved company. In social terms, 52% of employees are recruited locally and the company gives straw to livestock farmers free of charge after each harvest (300 t of straw to 170 farmers in June 2015).

10.3. External audit by the DEEC (Ministry in charge of Environment)
DEEC conducted a monitoring visit to the project Environmental and Social Management Plan on June 18, 2015. CASL is awaiting the mission report to consider the potential recommendations.

10. MONITORING PROGRAM
Under the project, the “Environmental and Social” function will be provided at three levels: (i) by CRSE which is the regional organization responsible for the coordination and monitoring of ESIAs and external, close monitoring of ESIAs implementation, under the coordination of the DREEC of St. Louis; (ii) by the Environmental and Social Expert that CASL has already recruited to ensure internal, close monitoring respectively in the preparation phase and implementation of the engineering work; (iii) by independent consultants who will conduct the mid-term and final evaluation (for the construction work), and on annual basis in the operational phase of the agro-industrial unit and at the farm.

Evaluation: Independent Consultants will conduct the mid-term and final evaluation (for the construction work), and on an annual basis in the operational phase of the mills.

Reporting mechanism: To better monitor the implementation of the ESIA, the following reporting system is proposed: (i) periodic reports (quarterly, semi-annual or annual) following-up the implementation of the ESIA to be produced by the social and environment expert (ESE/CASL); (ii) Periodic reports monitoring the implementation of the ESIA to be produced by the regional environmental and social monitoring committee (SREC/DREEC) of St. Louis.

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Quarterly and annual reports on the implementation of the ESMP will be submitted to the AFDB.

**Environmental and social monitoring indicators**

Indicators are parameters used to provide quantitative or qualitative information on the environmental and social impacts and benefits of the project activities. The monitoring of all biophysical and socioeconomic parameters is essential. However, to avoid burdening the system and prevent it from becoming a constraint in the project cycle, it is suggested to monitor the following main elements:

**Table 5: Indicators and monitoring mechanism**

<table>
<thead>
<tr>
<th>Components</th>
<th>Parameters for monitoring</th>
<th>Indicators</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Surveill ance Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>• Limnometric level&lt;br&gt;• Dissolved Oxygen&lt;br&gt;• Temperature&lt;br&gt;• Ammonium&lt;br&gt;• PH&lt;br&gt;• Conductivity&lt;br&gt;• Turbidity&lt;br&gt;• Organic matter&lt;br&gt;• Thermo tolerant coliforms Escherichia Coli&lt;br&gt;• Chlorophyll A&lt;br&gt;• Cyanobacteria&lt;br&gt;• Pesticides (molecules used by CASL)&lt;br&gt;• Heavy metals (mercury, lead, cadmium)&lt;br&gt;• Conductivity&lt;br&gt;• Nitrate&lt;br&gt;• Total coliforms</td>
<td>• Oxygen quantity contained in a volume of water&lt;br&gt;• Water temperature at T time&lt;br&gt;• PH balance&lt;br&gt;• Suspended material quantity in a volume of water&lt;br&gt;• Quantity of organic suspended matter in a volume of water&lt;br&gt;• Coliform concentration in a volume of water&lt;br&gt;• Chlorophyll concentration in a volume&lt;br&gt;• Cyanobacteria concentration in a volume&lt;br&gt;• % of pesticide concentration in a litre of water&lt;br&gt;• Concentration of heavy metals in one litre of water&lt;br&gt;• Nitrate concentration per volume of water&lt;br&gt;• Concentration of Coliforms</td>
<td>2 times a year (end of rainy season and end of dry season)</td>
<td>EES/CASL&lt;br&gt;CRSE/DRECC</td>
<td>EES/CASL&lt;br&gt;CRSE/DRECC</td>
</tr>
<tr>
<td>Soils</td>
<td>• Evolution of degraded soils&lt;br&gt;• Evolution of land salinity</td>
<td>• Physical and/or chemical state of soil that prevents its valorisation&lt;br&gt;• Earth surface area affected</td>
<td>Annual</td>
<td>EES/CASL&lt;br&gt;CRSE/DRECC</td>
<td>EES/CASL&lt;br&gt;CRSE/DRECC</td>
</tr>
<tr>
<td>Vegetation and Wildlife</td>
<td>• Plant cover rate&lt;br&gt;• Evolution of bird and wildlife populations</td>
<td>• Evolution of vegetation cover per unit area and per species&lt;br&gt;• Annual variation of wildlife and bird population&lt;br&gt;• Quantity/species of landed ichtyofauna</td>
<td>Annual</td>
<td>EES/CASL&lt;br&gt;IREF&lt;br&gt;Parks</td>
<td>EES/CASL&lt;br&gt;CRSE/DRECC</td>
</tr>
<tr>
<td>Rice production system</td>
<td>• Volume of inputs consumed (pesticides, herbicides, fertilizers)&lt;br&gt;• Uptake rate of IPM methods&lt;br&gt;• Waste management (liquid, solid) from processing activities&lt;br&gt;• By-products recovery rate (rice straw and husks)&lt;br&gt;• Agricultural Soil Quality&lt;br&gt;• Presence of certain rice crops pests</td>
<td></td>
<td>Annual</td>
<td>EES/CASL&lt;br&gt;SRH&lt;br&gt;Health Districts&lt;br&gt;Local authorities</td>
<td>EES/CASL&lt;br&gt;SRH&lt;br&gt;Health Districts&lt;br&gt;Local authorities</td>
</tr>
<tr>
<td>Farm, plant and human settlements</td>
<td>• Number of providers meeting the hygiene and waste management measures&lt;br&gt;• Number of people infected by STIs/HIV/AIDS and waterborne diseases&lt;br&gt;• Number of workers properly wearing protective equipment&lt;br&gt;• Number of poisoning related to pesticide use&lt;br&gt;• Number of workers following the safety instructions in case of accident&lt;br&gt;• Number of accidents&lt;br&gt;• Number and type of complaints</td>
<td></td>
<td>Annual</td>
<td>EES/CASL&lt;br&gt;SRH&lt;br&gt;Health Districts&lt;br&gt;Local authorities</td>
<td>EES/CASL&lt;br&gt;SRH&lt;br&gt;Health Districts&lt;br&gt;Local authorities</td>
</tr>
</tbody>
</table>
### Air Quality

