



AFRICAN DEVELOPMENT BANK GROUP

**PROJECT : DEVELOPMENT OF MINI HYDROELECTRIC POWER PLANTS
AND RELATED DISTRIBUTION NETWORKS (PDM-HYDRO)**

COUNTRY : MALI

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) SUMMARY

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Project Name	: Development of Mini Hydroelectric Power Plants and Related Distribution Networks (PDM-HYDRO)	
Country	: MALI	
Project Number	: P- ML-FA0-004	
Department	: RDGW	Division: RDGW.1

1. INTRODUCTION

This document is the Environmental and Social Management Plan (ESMP) Summary of the Project for the Development of Mini Hydroelectric Power Plants and Related Distribution Networks in Djenné and Talo. From the environmental and social viewpoints, the project is classified under Category 2, in compliance with the African Development Bank (AfDB) requirements and Category B, in accordance with Mali's environmental and social safeguards. The environmental and social impact assessment was carried out in 2017. This ESMP summary was prepared based on the ESIA's of mini hydroelectric power plants and their distribution networks in Djenné and Talo, in conformity with Mali's environmental and social requirements and those of AfDB's Integrated Safeguards System. The document first presents the project description and rationale and then the summary of the environmental and social impacts, the negative impact mitigation and enhancement measures, the monitoring programme, public consultations held during the ESIA conducted in Djenné and Talo for power distribution line deployment areas and supplementary project initiatives. The conclusion is about project acceptability.

2. PROJECT DESCRIPTION AND RATIONALE

2.1 Project Description

The project aims to enhance Mali's electric energy generation capacity, especially the share of renewable energy in the country's energy mix. More specifically, the project will help to: (i) increase the installed renewable energy generation capacity by 8.9MW; (ii) increase the rate of access to electricity, especially in rural areas; and (iii) reduce greenhouse gas emissions by replacing energy generation using small thermal generators with hydroelectric power plants.

Based on the Scaling-up Renewable Energy Programme (SREP) comprising 6 mini- and micro-power plants on the Billy, Kénieto, Woroni, Farako, Djenné and Talo sites, Phase 1 of the project will consist in installing water storage plants to generate energy on the existing Djenné and Talo dams located on the Bani River, a tributary of the Niger River. These energy generation units will be linked to medium- and low-voltage distribution lines to supply energy to 55 villages (21 in Djenné and 34 in Talo).

Project components in Phase 1 are:

A. Construction of Power Generation Plants and related Distribution Networks: it will comprise: (i) development works on the existing dams; (ii) hydroelectric power generation plants; (iii) establishment of 231 kilometres of medium-voltage distribution lines (125 kilometres for Talo and 106 for Djenné); (iv) procurement of prepayment meters (monophase and tri-phase); and (v) public lighting in the villages connected.

B. Institutional Support: it seeks to: (i) support the electricity sub-sector in preparing future operations by conducting priority project feasibility studies; (ii) train senior officers of the Project Management Unit; and (iii) equip multi-purpose platforms for women in the project area.

C. Project Management: it will provide project implementation support to facilitate, particularly: (i) audit of project accounts; (ii) energy control and IEC campaigns; (iii) recruitment of a Consulting Engineering Firm for works control and supervision; (iv) procurement of vehicles; and (v) functioning of the PMU.

The main activities will comprise: (i) the installation of turbines in the existing dams; (ii) constructing medium- and low-voltage distribution networks to supply power to 55 villages (21 in Djenné and 34 in Talo) with a population of 68 000. Close to 12 500 new subscribers are targeted, including households, businesses, etc.; (ii) acquiring prepayment meters (single-phase and three-phase; and (v) street lighting.

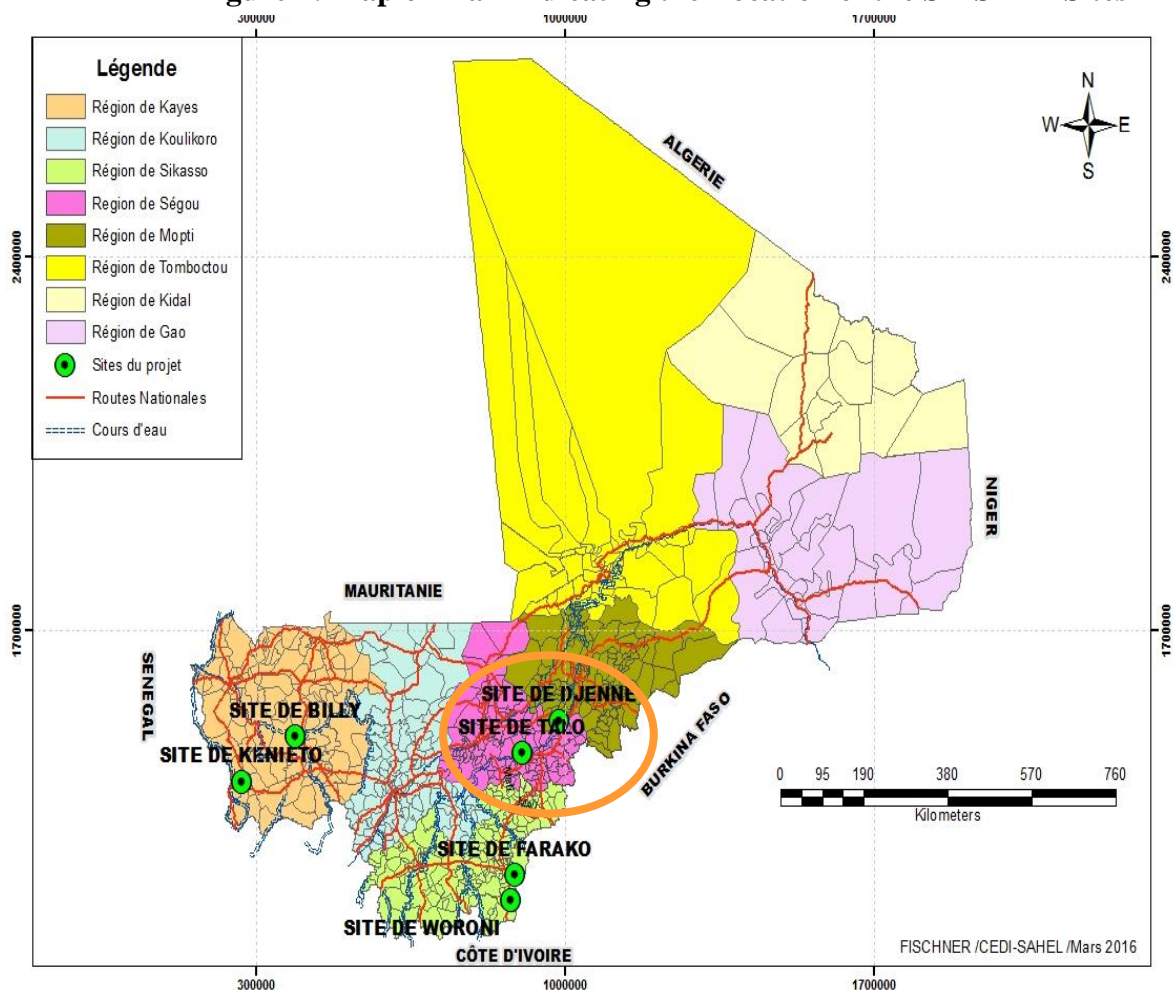
The estimated cost of this phase, including physical contingencies and price escalation, is CFAF 32 054 479 000, or UA 40.08 million.

2.2 Project Location

The **Talo** site (Ségou Region) is located 50 kilometres from San, headquarters of the cercle (administrative district) bearing the same name. The site is less than 0.5 kilometre from hamlets and villages.

The **Djenné** site (Mopti Region) is downstream of the Talo dam on the same river (Baní) near Soala that is 8 kilometres from the headquarters of the cercle (administrative district) (Djenné). Djenné is located downstream of the dam. Figure 1 shows the geographical location of the 6 SREP sites.

Figure 1: Map of Mali Indicating the Location of the Six SREP Sites



The Talo and Djenné mini hydroelectric power plants are run-of-the river power plants. They will integrate mini hydroelectric power plants into existing agricultural dams and constructing distribution lines. The Talo power plant is designed as shown in Figure 2 opposite.