**Quantitative analysis**

- Concentration of dust/particles in the air
- Dust concentration (TPS and PM10) channelled from the central suction of dust and rice mill storage silos dust suction units
- Concentration of discharge at the burner of dryers in accordance with the emission standard of 600 mg NOx/Nm³ at 10% O2
- Performance level of gas dust removal equipment
- Amounts of Nitrogen Oxides (NOx) emitted by the dryers
- Amounts of sulphur dioxide (SO2) released
- Emission of carbon dioxide (CO2)
- Periodic inspection by an authorized agency and measurement of pollutants every 2 years (NOx, dust, VOCs).
- Theoretical amount
- Flow rate and Volume

### Sound level

**Quantitative analysis**

- Number of continuous dB
- Results of measurements at the plant and at the houses closest to the plant and quarry

### Hygiene and safety

**Monitoring compliance with requirements and recommendations**

- Number of workers complying with the wearing of protective equipment, etc.
- Number of fire and accidents with environmental impact and/or complaints by residents
- Visual inspection
- Reports of CASL’s HSE

### Health

**Health monitoring of staff exposed to dust and local residents**

- Number and type of broncho pulmonary diseases detected
- Health inspection
- X-ray

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### 11. PUBLIC CONSULTATION AND DISCLOSURE

As part of completing the ESIA, public consultations were conducted in the Municipality of Diama and the town of Ross Béthio. Consultations were held in the villages of Polo 1, Diamdiam III, Rone, Ndigue, the town of Diama, and the town of Ross-Béthio. These were close meetings with future partners, beneficiaries of the project to ensure their participation in the project action planning, and encourage the inclusion of their views in decision-making. The point was more precisely: to inform people about the project and its activities; to enable people to decide, to give their opinion on the project; to identify and gather the concerns of the populations, and their recommendations and suggestions for the project. These consultations began since 2013.

The ESIA report and the resettlement action plan validation session was held on March 19, 2014 in St. Louis. These reports were then publicly communicated on August 30th, 2014 for the sharing of the results with the various local actors and populations involved at the municipality of Diama.