This power plant is linked to 34 villages to be electrified by a 125 km-long 33 kV transmission line. Figure 3 below shows the distribution network.

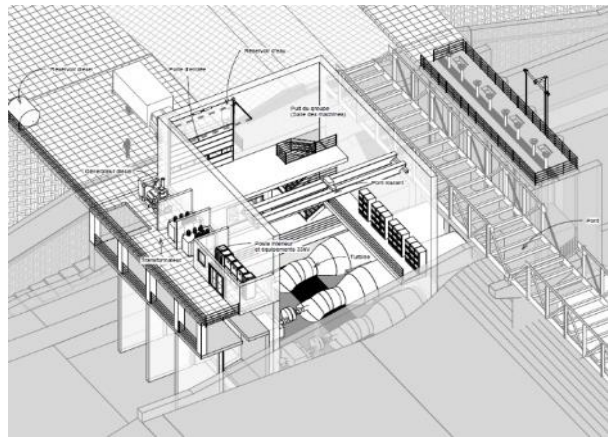
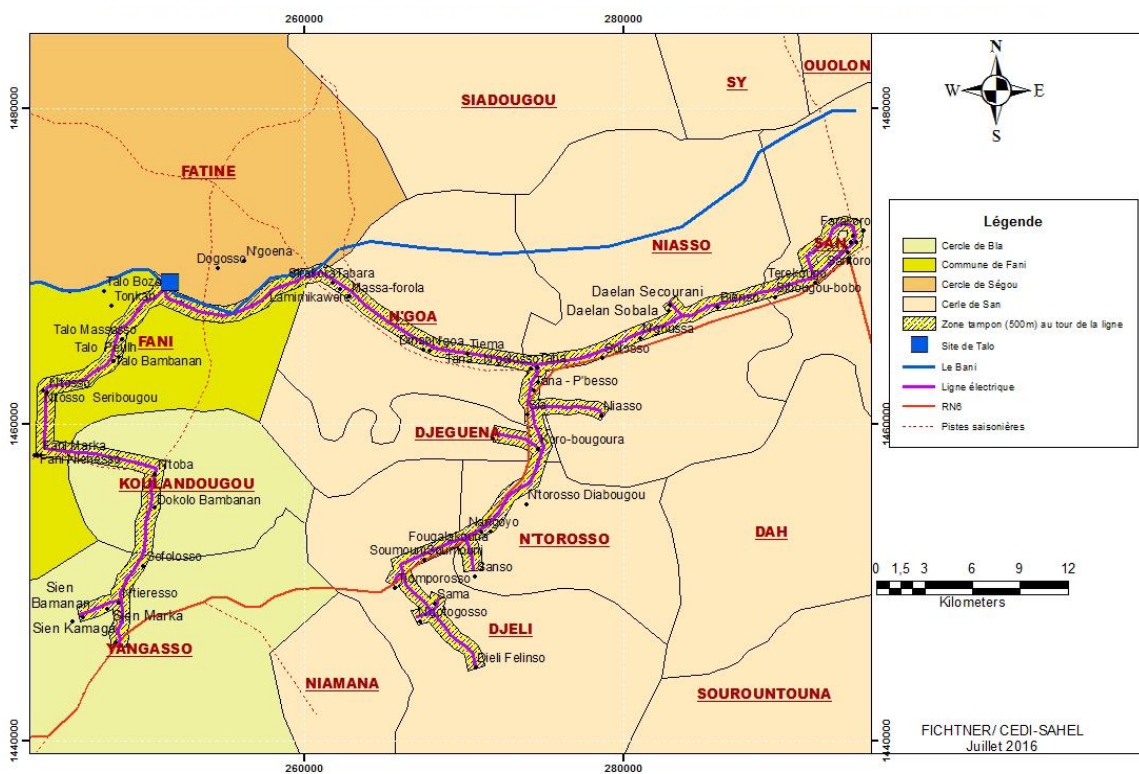


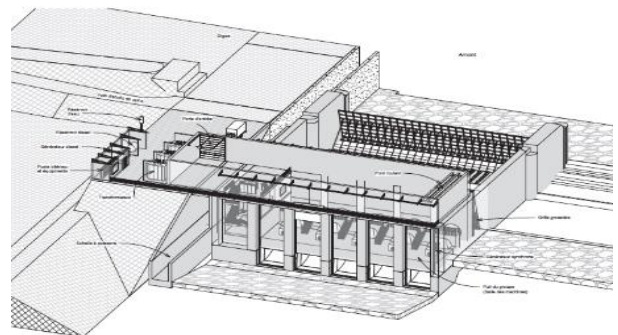
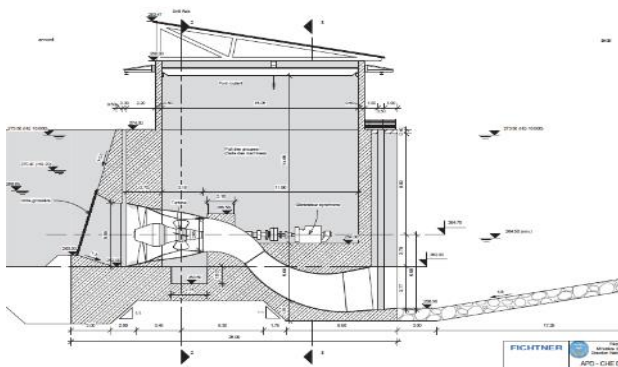
Figure 2: Talo Power Generation Plant

Figure 3: Talo Line Network



The list of villages is presented in Annex 2.

The Djenné hydroelectric power plant is designed as shown in Figure 4 below.



This power plant will be linked to villages to be electrified by 15 kV and 33 kV transmission lines. This type of link is a simple 106 kilometre-long three-phase system that will connect 21 villages. Figure 5 below shows the distribution network.

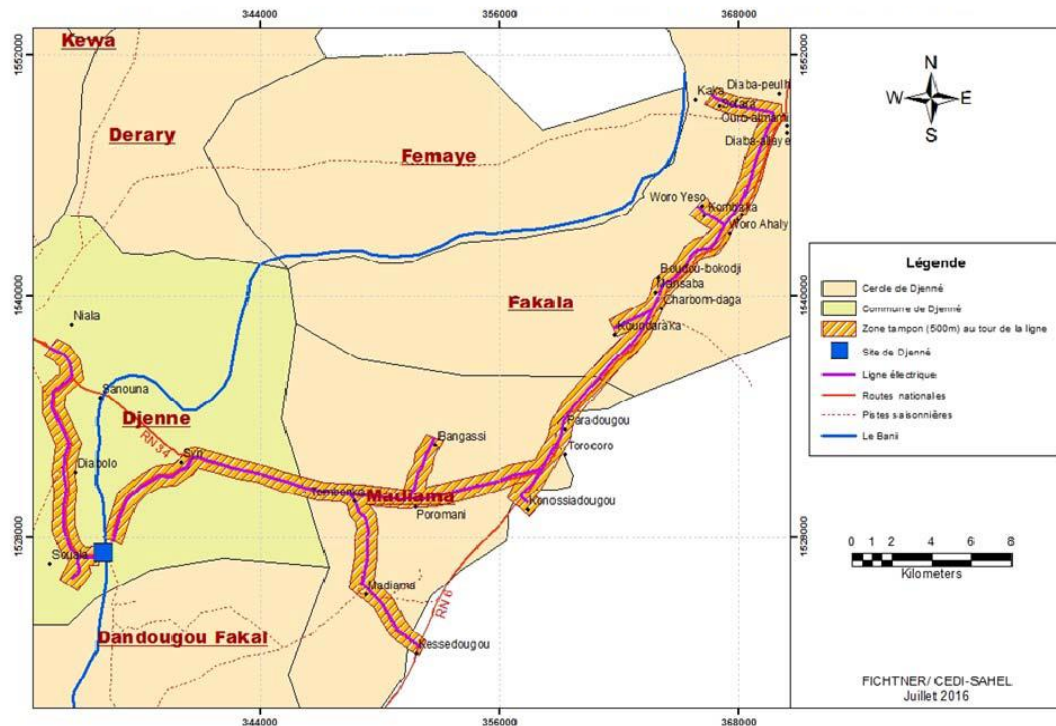


Figure 5: Djenné Line Network

2.3 Mali's Administrative Framework

The National Directorate of Pollution and Nuisance Control (DNACPN) of the Ministry of Environment, Sanitation and Sustainable Development (MEADD) is in charge of environmental issues. The ministry is responsible for planning and managing environmental resources.