The consultations were held through focus groups discussions focusing on issues of relevance to the ESIA in each of the areas. These consultations were followed by targeted meetings with grassroots’ stakeholders in the rice sector in the village of Tilène and Pont gendarme, also to gather their perceptions and their concerns and opinions on the project.

**Opinion on the project**: The populations are favourable to the project that raises great hope in the area. In fact, they believe it will enable them to develop agriculture and livestock, which are their main activities in this area. The irrigation schemes provided by the project will help develop their lands that were virtually abandoned due to lack of water. Rice farming will favour the restoration of the grass cover and the availability of agricultural by-products to benefit farmers. Local producers may also benefit from support for the development of their plots, and their rice production may be sold to the project. The implementation of the agro-industrial unit will generate employment especially for youths and women. At the community level, the project
could help improve access to basic social services (health, education, drinking water, sanitation, etc.), to support women empowerment through income-generating activities (IGA) and farmer training.

**Concerns and fears:** (i) poor communications on the project; (ii) risks of social conflict; (iii) Proliferation of certain diseases (malaria, schistosomiasis, HIV-AIDS, helminths, etc.); (iv) Disposal of waste in the environment, especially plastic bags and packaging; (v) Poisoning Risks associated with the use of pesticides; (vi) Water and air pollution by excessive use of pesticides; (vii) **Recruitment in the Project sites**; (viii) Ending of fishing activity due to the invasion by Typha, causing eutrophication; (ix) Reduction of livestock spaces; (x) Access to agricultural by-products for livestock feed.

These concerns are taken into account, particularly through: (i) the development of and compliance with the terms of the Convention as stated; (ii) raising public awareness on disease prevention, hygiene and sanitation; (iii) support for the control of major diseases (malaria, schistosomiasis, HIV-AIDS, etc.); (iv) support for the construction of latrines in homes and at the level of developed plots; (v) training of farmers on the use of pesticides and providing them with personal protective equipment; (vi) provision of farmers with protective equipment (suits, gloves, boots, glasses, etc.) during manual application of pesticides; (vii) decentralization and vaccination at the health huts; (viii) waste management, especially during the rainy season; (ix) Prioritizing local people in the recruitment of the Project workforce; (x) controlling the Typha that jeopardizes the development of fisheries in the village with nearly two dozen fishermen; (xi) Delineating and marking livestock rangelands and corridors leading to the water points.

The nature and issues of the project require a plan for engagement, consultation and communication with stakeholders to be in place by September 2015. This plan should be prepared to guide the implementation of all its activities.

Briefly describe the mechanism for receiving and processing complaints/complaints related to the project. Provide the name, address and contact person in case of need.

**12. CLIMATE CHANGE**

The project is in Category 1 in the context of climate change due to its vulnerability to climate variations including declining rainfall and increased frequency of extreme events (exceptional drought and flooding). Besides, the impact on climate change is assessed through the carbon footprint for both irrigation areas and for rice mills. The results of the project’s carbon footprint as a whole disclosed that the project is a source of GHG emissions related to production activities in addition to the rice farming that produces methane (CH4) and (N2O and CO2).

Regarding emissions related to agriculture (rice farming), the project activities will achieve an overall emission of 324,921 t of CO2eq. Regarding the issue related to the energy sector, the overall emission is of 37,595 tCO2eq. The assessment was simulated over 18 years with an implementation and investment phase of 3 years and a 15-year capitalization phase.

**Climate change adaptation measures**

Climate change adaptation measures are addressed in the project design at three levels: (i) Sizing of the irrigation network facilities (calibration of channels; parking areas near the supply intake of primary channels to receive tractors with emergency pumps in case of flooding); (ii) Design of the drainage network (to account for a five-year frequency rainfall of 50 mm evacuated in 72 hours); (iii) Design of protection against floods (containment of the Gorom by the MCA bringing its height from 2.20m to 2.50m; the water intake is equipped with valves to manage the slope of the Goana Channel extended by CASL, at a maximum slope of 2.00m NGS).
Mitigation of climate change impacts

Agriculture sector: To balance the record in this sector, the project will necessarily undertake the following mitigation activities: improvement of sustainable land management practices; management of irrigation water to reduce CH4 emissions; undertake reforestation activities by developing tree-nurseries at each site and supporting the population and technical services for reforestation of degraded lands. These actions will offset the emissions generated by the project; Educate and support people to fight against bush fires (firewall).