The Ministry of Environment, Sanitation and Sustainable Development (MEADD) comprises directorates, including DNACPN which is responsible for environmental and pollution monitoring. It is the most important body regarding the implementation of Mali's environmental policy.

The Mali Energy Corporation (EDM-SA) obtained the ISO 9001 certification in 2008. It has an Environment Directorate staffed by senior officers very conversant with environmental and social issues. It recently embarked on the process of obtaining the ISO 14000 certification.

Other entities will also be involved in the environmental management aspects of the project. These include: (i) the National Directorate of Water Resources and Forestry which is responsible for ecosystem management and protection; (ii) the Ministry of Regional Development; (iii) the Ministry of Public Works which manages National Road (RN) rights-of-way to be followed by the distribution lines; and (iv) the Ministry of Agriculture which manages the irrigation dams in Djenné and Talo.

2.4 Mali's Regulatory Framework

Mali's regulatory framework is governed by the following instruments covering the requirements of the five Integrated Safeguards System (ISS) operational safeguards (OSs):

1. OS1 is covered by Decree No. 08-346/P-RM of 26 June 2008 on the obligation to conduct an environmental and social impact assessment (ESIA), as amended by Decree No. 09-318 of 26 June 2009. It defines three categories, namely: (i) Category A which may have major, and generally irreversible, negative impacts which are most often felt in an area wider than the sites covered by the works; (ii) Category B with less serious negative impacts on the environment and the populations than those of Category A; and (iii) Category C which does not have major negative impacts on the environment.
2. OS2 is covered by Ordinance No. 00-027/P-RM of 22 March 2000 on the State Property and Land Tenure Code which governs expropriation for public purpose and Law No. 85-40/AN-RM of 26 July 1985 on the protection and promotion of the national cultural heritage, as amended by Law No. 10-061 of 30 December 2010.
3. OS3 requirements are met by Law No. 08-033 of 11 August 2008 on classified facilities for environmental protection; Law No. 02-006 of 31 January 2002 on the Water Code which lays down rules for the use, conservation, protection and management of water resources; Law No. 95-031 of 20 March 1995 on wildlife; Law No. 95-004 of 18 January 1995 laying down conditions for the management of forest resources, as supplemented by Law No. 10-028 of 12 July 2010 on forest resources; and Law No. 04-005 of 14 January 2004 establishing the Fund for the Development and Protection of Forests and Wildlife on State Land.
4. OS4 requirements are contained in Law No. 01-020 of 30 May 2001 on pollution and nuisances. It lays down the fundamental principles governing pollution and nuisance control. Decree No. 01-396/P-RM of 6 September 2001 spelling out the terms and conditions for managing noise pollution and Decree No. 01-397/P-RM of 6 September 2001 laying down the terms and conditions for managing atmospheric pollutants.
5. OS5 is covered by Law No. 92-020 on the Labour Code of the Republic of Mali; Law No. 99-041 of 12 August 1999 on the Social Security Code, as amended by Law No. 06-008 of 23 January 2006; Law No. 2011-036 of 15 July 2011 on the resources of municipal councils, cercles and regions; Law No. 2012-005 of 23 January 2012 amending Law No. 93-008 of 11 February 1993 defining the conditions for the free administration of local communities.

2.5 Description of the Scope and Assessment of the Sensitivity of Environments Crossed

Activities under the various project phases will create impacts that can be felt beyond the project site. Regarding biophysical aspects, the **project impact area (PIA)** covers approximately 200 metres around electrical transmission lines. Thus, biophysical components such as plants, water resources, quality and the landscape of localities crossed by electrical transmission lines will be taken into account. These localities are potential recipients of electrical transmission line preparation, construction and operation activities.

The sites of **Djenné** and **Talo** are located on the Bani River, a tributary of the Niger River in the Sudano-Sahelian zone with an average rainfall of 564 mm/year and two seasons, namely a dry season (November to April) and a rainy season (May to September). The Bani River catchment area covers an area of 106 800 square kilometres. In the rainy season, the waters of the Bani River build-up local water tables and flood the alluvial plain formations extending between Ségou and Mopti (Inland Niger Delta Unit) right up to the edge of the sandy plateaus of San and Bandiagara. Continental deposits vary from 30 metres to 80 metres and contain clay beds. The average productivity (average annual increase) of forest stands is low and is about 0.1 m³ - 1 m³/ha/year (PIRL 1999). The average volume of wood per hectare in the cercle is 5 m³/ha. The main activity in the area is farming (rice cultivation and market gardening organized into developed and irrigation areas around dams).

Landscape and plant formation types in the Inland Niger Delta, the cercles of **Djenné**¹ and Bla (for **Talo**) are:

- gallery forests comprising *Anogeissus leiocarpus*, *Balanites aegyptiaca*, *Myragina inermis*, *Pterocarpus lucens*, *Piliostigma reticulatum* (around rivers), along the Bani River;
- hygrophilous prairies located on flood plains dominated by *Vetivera spp.*, *Panicum spp.*, etc.;
- herbaceous hygrophilous formations in frequently flooded areas;
- grassy savannahs on alluvial deposits located outside the flood zone which regenerate pioneering species;
- shrubby savannahs full of chaplet on which poor and very heterogeneous woody vegetation develops;
- fallow systems dominated by a loose stratum of *Acacia* or *Adansonia* which is colonized by pioneering heliophilic species. **Much of the landscape is cultivated;**
- tree savannahs associated with low carapace rumps and rock pediments and/or baring;
- savannahs in open plains with depressions that are irregular with limited flooding;

Virtually all the low flood plains of the delta are dominated by herbaceous hygrophilous species. However, the steady receding of floods liberates soils that now emerge, creating a new ecological situation. Herbaceous species are replaced by pioneering woody species such as *Piliostigma reticulatum*, *Combretum micranthum*, *Borassus aethiopicum*, *Guiera senegalensis*, *Calotropis procera*, etc. In addition, there is a steady regeneration of *Acacia albida* in plains that are inadequately flooded or free of floods in recent years. This is generally linked to the transportation of seeds by animals and the emergence of new ecological conditions that are conducive to such species.

The site has two types of plant formations, namely **grassy savannahs on alluvial deposits** and **farmland** found almost all over around dwellings and cultivated by villagers. Plant formations

¹ DNEF Inventory 2014.

are transformed through rice farming and market gardening. Dry crops, namely millet, sorghum and maize, are cultivated on the non-flooded parts.

At present, **large wildlife** no longer exist in the PIA due to anthropic and climatic conditions. Surveys conducted among the local population (Djenné, Talo and environs) and field works only indicate the presence of a few small wildlife such as hares, squirrels, rats, etc. Wild birds abound due to proximity to the Inland Niger Delta and numerous ponds and lakes which are nesting areas for migratory birds. The most common species are herons, egrets, storks, ibis, spoonbills, scopus, gallinules, coots, jacanas, shorebirds, etc.

Aquatic wildlife also abound. The Inland Bani Delta is home to nearly 130 species of fish, many hippopotamuses, etc. The specific biological diversity of the Niger and Bani deltas is relatively richer when water recedes than during flooding. The distribution of fish species and their frequency in the various biotopes of the site vary. The most representative families are the *Cichlidae*, *mochokidae*, *bagridae* and *characidae*.

Based on field observations, it can be stated that there are no species of protected raptors in the study area, except some protected species such as cattle egrets and little egrets. Environmental value should be assigned to the sites because of their importance in the breeding of rodents, reptiles and isolated birds. Furthermore, according to information from technical entities, the entire PIA is not located in a wildlife reserve or reserved forest.

The PIA is also being affected by climate change as reflected in the increase in flooded areas and the reduction of arable land. The PIA is deteriorating rapidly due to the combined effects of human activities such as infrastructure development, land use, overgrazing, etc. and climate change (flooding) which disrupt the fragile equilibrium of flooded and dewatered areas.

Concerning the **human environment**, like everywhere in Mali, land management in the project impact area is marked by the coexistence of modern and customary laws. The latter is more widely practised. It emerged from public consultations that most land is allocated under customary law. There is also the issuing of tenancies at will (letters of allocation, land use permit, status of provisional tenancy agreement). Land management falls under the jurisdiction of the municipal council and the Government authorities of the area (Divisional Officer, Senior Divisional Officer and Governor) and is governed by the State Property and Land Tenure Code. Concerning administrative organization, Djenné Cercle comprises 12 municipal councils, namely Dandougou Fakala, Derrary, Femaye, Kewa, Madiama, Nema Badenyakafo, Niassaniari, Ouro Ali, Pondori, Togué Mourari and Djenné. Bla and San Cercles will host the project on the Talo site.

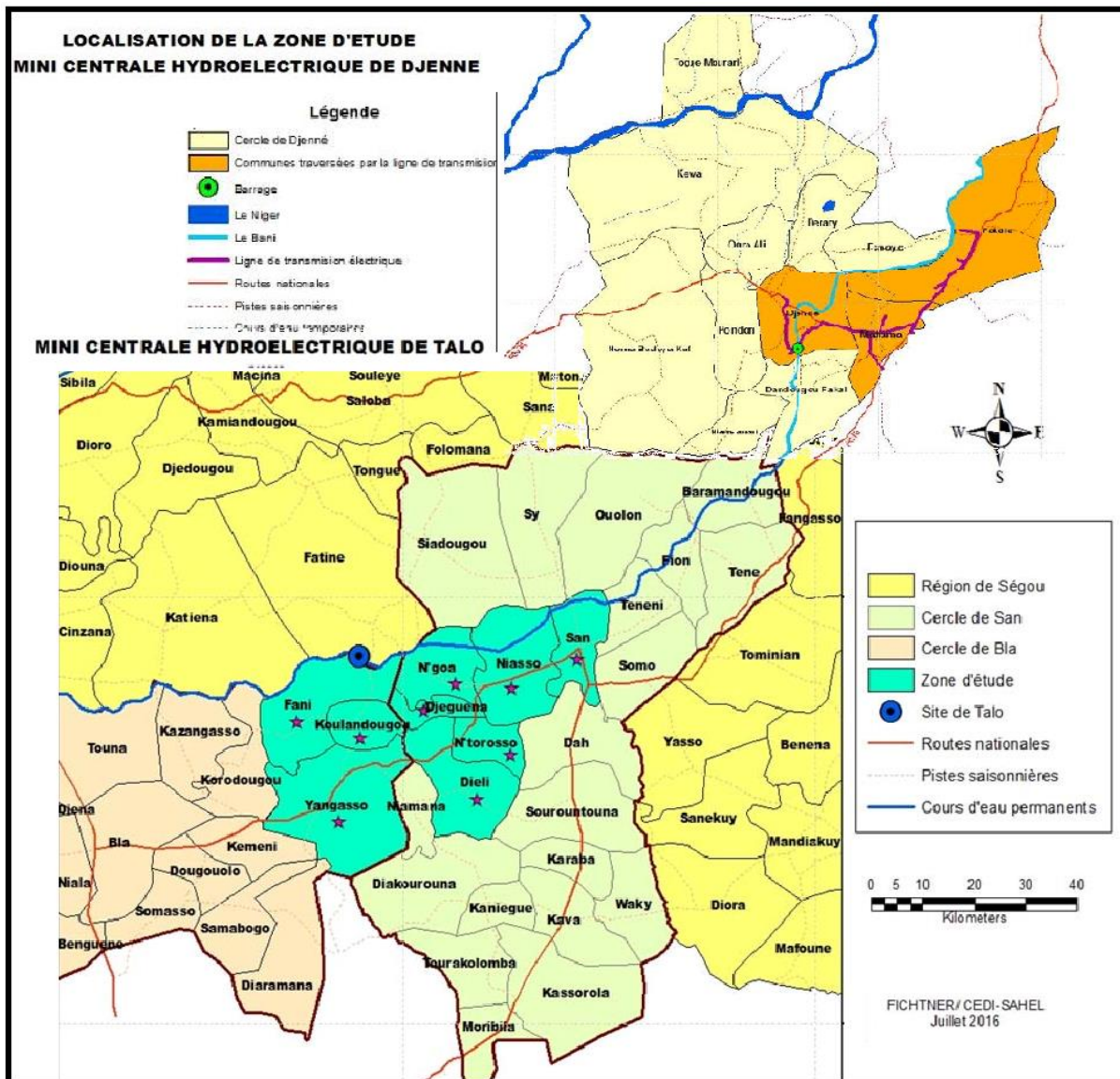
According to the 2009 General Population and Housing Census (RGPH), the population of the Ségou Région is 2 336 255 people in 391 116 households, which makes it the country's third most populated region. The population of Ségou comprises 1 155 841 men and 1 180 414 women. Women represent 50.5% of the population, as against 49.5% for men. According to the same source, the population of Ségou has increased by 40% since 1998, representing an average annual growth rate of 3.1%. According to the same RGPH, the population density of Ségou Region is 37.8 inhabitants per square kilometre and its urbanization rate is 21.6%. The social setting of the study area is summarized in the Table below.

Table 1: Population of the PIA

Region	Cercle	Municipal Councils	Number of Households	Number of Men	Number of Women	Population in 2009	Projected Population in 2017	Average Annual Growth Rate (1998-2009)
Mopti	Djenne	Djenne	6 421	18 318	17 882	36 200	50 390	5
		Fakala	6 030	21 093	21 467	42 560	50 732	2
		Madiama	2 666	7 240	7 698	14 938	18 762	3
	Tominian	Ouan	2 178	4 509	4 599	9 108	9 254	0
Ségou	Bla	Bla	9 279	29 817	31 521	61 338	98 141	8
		Fani	2 100	6 629	7 008	13 637	16 146	2
		Kouladougou	740	2 103	2 190	4 293	4 946	2
		Yangasso	3 607	10 786	11 057	21 843	27 085	3
	San	San	11 067	33 754	34 313	68 067	87 126	4
		Dieli	2 255	6 753	7 012	13 765	15 967	2
		Djeguena	650	1 966	2 084	4 050	4 666	2
		N'goa	1 641	4 612	4 748	9 360	11 232	3
		N'torosso	1 738	5 335	5 599	10 934	11 721	1
		Niasso	2 198	6 333	6 636	12 969	12 761	0
Total			69 865	210 408	215 460	425 868	521 735	3

Figure 5 below shows the areas and municipal councils of the project impact area covered by the distribution lines.

Figure 5: Municipal Councils of the Project Impact Area



Land Use

The countryside around Djenné and Talo is made up mainly of shrubs, trees often of economic value such as shea trees, eucalyptus plantations, balanzan trees and coastal banks and/or borrow areas.

Public Health

Each of the headquarter towns of the municipal councils of Djenné, Fakala, Madiama, Dandougou Fakala and Timissa, Ouan, Kessédougou and Bourasso, has a Community Health Centre (CSCOM) which provides day-to-day healthcare services. Complicated cases which cannot be handled by CSCOMs are referred to the Ségo hospital or directly to the Gabriel Touré and Point G University Teaching Hospitals (CHU).

Education

Almost all municipal councils have schools in all villages under the responsibility of the Mopti and Ségo Academy of Education. However, access to education is still limited in Ségo Region. The enrolment rate is 81% in the 1st cycle and 49% in the second cycle, despite considerable efforts to build infrastructure and train human capital in the education sector.

Economic Activities

Like in the other regions of Mali, the primary sector is the mainstay of the economy of Djenné Cercle. Livestock breeding is the main economic activity, followed by agriculture and fisheries. In Talo, irrigated food crop farming is the main economic activity, followed by traditional livestock breeding. Agricultural production is based on rain-fed crops and the dominant crops are: sorghum, millet, corn, rice and cowpea.

Vulnerable Groups

In Mali, socio-cultural factors weigh heavily on the status of women in the family and society, and limit their decision-making capacity and their participation in community life on an equal footing with men. In PIA villages, there are household head widows, elderly persons without family support or external assistance and some disabled people who are household heads. However, their number is not known to date as there are no local statistics. Nevertheless, Fani Municipal Council has an association of vulnerable persons.

Cultural Heritage, Places of Worship and Sacred Sites

The old town of Djenné is inscribed on the World Heritage List since 1988. Besides Djenné, cultural heritage assets comprise 4 archaeological sites, namely Djenné Djenno, Hambarkétolo, Kaniana and Tonomba. Although the boundaries of the protected areas are not clear, they are limited to the town's urban area.