Energy Sector: To balance the record in this sector, the project will necessarily undertake the following mitigation activities: combustion by biomass (use rice husks to generate energy by burning agricultural residues to avoid part of emissions from fossil fuel); renewable energy (use of solar lighting for the site areas).

13. INSTITUTIONAL CAPACITY-BUILDING PLAN

Strengthening environmental and social expertise of CASL

CASL has already recruited an Environment and Social Expert. However, the staff that will be hired for the operations of the rice farms, the farm house and the agro-industrial plant should be trained on good, environmental-friendly agricultural practices, but also on hygiene, safety and protection measures. CASL will also provide staff training for security protection.

Strengthening capacities of POs and municipalities

- **Capacity building of the municipality of Diama in environmental and social management**: The project will provide support in strengthening the capacities of the municipality of Diama in monitoring environmental and social issues, on land management, etc. To this end, the Municipality will also benefit from information and awareness programs on environmental and social issues of the project.

- **Organizational, technical and financial support for organizations in the Municipality of Diama**: The project will provide organizational, technical and financial support for those organizations enabling them to gradually move towards agribusiness: facilitation of access to and dissemination of economic and financial information (access to credit); institutional capacity-building, technical and organizational management; facilitation the marketing and selling of rice production; support, supervision and monitoring.

- **Capacity-building of sustainable of POs in sustainable farming techniques**: The project will also provide support to POs in mastering the technical itineraries for rice cultivation; good environmental practices; rational management of fertilizers and pesticides; packaging and marketing of rice; etc.

Information and awareness of the populations involved

CASL and the EES/CASL will coordinate the implementation of information and awareness campaigns across settlements in the Municipality of Diama and among agricultural producers benefiting from project activities. The specific objectives of this service are: (i) preparing the population for good conduct and management of agricultural activities; (ii) sensitizing women to field actions and supporting them in the process of recognition of their rights; (iii) sensitizing the population, educating technical officers; (iv) provide monitoring and supporting implemented solutions, etc. Awareness will also focus on the elimination of other factors of vulnerability of agricultural activities such as HIV/AIDS, malaria and intestinal and urinary schistosomiasis.
14. ESMP AND COST

The Environmental and Social Management Plan (ESMP) includes three (03) categories of measures: (i) measures to be included in the tender dossiers and implementation specifications as contractual measures for which the financial evaluation will be taken into account by the bidders in setting their rates and prices; (ii) engineering measures required in the invitation to tender and the implementation specifications; (iii) environmental measures (reforestation, awareness, surveillance and monitoring, etc.). Asset losses will be taken into account by the Resettlement Action Plan (RAP) prepared in a separate document.