It was added to the list of endangered sites in 2016² (owing to insecurity in the region which makes it difficult to take required measures to preserve the sites).

In total, there are 10 cultural sites around Djenné, namely 2 historic places, 5 archaeological sites, and 3 places of worship. These sites are found in Diabolo, Soala and Kobassa, and no cultural heritage is found in the direct right-of-way of the transmission lines.

There are also 23 cultural sites around Talo, including 15 places of worship and 8 historic sites.

² Source: <http://whc.unesco.org/fr/list/116/>.

These sites are found in Fani, N'dosso, Ndosso Sérébougou, Dagadosso, Talo Bozo, Talo Moussasso, Talo Peulh and Talo Bamanan, as well as in the right-of-way of distribution lines.

3. POTENTIAL IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES

The **non-implementation of the project** will impede development and delay the process of attaining the objectives of the Economic Recovery and Sustainable Development Strategic Framework (CREDD 2016-2018) as well as those of the 2006 National Renewable Energy Development Strategy which sought to increase the share of renewable energy in national power generation to 10% by end-2016.

The **project works** will mainly involve: (i) the installation of power plant turbines; (ii) Medium-voltage/Low-voltage distribution networks of approximately 231 km are being built exclusively and solely within easements of the rights-of-way of existing roads; (iii) the procurement of prepaid meters (monophase and tri-phase); and (v) public lighting in the villages connected.

The plants will be built in the existing Djenné and Talo dams whose sites have already been impacted from the environmental point of view. Power distribution lines will span the existing RN34, RN6 and RD easements without affecting or necessitating the expropriation of dwelling houses or economic infrastructure during the transmission route determination stage, except the pruning of fruit trees and loss of some crops near the said roads. The few fruit trees and farms that may be affected located at the foot of power transmission line pylons/supports or relay substations, as well as annual tillage crops such as millet, sorghum etc. under power transmission lines will be spared. Each impact was identified on a cause-and-effect basis, determined by the interaction between environmental components and project activities. The matrix below (Table 1) shows the interaction with environmental components.

Table 2: Interaction Matrix

Components Affected		Potential Impacts Identified		Djenné and Talo		
				Phase		
			Pre-construction	Construction	Operation	
		Not Assessed				
		++ Positive Impacts				
		--- High				
		- Average				
		Low				
Physical	Air	Dust emission			-	
	Water	Risk of Bani River water pollution		-		
	Soil	Erosion hazard				
Risk of soil pollution						
Biological	Plants	Productive forest resources		-	-	
		Production of deforestation and clearing residue		---	-	
	Wildlife	Wild birds		-	---	
		Other wildlife groups				
	Ecosystems	Impacts related to construction site waste		-		
Environmental integrity						
Human	Development	Level of development and macro poverty (council)		++	++	
		Level of development and micro poverty (local, village)		++	++	
	Health	Impacts related to overhanging cables			-	
		Accident risks faced by the population				
		Impacts related to the spread of HIV/AIDS		-		
		Impacts related to fire risks around substations				
	Employment	Underemployment and poverty level		++	++	
		Subcontracting capacity		++	++	
		Economic potential of the project (indirect jobs and activities)		++	++	
	Land	Sensitivity to the substitution of ownership and use of space (expropriation)		-		
		Sensitivity to the value of property, parcels of land or constructible zones		---		
Agriculture	Scope of crops and plantations		-			
Stockbreeding	Scope of stockbreeding and exposure to accident risk		-			

Trade and other activities	Impacts on trade and handicrafts		-	++
Heritage	Impacts on historical and cultural heritage		-	
Landscape	Value of local landscapes		-	-
Living Environment	Sensitivity to noise nuisances near dwellings		-	
	Sensitivity to risk of accidents and other nearby sources		-	-

3.1 Negative Impacts

3.1.1 During the Preparation Phase

The initial damage to the physical and human environments will be recorded during the pre-construction phase. The major negative impacts will be: (i) disruption of activities; (ii) obstruction of traffic and access roads; (iii) displacement of networks; (iv) felling and pruning of trees resulting in the loss of vegetation cover; (v) land use through the construction of workers' camps as well as the storage of materials and equipment resulting in soil compaction and possible land clearing.

Risks associated with expropriation: the relocation of persons will be minimal. *Physical relocation* will be virtually avoided, except for four houses. Compensatory measures will be implemented for other affected property such as crops and fruit-bearing trees. Project affected persons (PAPs) have been identified and an Abbreviated Resettlement Plan (ARP) prepared. Fifty-nine PAPs have been identified in Djenné and 55 in Talo, which is a total of 114 PAPs. The deadline for eligibility assessment for compensation is June 2017.

In accordance with Mali's energy policy and land laws, land required for the installation of new low-voltage/medium-voltage distribution boards will be selected in a way to avoid expropriation.

3.1.2 During the Construction Phase

The **potential negative impacts** for physical and biological environments are: (i) tree felling and temporary destruction of plant cover; (ii) obstruction of vehicular traffic on roads and access roads and the risk of road accidents due to the movement of machines; (iii) risk of oil pollution in the event of non-maintenance of mini power plants; (iv) increased pressure on water resources; and (v) waste management during the construction phase.

The potential negative impacts on the social environment are: (i) increased vulnerability of some categories of local residents; (ii) non-preservation of places of worship or classified sites; (iii) risk of non-management of the interfaces between the Bani Basin and Sélingué Irrigation Development Programme (PDI-BS) and the Project for the Development of Mini Hydroelectric Power Plants and Related Distribution Networks (PDM-Hydro); (v) risk of desecration of sacred sites; and (vi) obstruction of pedestrian traffic.

The influx of people from neighbouring towns in search of jobs may disrupt socio-cultural equilibrium among the local population. Likewise, construction workers may adopt behaviours that could violate local customs and traditions and spread STIs and HIV/AIDS.

3.1.3 During the Operation Phase

Electricity networks will contribute significantly to strengthening the security of the area's population. This is deemed to be a positive and strong impact for the population and their property. The use of generators will decrease significantly, thus contributing substantially to noise reduction, particularly at night, as well as fuel consumption.

Adequate signage and sensitization of the population on safety regulations should help to

minimize the risk of accidents. After commissioning, the specific impact of the electric and electromagnetic fields of the medium-voltage and low-voltage transmission line network and transformer stations on the health of local residents will be well below the thresholds and recommended international standards. The impact is considered to be minor.

3.2 Positive Impacts

During the construction phase, the project will generate beneficial socio-economic impacts, offering job opportunities for local rural youths through the creation of: (i) about 400 direct jobs, at least 15% of them for women, on construction sites; and (ii) indirect jobs related to the development of commercial activities (sale of agricultural and handicraft products, and food) around workers' camps.

During the operation phase, the project will generate **beneficial impacts** on the social environment, particularly rural areas, and contribute to improving the quality of life of 12 500 households (5 200 in Djenné and 7 300 in Talo). More specifically, the project's cross-cutting impacts on socio-economic development will include: (i) the creation of some 20 permanent jobs; (ii) the creation of an environment conducive to developing new income-generating activities, thanks particularly to public lighting enabling the extension of the working day (opening of cafés and restaurants, sale of frozen products, opening of hair salons and welding shops, etc.); (iii) the improvement of the quality of public services, particularly health and education; (iv) the improvement of security of people and property through public lighting; and (v) better access to information and entertainment technology.

3.3 Mitigation and Enhancement Measures

Before the construction phase, the EDM-SA/PMU will specify in the bidding documents obligations and clauses intended to protect the natural and human environments. The specifications of bidding documents for the execution of works will clearly indicate the environmental and social requirements to be complied with. In addition, the bid evaluation system will give priority to commitments regarding compliance with the environmental regulations of Mali and the inclusion of environmental considerations in all construction site operations. The guarantee period will cover environmental and technical aspects. Similarly, the selection of a consultant for the control and monitoring of works will necessitate the establishment of an environmental unit. The bid evaluation system will include relevant competence criteria.