Table 6: Cost of the Environmental and Social Management Plan

<table>
<thead>
<tr>
<th>Activities</th>
<th>Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measures for the restoration of degraded vegetation cover and biodiversity protection:</strong></td>
<td></td>
</tr>
<tr>
<td>• Land clearing tax, compensatory reforestation (fruit trees in villages, and PNOD weed cutting for the development of water-lilies)</td>
<td>10 000 000 CFAF(^1)</td>
</tr>
<tr>
<td>• Controlling invasion by grain-eater birds</td>
<td>Not applicable</td>
</tr>
<tr>
<td>• Maintenance of channels through cleaning aquatic plants, repairs works, etc.</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Measures to reduce vulnerability to climate change and mitigation of carbon footprint impacts:</strong></td>
<td></td>
</tr>
<tr>
<td>• Reduction and carbon mitigation of the carbon footprint</td>
<td>5 000 000 CFAF</td>
</tr>
<tr>
<td><strong>Compensation measures for loss of land:</strong></td>
<td></td>
</tr>
<tr>
<td>Compensations for loss of land and other related activities</td>
<td>480 000 000</td>
</tr>
<tr>
<td><strong>Health protection and safety of population and operations personnel:</strong></td>
<td></td>
</tr>
<tr>
<td>• Support for waterborne diseases control and awareness</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Impact mitigation measures on pastoral activities in the project area:</strong></td>
<td></td>
</tr>
<tr>
<td>• Development of corridors and ponds for livestock</td>
<td>10 000 000 CFAF</td>
</tr>
<tr>
<td>• Facilitating access to residues (farm and plants) and fodder for livestock</td>
<td>Not applicable</td>
</tr>
<tr>
<td>• Support for livestock health (controlling water-borne diseases in livestock)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>• Supporting the development of intensive livestock (youths)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Technical measures for good environmental practices, and risk prevention and management:</strong></td>
<td></td>
</tr>
<tr>
<td>• Development of a manual of good agricultural practices, and rice storage rice milling conducted internally</td>
<td>Not applicable</td>
</tr>
<tr>
<td>• Development of Internal Operations Plans (IOPs) and their implementation</td>
<td>5 000 000</td>
</tr>
<tr>
<td><strong>Measures to strengthen the environmental and social expertise of CASL staff:</strong></td>
<td></td>
</tr>
<tr>
<td>Training implementation staff on good agricultural and rice storage and milling practices</td>
<td>20 000 000 CFAF</td>
</tr>
<tr>
<td><strong>Organizational strengthening measures of Pos and capacity-building of municipalities in gender mainstreaming:</strong></td>
<td></td>
</tr>
<tr>
<td>Capacity-strengthening of producers’ organizations</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Support for strengthening gardening activities, (10 hectares for women)</td>
<td>7 500 000 CFAF</td>
</tr>
<tr>
<td>POs Capacity building in sustainable farming techniques</td>
<td>2 000 000 CFAF</td>
</tr>
<tr>
<td>Support for fish farming</td>
<td>1000 000 CFAF</td>
</tr>
<tr>
<td>Support for supply of drinking water to communities</td>
<td>30 000 000 CFAF</td>
</tr>
<tr>
<td>Other social activities</td>
<td>9 500 000 CFAF</td>
</tr>
<tr>
<td><strong>Surveillance, monitoring, audit and evaluation:</strong></td>
<td></td>
</tr>
<tr>
<td>Continuous surveillance of construction and operations (by the EES/CASL)</td>
<td>2 000 000 CFAF</td>
</tr>
<tr>
<td>Environmental and Social Monitoring (by DREEC and SREC)</td>
<td>8 000 000 CFAF</td>
</tr>
<tr>
<td>Final evaluation (at the end of the construction work)</td>
<td>2 000 000 CFAF</td>
</tr>
<tr>
<td>Annual audits (during operations)</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Contingencies</strong></td>
<td></td>
</tr>
<tr>
<td>8 000 000 CFAF</td>
<td>1 000 000 CFAF/year</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>600 000 000 CFAF</strong></td>
</tr>
</tbody>
</table>

Total cost of environmental and social measures:
- 600 000 000 CFAF (for the construction phase)
- 90 000 000 CFAF/year (during the operational phase)

\(^1\) This amount includes the land clearing tax and compensatory reforestation after the construction phase

\(^2\) This amount includes annual reafforestation costs on behalf of communities
CONCLUSION

Based on the above assessments, it can be concluded that the project, as proposed, is a viable option both environmentally and socially, on the condition that all the measures provided by the Promoter and those defined in the environmental and social management plan are fully and rigorously implemented.

REFERENCES AND CONTACTS

References


Contacts

For CASL

1. GRANDRY François, Director of Operations and QRSE, Email: francois.grandry@compagnieagricole.com

For AfDB

1. Mme Seliatou KAYODE-ANGLADE, Chargé d’investissement, E-mail : s.kayode-anglade@afdb.org
2. Mr. Modeste KINANE, Environment and Climate Change Division, Email: m.kinane@afdb.org
3. Mr. Hassan Pierre SANON, Environment and Climate Change Division, Email: p.sanon@afdb.org
### Annex: ESMP during the engineering work phase (engineering work of the rice farm; construction of the farmhouse and agro-industrial plant)