Before installing and setting up workers' camps and construction sites, the Contractor will, for each construction site, submit to the Consulting Engineering Firm and the PMU for prior approval: (i) working designs for optimizing the routes of power distribution lines; (ii) a Construction Site Traffic and Installation Plan; the installation of workers' camps and equipment depots near localities must be approved by the Consulting Engineering Firm to enable the EDM-SA to own the infrastructure at the end of construction works; (iii) a Site Environmental Protection Plan (PPES) including a Site and Construction Site Environmental Management Plan (PGESC) and a Health, Safety and Environment (HSE) Plan. To guarantee the safety of workers, local residents and users of road networks and the roads along the future power transmission lines, the Contractor will be required to take all precautions to prevent road accident risks, fire risks, etc. Furthermore, personal protective equipment (PPE) – helmets, gloves, protective footwear and safety belts – should be made available to skilled workers.

Prior to the commencement of works, the project supervisor should, based on the working design, picket the road on the ground so as to: (i) optimize the identification of owners of property that may be damaged; (ii) define access to property that must be maintained during construction and/or returned to their owners after the works; (iii) implement the ARP, in collaboration with local authorities and in accordance with the legal provisions in force in Mali; and (iv) optimize the Deforestation/Reforestation Management Plan.

During the construction phase, the mitigation measures to be implemented by the Administration will include: (i) the organization, by the services of the Ministry for the Advancement of Women, Children and the Family (MPFEF) and specialized NGOs, of information and sensitization campaigns for technical services, pupils, local residents, traditional rulers, authorities (local, regional and national), users, transport unions and local communities, using every possible means. The campaigns will also focus on: (i) safety- and risk-related issues in order to induce behavioural change among the population regarding the efficient use of energy and the fight against electrocution and global climate change (mainly for school children, clubs and youth centres); and (ii) incentives for hiring local manpower and subcontracting to local NGOs during the execution of works such as sensitization, the collection of climate, agricultural as well as forestry and wildlife data.

The Contractor will ensure that terrestrial wildlife and water resources are protected during the execution of civil engineering works and the deployment of power transmission lines.

The installation of fuel and lubricant deposits will consist of units for storing barrelled products placed in appropriate containment areas to avoid spillage and minimize fire hazards. Provision will be made for oil spill clean-up equipment. The equipment will be kept in perfect working condition.

Containment of inflammable and hazardous substances: storage areas for inflammable products should have adequate emergency equipment in good working order. Used oils will be collected in tanks or drums, recycled and evacuated from the site, according to conditions laid down by regulation.

Tree felling and pruning: tree felling will be subject to authorization by the Regional Department of Water Resources and Forests. By way of compensation, trees will be planted along road rights-of-way and road networks beyond drainage facilities (before and after project completion).

Dust emissions: to reduce dust emissions caused by the movement of machines and the transportation of materials, the construction site managers will water earth roads near inhabited areas. Temporary deposits of backfills or debris may also need to be humidified.

Liquid discharges, risk of water pollution, and solid discharges: depending on the size of sub-construction sites, the effluents produced will be collected and disposed of using mobile systems. Potential depots of oil and petroleum products will be designed in a way to prevent them from draining onto the ground, into River Bani and streams. They will be conveyed to authorized dumps (belonging to the EDM-SA or municipal councils), to facilitate their selection and recycling, particularly for lumber, metal, rebars and organic compost.

The construction of transformer stations will require the execution of civil engineering works, while maintaining road traffic at all times. In addition, the water drained from concrete mixing areas will be collected in silting basins with no outlet. The suspended particulates stored in such basins will be collected and the dry residue evacuated to a controlled or authorized rubbish dump.

Furthermore, the Contractor must respect the local population's living environment by: (i) placing mobile signals in construction sites, especially at night, road signs and speed-limit signs in dangerous areas; (ii) rehabilitating access roads used by local residents; (iii) preserving the health of the local population; (iv) ensuring that his staff respect local customs and traditions; and (vi) ensuring that his staff go for periodic medical check-ups.

The measures **during the operation phase** will concern the safety of local residents, site workers and road users, the maintenance of power distribution lines, transformer stations and appurtenances (manholes, drainage ditches, earthing, etc.). IEC and sensitization campaigns will be organized on safety requirements regarding newly installed electrical equipment (transmission lines and transformer stations), but also the technologies that will be powered by this energy and efficient energy use. Furthermore, to contribute to women empowerment, the project will, through the MPFEF, establish multipurpose platforms (infrastructure and equipment) in 10 localities in the project impact area to contribute to ensuring efficient energy use and diversifying sources of income. Reports on the implementation of these project activities, indicating the number of participants for each locality, will be prepared. On the whole, the project will generate beneficial impacts during the operation phase.

3.4 Residual Impacts

Residual impacts are those generated **after mitigation measures are implemented at the end of construction works**. Most of them will be positive. Negative residual impacts will be negligible or limited. They will concern (i) local landscaped patterns due to the permanent presence of pylons; (ii) periodic pruning (annual or bi-annual) carried out by the operator (EDM-SA); and (iii) pollution risk in the event of the non-maintenance of facilities.

3.5 Cumulative Impacts

Cumulative impacts are those ensuing from the combined effect of the activities of the project itself and related actions and/or projects or actions in the same impact area. These mainly include cumulative impacts generated by: **(i)** the project on the existing Djenné and Talo hydroelectric dams (at the end of the construction phase) which have already had an impact on their respective environments. It is necessary to establish a coordination of PMUs to jointly restore and protect dam embankments at the Talo site as well as ensure work scheduling; **(ii)** the other four (4) SREP complementary projects, namely the micro and mini hydroelectric plants of Billy, Kénieto, Farako 1 and Woroni. ESIA/ESMPs as well as a Strategic Environmental and Social Impact Assessment are being prepared and take into account all SREP studies on the six sites.

4. ENVIRONMENTAL RISK MANAGEMENT AND CLIMATE CHANGE

4.1 Project-related Environmental Risks

Pollution will be the main environmental risk due to the poor management of construction site waste such as pollutants (storage, transportation and use). It is therefore necessary to provide for a Waste Management Plan in the specifications. The plan should include the collection of inert and chemical construction site waste. All technical specifications for compliance with standards regarding energy generation equipment will also be specified in the bidding documents.

Another potential risk during the transmission line deployment phase is vulnerability to road accidents. Thus, safety measures, sensitization and training will be provided for locally recruited staff, local residents, site staff, competent services, particularly civil protection, etc.

The measures taken to mitigate these risks will include: (i) the sensitization and training of construction workers and ad hoc teams from neighbouring localities regarding emergency response techniques; (ii) compliance with safety measures in dangerous or hazardous zones; (iii) the installation of communication and rapid evacuation equipment; (iv) the conclusion of contracts with workers' health care services and health centres; (v) the establishment of and provision of medical supplies to outreach pharmacies; (vi) the sensitization of the local population on the prevention of health risks and on road safety; and (vii) the conduct of epidemiological investigations to assess project impacts on the environment and human health.

4.2 Climate Change

The project has been classified under Climatic Category 2. The annual power generation of the **Djenné** hydroelectric power plant is about 17.75 GWh/year. For this amount of hydroelectric power generated, about 11 900 tCO₂ can be avoided yearly compared with thermal power generation (diesel). The annual power generation of the Talo hydroelectric power plant is 5.93 GWh/year, corresponding to about 3 900 tCO₂ that can be avoided yearly. For a facility with a service life of 25 years, 395 000 tCO₂ will be avoided.

In addition, the erosion of the embankments of the Talo and Djenné dams is being addressed under the PDI-BS. They will benefit from adjustment measures (resilience) which consist in constructing protective walls using heavy ripraps.

5. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

5.1 Organization of Environmental and Social Monitoring and Control

Under this project, the monitoring programme will first ensure that the mitigation and enhancement measures proposed in the ESMP are effectively implemented during each project phase (installation, construction and operation).

The Delegated Project Owner (DPO) will ensure the overall environmental monitoring of the ESMP through its Project Management Unit (PMU) comprising an environmentalist and a socio-economist, with the support of the environmentalist of the Consulting Engineering Firm (control mission) in its capacity as Delegated Project Supervisor. Environmental monitoring will concern compliance with regulations, the management of construction site(s), the execution of specific environmental and social works and the search for solutions to specific environmental problems. The Malian Government will ensure the periodic inspection of project implementation. The reports prepared by the PMU, assisted by the Consulting Engineering Firm (CM), will include, among other things, the physical implementation of works, the technical and environmental problems faced, the solutions envisaged, and the efficacy of environmental and social measures. These periodic (quarterly) reports will be submitted regularly to the Bank. The monitoring programme will comprise two parts, namely monitoring by the Consulting Engineering Firm (CEF) and monitoring by the DNACPN.