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Mitigation or compensation measures</th>
<th>Responsibility</th>
<th>Implementation strategy</th>
<th>Cost (CFAF)</th>
<th>Implementation schedule</th>
<th>Surveillance/Regulatory Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of vegetation due to clearing</td>
<td>• Strict adherence to limits of areas to be cleared</td>
<td>CASL Engineering company</td>
<td>• Payment of clearing fees in connection with the IREF</td>
<td>10 000 000 CFAF (Engineering work)</td>
<td>At the start of the work</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td>• Compensatory reforestation</td>
<td></td>
<td>• Development of community forests and tree-nurseries Integration of green spaces (plant and farm)</td>
<td></td>
<td></td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• IREF</td>
</tr>
<tr>
<td>Risks of surface water and groundwater pollution</td>
<td>• Collection of oils and other liquid waste for disposal and / or recycling</td>
<td>CASL Engineering company</td>
<td>• Cleaning of project site living quarters</td>
<td>Included in the engineering work contract</td>
<td>During construction</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Monitoring of water quality</td>
<td></td>
<td></td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Air pollution due to dust emissions</td>
<td>• Wearing of mask</td>
<td>CASL Engineering company</td>
<td>• To be considered in the contract documents</td>
<td>Included in the engineering work contract</td>
<td>During all the construction work phase</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td>• Awareness campaign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Noise pollution due to gear</td>
<td>• Wearing earmuffs and / or noise plugs</td>
<td>CASL Engineering company</td>
<td>• To be considered in work specifications</td>
<td>Included in the engineering work contract</td>
<td>During all the construction work phase</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td>• Respecting working hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td>• Regular maintenance of gear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Nuisances due to waste from work</td>
<td>• Garbage collection and recycling of non-hazardous waste</td>
<td>CASL Engineering company</td>
<td>Regular cleaning of work areas Putting collection bins and storage areas for waste to be recycled</td>
<td>Included in the engineering work contract</td>
<td>At the establishment of the engineering site</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td>• Hazardous waste management (waste oils, paints, electrical waste)</td>
<td>CASL Engineering company</td>
<td>Putting separate collection bins Draining in a suitable location and oil recycling Waste collection and transfer to an authorized site</td>
<td>Included in the engineering work contract</td>
<td>At the establishment of the engineering site and during all the construction works</td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Occupational risks (risks of fall, injury, accident, etc.)</td>
<td>• Develop a safety plan</td>
<td>CASL Engineering company</td>
<td>• Include in the safety plan: i) wearing of earmuffs and noise plugs at all stations where the noise level is likely to exceed 85 dB (A), (ii) wearing of helmets, (iii ) wearing safety glasses, (iv) use of safety shoes,</td>
<td>Included in the engineering work contract</td>
<td>During the engineering work phase</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td>• Briefings and awareness sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• C/ DIAMA</td>
</tr>
<tr>
<td></td>
<td>• Individual Protection Equipments (PPEs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td></td>
<td>• Safety instructions</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 30 -
<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Mitigation or compensation measures</th>
<th>Responsibility</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Development of STIs/HIV/AIDS</td>
<td>• Awareness-raising of the population and the site staff</td>
<td>CASL Engineering company</td>
<td>• IEC campaigns with support from the authorities of Diama, POs, CBOs</td>
<td>5 000 000</td>
<td>During construction</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Awareness-raising of workers</td>
<td>CFAF</td>
<td></td>
<td>• C/DIAMA</td>
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<td></td>
<td></td>
<td></td>
<td>• Availability of condoms in the site quarters</td>
<td></td>
<td></td>
<td>• CRSE</td>
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<td></td>
<td>(v) wearing special aprons, etc.</td>
<td></td>
<td></td>
<td>• Health District</td>
</tr>
<tr>
<td>Impacts related to quarry opening/operation</td>
<td>• Exploitation of authorized quarries</td>
<td>CASL Engineering company</td>
<td>• Exploitation of existing quarries where possible</td>
<td>Included in</td>
<td>During construction</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Contact mining services for authorization</td>
<td>the engineering work contract</td>
<td></td>
<td>• C/DIAMA</td>
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<td>• CRSE</td>
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<td></td>
<td>Service des Mines</td>
</tr>
<tr>
<td>PAPs (loss of land)</td>
<td>• Compensation</td>
<td>CASL</td>
<td>• Payment of all compensation is already effective. In addition, rights holders will benefit from the project hydraulic systems and other social benefits</td>
<td>364 410 000</td>
<td>Before the engineering work</td>
<td>• EES/CASL</td>
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<td>• C/DIAMA</td>
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<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Social risks for non recruitment of local labour</td>
<td>• Using local unskilled labour in priority</td>
<td>CASL Engineering company</td>
<td>• Involve the Rural Assembly of Diama and grassroots organizations in the process of recruitment of unskilled labour Respecting the Memorandum of Understanding with CASL /Municipality of Diama</td>
<td>Included in</td>
<td>At the start of the engineering work</td>
<td>• EES/CASL</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Involve the Rural Assembly of Diama and ranchers in the development of corridors, water troughs and ponds</td>
<td>the engineering work contract</td>
<td></td>
<td>• C/DIAMA</td>
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<td></td>
<td>• CRSE</td>
</tr>
<tr>
<td>Disturbance of pastoral activities</td>
<td>• Development of pastoral infrastructure (water troughs, ponds, etc.) • Provide for access corridors to water points and rangelands</td>
<td>CASL</td>
<td>• Involve the Rural Assembly of Diama and ranchers in the development of corridors, water troughs and ponds</td>
<td>10 000 000</td>
<td>During construction</td>
<td>• EES/CASL</td>
</tr>
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<td>CFAF</td>
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<td>• C/DIAMA</td>
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<td>• CRSE</td>
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<td></td>
<td>Herders’ Association</td>
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<tr>
<td>Impairment in work</td>
<td>Surveillance, monitoring and evaluation</td>
<td>CASL</td>
<td>• Expert QHSE</td>
<td>Expert CASL</td>
<td>During construction</td>
<td>• Expert QHSE/CASL</td>
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<td></td>
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<td></td>
<td>• Protocol with CRSE/DREEC</td>
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<td></td>
<td></td>
<td></td>
<td>• Recruitment of Consultant</td>
<td>12 000 000</td>
<td>During engineering work</td>
<td>• CRSE/DREEC</td>
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<td>000</td>
<td></td>
<td>Consultant</td>
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</tbody>
</table>
### ESMP at the operational phase of the developed rice farming areas

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Mitigation measures/beneficiation measures</th>
<th>Responsibility</th>
<th>Implementation Strategy</th>
<th>Cost CFAF)</th>
<th>Implementation schedule</th>
<th>Surveillance/Regulatory Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse Gas (GHG) Emission</td>
<td>• Reduction of GHG emissions</td>
<td>CASL</td>
<td>• Conduct an annual GHG inventory and propose mitigation measures</td>
<td>To be included in the operating budget</td>
<td>During commissioning</td>
<td>EES/CASL, DREE/CRSE</td>
</tr>
<tr>
<td>Water and soil pollution due to discharge of polluting and drainage waters</td>
<td>• Drainage of waste water • Facilities (connection to Djeuss channel) • Reasonable use of agricultural inputs • Monitoring the quality of surface water and groundwater</td>
<td>CASL</td>
<td>• Connection to MCA drainage outfall • Periodic analysis of water samples (Protocol with laboratories)</td>
<td>PM</td>
<td>At the beginning of work</td>
<td>EES/CASL, C/DIAMA, CRSE</td>
</tr>
<tr>
<td>Disturbance of pastoral activities</td>
<td>• Cleaning of natural ponds • Securing the developed plots (impassable channels jumpers) • Facilitate access to harvested rice straw or rice husk to breeders • Communication with herders • Assist with access to veterinary products (Chytoomonose and fluke infections)</td>
<td>CASL</td>
<td>• Schedule an annual cleaning managed ponds in conjunction with pastoralist communities and livestock services and the municipality of Diama</td>
<td>Included in the annual engineering works</td>
<td>Before commissioning</td>
<td>EES/CASL, C/Diama, CRSE, Livestock Service, Herders’ Association</td>
</tr>
<tr>
<td>Proliferation of waterborne diseases, STIs/HIV/AIDS</td>
<td>• Support for health centres • Provision of long-lasting impregnated nets (LLINs) • Information and awareness-raising of workers on the risks of STIs/AIDS</td>
<td>CASL</td>
<td>• Support for health centres and health services in the prevention of waterborne diseases, vector control • Site staff IEC Programme</td>
<td>2 000 000 CFAF/an (exploitation)</td>
<td>During the operation of the developed areas</td>
<td>EES/CASL, C/Diama, CRSE, Health District</td>
</tr>
<tr>
<td>Risks on aquatic wildlife at the Djoudj Park</td>
<td>• Building protection wire fences at the entrance of channels to avoid the aquatic fauna of the park escaping • Maintenance and monitoring of the fences</td>
<td>CASL</td>
<td>• Memorandum of Understanding with the Djoudj Park Management</td>
<td>Included in the engineering work</td>
<td>During the operation of the canal and developed areas</td>
<td>EES/CASL, CRSE, Director of Djoudj</td>
</tr>
<tr>
<td>Low capacities of communities</td>
<td>• Strengthening capacities of producers’ organizations • Support for strengthening gardening activities, especially for women</td>
<td>CASL</td>
<td>• Training and supervision by technicians of CASL</td>
<td>Included in the operating budget</td>
<td>During the operation of the canal and developed areas</td>
<td>EES/CASL, C/Diama, CRSE</td>
</tr>
</tbody>
</table>
## EMSP at the farm and agro-industrial plant operation phase