The Consulting Engineering Firm (control mission) will in particular be responsible for: (i) examining the Contractor's detailed ESMP of the construction site and specific procedures; (ii) verifying the assessment of the negative impacts identified; (iii) verifying the efficacy of proposed measures; (iv) studying specific conditions of applicability of proposed measures; (v) controlling the application of measures during the construction phase; (vi) monitoring the proposed measures; (vii) proposing remedies where major impacts occur; and (viii) carrying out an environmental assessment upon project completion .

The PMU, with the assistance of the Consulting Engineering Firm, will use monitoring indicators to assess the project's implementation status and ensure that the various project objectives are in harmony with national environmental objectives.

The ESMP matrix in Annex I includes monitoring indicators as well as the proposed actions and measures.

6. ESMP COST

The cost of the environmental measures to be mainstreamed into the project will be included in the Contractor's priced bill of quantities. Compensation for property destroyed will be included in the Resettlement Plan.

The total ESMP cost is estimated at **CFAF 351.5 million, or about EUR 535 000**, representing nearly 1.03% of the project cost. Table 3 below shows the cost breakdown by site and set of measures.

Table 3: ESMP Cost Breakdown

Proposed Measures	Djenné	Talo	Total Cost	
	Cost (CFAF)	Cost (CFAF)	(CFAF)	(EUR)
Cost of compensation for private property and public infrastructure destroyed in the right-of-way of power transmission lines (ARP)	MI	MI		
The compensatory reforestation of 94.05 hectares in Djenné and 109.629 hectares in Talo at CFAF 5 000/plant	47 025 000	54 814 500	101 839 500	155 243
Protection of terrestrial and aquatic wildlife (sensitization of workers on the need to avoid poaching)	1 000 000	1 500 000	2 500 000	3 811
Protection and restoration of degraded soils	4 000 000	6 000 000	10 000 000	15 244
Measures to protect water resources (construction of 3 boreholes, 2 in Djenné and 1 in Talo), sensitization of workers, analysis of water to establish the baseline situation, etc.)	20 000 000	12 000 000	32 000 000	48 780
Measures to control dust and carbon emissions and reduce noise and vibration (watering the road at the crossing of localities, ensuring the regular maintenance of vehicles and machines, insulating noisy areas, laying speed bumps, etc.)	3 000 000	6 000 000	9 000 000	13 720
Measures for preserving and protecting the archaeological sites identified on the site (in-depth studies and documentation on the sites identified, identification plate, demarcation and boundary marking)	1 000 000	3 000 000	4 000 000	6 098
Sensitization of workers on occupational health and safety	1 000 000	3 000 000	4 000 000	6 098
Procurement of collective and individual safety materials and equipment (fire extinguisher, road signs, appropriate individual protective equipment – IPE, etc.)	4 000 000	6 000 000	10 000 000	15 244
Mitigation measures concerning the health and safety of the population (awareness campaigns on STDs and HIV/AIDS, water- and hygiene-related diseases, provision of condoms and sanitary facilities, etc.)	3 000 000	5 000 000	8 000 000	12 195
Solid and liquid waste management (waste collection and disposal systems, sanitation infrastructure in workers' camps, etc.)	3 000 000	3 000 000	6 000 000	9 146
Building the capacity of basic social services (health instruments, training of health workers, schools, etc.)	3 000 000	6 000 000	9 000 000	13 720
Support of local initiatives for women and vulnerable groups in the study area (FF)	1 500 000	2 000 000	3 500 000	5 335
Annual monitoring of the quality of water resources (1 500 000/semester)	3 000 000	3 000 000	6 000 000	9 146
Building the capacity of actors in environmental management (coverage of the trainer's expenditure, per diem and management tools, etc.)	3 000 000	4 000 000	7 000 000	10 671
The operating costs of the Monitoring Committee (reproduction of documents, input of data, conduct of studies, coverage of travel expenditure, etc.)	8 000 000	10 000 000	18 000 000	27 439
The operating costs of the Environmentalist of the Consulting Engineering Firm (control mission) (10% of the project cost) (*)	10 552 500	69 888 500	80 441 000	122 623

Proposed Measures	Djenné	Talo	Total Cost	
	Cost (CFAF)	Cost (CFAF)	(CFAF)	(EUR)
Other unforeseen measures (5% of the cost of measures)	5 276 250	34 944 250	40 220 500	61 312
TOTAL	121 353 750	230 147 250	351 501 000	535 825

(*) Calculated based on the entire project, that is including the installation of the hydroelectric plant in the dam.

7. PUBLIC CONSULTATIONS AND DISSEMINATION OF INFORMATION

The ESMP was prepared based on a participatory approach adopted at the early stage of project preparation during the validation of terms of reference by the groups concerned.

The entire population welcomed the project because they are convinced that it will improve their living conditions. They all hope that the project will contribute to promoting the socio-economic development of the localities crossed by helping the population to carry out income-generating activities thanks to the availability of electrical power. Some of them even expressed fears about the non-concretization or slow implementation of the project given the high expectations of the population. They, however, expressed some concerns and made proposals for improvement.

Public consultations were held between 20 May 2016 and 24 May 2016 and between 22 October 2016 and 24 October 2016 in Diabolo, Syn, Bangassi, Konanssiadougou, Koundaraka, Ouan, Bourasso, Konio and Kombaga. The main opinions, proposals and recommendations made by participants were:

- the installation of power transmission lines should have no major impacts on their land;
- the need to involve them in project activities before works start ;
- support should be given to women and nurserymen to facilitate compensatory reforestation;
- the conditions for connection to the network should be simple and the price per unit of electricity reduced;
- there should be no interference with places of worship, sacred sites, cemeteries and social facilities.

Thus, it is necessary to optimize the transmission line route right-of-way to avoid displacement of places of worship and sacred sites located in the transmission line right-of-way. The participants underscored the need to electrify all villages located on the power transmission line route (for reasons of inter-council solidarity).

The issue of compensation for loss of land and property in the transmission line right-of-way and the need to adequately sensitize PAPs were also raised. To that end, it is necessary to involve the municipal council and local communities as well as traditional rulers. Preferably, they should be informed at least six months before the start of works.

They expressed concerns about conditions for connection to the electricity network and the kWh unit price. They also called for the prioritization of the hiring of local manpower during construction.

The local population and communities will be closely involved in environmental surveillance and monitoring. This will enable them to hold discussions with the project team on the impact of project activities and possible modifications to be made.

The DNACPN, through the Regional Directorate of Pollution and Nuisance Control (DRACPN) of Mopti and Ségou, and the PMU will carry out a continuous communication, consultation and sensitization campaign while taking steps to:

- consult men and women likely to be affected during all phases of project implementation;
- provide the opportunity for all PAPs to participate in consultations by proposing appropriate consultation mechanisms;
- explain to the local population how their concerns will be or have been taken into account.

All partners will be regularly consulted through local radio broadcasts, the public media and village meetings. At the national level, the DNACPN will evaluate the validation process and publish it for 30 days. The project promoter and key stakeholders identified in the project environmental and social management plan will then be responsible for the implementation of the measures proposed in the ESMP.

The Bank will as well organize consultations during its project implementation supervision missions. ESMP and ARP summaries will also be posted on its website.

9. CONCLUSION

The environmental and social impact assessment shows that the implementation of the project will have some limited negative impacts, but also major positive impacts on the socio-cultural and socio-economic environments during the construction of power transmission lines. The potential negative impacts of the project will have no ecological effect both in the immediate project impact area and its environs, because they will be technically restricted within reasonable limits, and offset by the adequate corrective measures specified in the ESMP.

Positive impact enhancement measures will strengthen the project scope. The project is deemed acceptable from the environmental and social standpoint.

10. REFERENCES AND CONTACTS

- ESIA/ESMP Report on the Djenné Transmission Line.
- ESIA/ESMP Report on the Talo Transmission Line.
- ESIA Report on the Djenné and Talo Power Plants.
- ARP Report for Djenné and Talo.

For more information, please contact:

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- Mr Salim BAIOD, SNSC Department, (s.baiod@afdb.org).