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Mitigation or compensation measures</th>
<th>Responsibility</th>
<th>Implementation strategy</th>
<th>Cost (CFAF)</th>
<th>Implementation schedule</th>
<th>Surveillance/Regulatory control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Greenhouse Gas (GHG) Emission</strong></td>
<td>- Reduction of GHG emissions</td>
<td>CASL</td>
<td>- Conduct an annual GHG inventory and propose mitigation measures</td>
<td>To be included in the operating budget</td>
<td>During the commissioning</td>
<td>EES/CASL, DREEC/CRSE, Directorate of Industry</td>
</tr>
</tbody>
</table>
| - Deterioration of air quality by dust and greenhouse gas (GHG) emissions | - Putting in place dust control devices  
- Dust masks for staff  
- Reduction of GHG emissions | CASL | - Provide for these facilities in the plant design  
- Purchasing of appropriate masks for all staff and require they wearing them  
- Conduct an annual GHG inventory and propose mitigation measures | To be included in the engineering and operating budget | During installation and before commissioning | EES/CASL, DREEC/CRSE, Directorate of Industry, Labour Inspection |
| - Soil pollution by untreated wastewater | - Treatment of all potentially polluted wastewater | CASL | - Collection and treatment of wastewater and recycling of used oils | To be included in the construction budget | During installation and before commissioning | EES/CASL, DREEC/CRSE, Directorate of Industry |
| - Risks of depletion of water resource  
- Water pollution by plant waste  
- Risk of fuel contamination | - Building embankments around buildings  
- Management of solid and liquid waste  
- Constructing protective basins | CASL | - Storm drainage network  
- Collection, evacuation and disposal of solid and liquid waste  
- Security mechanisms around hydrocarbon facilities | To be included in the engineering and operating budget | During installation and during commissioning | EES/CASL, DREEC/CRSE, Directorate of Industry |
| - Sound emission by blasts | - Respecting work schedules  
- Helms for staff operating machinery | CASL | - Regular maintenance of machinery and equipment  
- Acquisition of appropriate helmets for staff operating machinery and require they using them | To be included in the operating budget | During installation and during commissioning | EES/CASL, DREEC/CRSE, Directorate of Industry, Labour Inspection |
| - Risks of accidents, explosion, etc. | - Developing an Internal Operation Plan (IOP) and implementing it  
- Educating staff  
- Conducting an audit | CASL | - Strict adherence to safety instructions and measures recommended by the hazards analysis and the IOP | 5000 000 CFAF  
To be included in the operating budget | Before commissioning  
During commissioning | EES/CASL, DREEC/CRSE, Directorate of Industry, Labour Inspection |
| **Engineering deficiencies** | - Surveillance and monitoring | CASL | - QHSE Expert  
- Expert CASL | During construction | Expert QHSE/CASL |
| | - Protocol with CRSE/DREEC | | | 15 millions F/an | During construction | CRSE/DREEC |