Environment	Impacts	Mitigation Measures and Recommendations	Action Required	Body in Charge	
				Application	Monitoring
Pre-construction and Construction Phases					
Air quality	Degradation of air quality (dust and air emissions)	Equip transport vehicles and machines with anti-pollution devices. Use appropriate means to minimize the dispersion of dust near inhabited areas.	Maintenance and technical control/dust removal machines	Contractors	CEF/PMU EDM-SA
Water quality	Risk of contamination by hydrocarbons and other dangerous products	Control vehicles and machines to avoid the seepage/spillage of hazardous materials.	Maintenance and technical control	Contractors	CEF/PMU EDM-SA
		Preserve vegetation near streams.	Deforestation/Reforestation Plan		
		Prohibit the movement of construction machines within 20 metres of streams and within 5 metres of intermittent streams, except on the appropriate paths.			
	Risk of contamination by wastewater emanating from workers' camps	Prohibit the fuelling of vehicles and machines within 60 metres of streams. Reduce the possibility of the leakage of erodible materials near a stream and direct runoff towards vegetation areas; otherwise, filter the runoff.	Limit the refuelling area to a particular area Construction of a retention pond prior to discharge		
Drainage	Obstruction of the normal flow of water	Schedule periods of intervention in dams outside seasons characterized by floods or heavy rainfall. Pay attention to surface drainage at all times; avoid obstructing streams, ditches or any other channel; remove any debris that interfere with the normal flow of surface water.	General Work Plan (scheduling, situation and planning)	Contractors	CEF/PMU EDM-SA
Soil	Soil erosion and destabilization of soil and slopes Soil compaction Risk of soil contamination	Use deforestation methods helping to preserve minimum vegetation cover (shrubs or grass). After deforestation, mechanically stabilize bare soil to reduce soil erosion risk. Avoid developing access roads along continuous slopes; rather, opt for a vertical or diagonal direction.	Deforestation/Reforestation Plan Plan of Access Paths	Contractors	CEF/PMU EDM-SA
		Upon completion of construction works, level altered soils and encourage the planting of a stabilizing herbaceous stratum.	Implementation study Site Restoration Plan		
		Strictly control the movement of heavy machines; limit the width and number of traffic lanes; limit the movement of machines in work areas and marked access paths.	Traffic Plan, including temporary culverts		
		Provide a passage for vehicular traffic where there is risk of surface compaction or alteration. Use existing borrow pits. Restore borrow pits that will no longer be used by stabilizing slopes, covering them with muck soil and promoting re-vegetation.	Extraction Plan Technical Requirements Note		
Terrestrial vegetation	Damage to vegetation Loss of productive vegetation Risk of invasion by invasive plants near substations	Clearly define logging areas to limit deforestation. Protect trees from machines near rights-of-way.	Deforestation/Reforestation Plan	Contractors	CEF/PMU EDM-SA/DNEF
		Protect tree roots by prohibiting the movement of machines projecting their crown to the ground in such areas; mark out the areas.	PHSE, PPES, Fire Safety Plan		
		Preserve useful trees that have been spared during land clearing for agriculture (such as shea, etc.). Restore vegetation upon the completion of works.	PPES and Reforestation Plan		
		Weed a peripheral buffer zone and provide for fire control equipment (pumps, etc.) Make an inventory of the protected species found in the right-of-way and the sites of substations and compensate for possible loss of such species by setting up corresponding plantations .			

Environment	Impacts	Mitigation Measures and Recommendations	Action Required	Body in Charge	
				Application	Monitoring
Terrestrial, aquatic and avian wildlife	Temporary obstruction of the movement of wildlife	Avoid executing works in wildlife breeding grounds during breeding periods.	PPES	Contractors	CEF/PMU EDM-SA/DNACPN
	Loss/degradation of wildlife habitats	Establish a work schedule and an activity schedule taking into account the presence of wildlife in the area.			
	Poaching	Avoid migratory bird habitats.			
	Loss/degradation of aquatic wildlife breeding grounds	Protect known spawning areas.			
Population	Opportunistic migration	Establish eligibility rules for people wishing to settle in the area after the cut-off date specified to in the Resettlement Plan	Resettlement Plan	PMU EDM-SA	Refer to the ARP
Gender Issues	Loss of property by women	Refer to the Abbreviated Resettlement Plan (ARP).	Resettlement Plan	PMU EDM-SA/MPFEF and NGO	Refer to the ARP
	Potential loss of means of production by women	Facilitate the establishment of women's groups, or consult existing women's groups to ensure that they are organized and represented. Provide women and men with the same job opportunities within the project, encourage women to apply and select candidates based on their skills. Provide the same business opportunities.	Preparation of a Charter/By-laws	Contractor/MPFEF	CEF/PMU EDM-SA/MPFEF/DNACPN
Health Issues	Risk of an increase in the incidence of HIV/AIDS, STIs and tuberculosis	Sensitize and educate the population of the towns crossed by access roads and substations as well as workers on the health risks associated with unprotected sex, particularly the possibility of spreading AIDS.	Sensitization	PMU EDM-SA and NGO	CEF/PMU EDM-SA/DNACPN
	Risk of an increase in respiratory diseases due to transportation activities	Set up workers' camps within a reasonable distance from the local population; ensure that such camps provide access to basic services (drinking water and sanitation) and lay down rules for managing relations between workers and villagers. Ensure the syndromic management of STIs (training of personnel and provision of generic medicine kits) by health centre personnel.	HSE Plan	Contractor	
	Risk of food shortage and increase in malnutrition	While encouraging local purchases, ensure that food supply to workers does not exceed local supply capacity by facilitating supply from local or regional urban centres.	Sensitization	PMU EDM-SA and NGO	
	High risk of accidents due to the execution of works and use of unskilled labour.	Ensure that machines move at reduced speed on construction work and marked areas. Control access to construction sites and machine storage areas. Develop, communicate and implement safety and accident prevention measures for the local population during construction work (fence, monitoring, etc.).	HSE Plan	Contractor	
		At the end of construction work, properly clean and restore construction sites and the surrounding areas affected by construction activities.		Contractor	
Quality of life	Inappropriate or inadequate land acquisition process	Refer to the ARP	Resettlement Plan	PMU EDM-SA	Refer to the ARP
	Feeling of frustration by those not consulted		Resettlement Plan/Complaints Management /Mediation		
	Landscape modification	Consult the people during all the project planning phases. Prepare a communication programme to inform the population about the ongoing works.	Sensitization	PMU EDM-SA	CEF/PMU EDM-SA/DNACPN
Dust, pollution, noise level and accumulation of waste near construction sites and workers' camps	Involve the local authorities in construction activities to minimize obstruction in communities.		Contractor		

Environment	Impacts	Mitigation Measures and Recommendations	Action Required	Body in Charge	
				Application	Monitoring
	Poor living conditions for workers, and social conflicts due to their arrival	Provide for a complaints management entity in the Local Coordination and Monitoring Committee to record all complaints from the local population. Plan construction activities in a manner to avoid obstructing traffic and minimize their impact on the landscape, ambient noise and the local population's lifestyle. Choose the location of construction sites and workers' camps to interfere as little as possible with the activities of the local population.	General Conditions of Contract/ Technical Conditions of Contract/By-laws/Site Environmental Protection Plans (PPES)	PMU EDM-SA PMU EDM-SA /Contractors	
		Where disruptions (such as power outage) are anticipated, notify the authorities and the population concerned and take appropriate steps to reduce the duration and scope of the nuisances. Avoid storing machines and materials in areas other than those considered essential for works and clearly define the boundaries of such areas. Carefully plan housing, basic services (water and sanitation) and the supply of food to non-resident workers and their families, if any.	Facility Map/ Workers' camp/ Construction sites Waste Management Plan Training Programme	Contractors	
	Development of new skills	Avoid accumulating various types of waste outside and on the construction site and evacuate them to the disposal sites provided for that purpose. Encourage the employment of local manpower by promoting, as much as possible, the use of labour intensive construction techniques and providing prior technical training as well as further or on-the-job training.		PMU EDM-SA and NGO	
Economic activities	Loss of productive agricultural and livestock potential	Refer to the ARP	Resettlement Plan	Refer to the FRP	Refer to the ARP
	New business opportunities	Encourage the project Contractor to make purchases locally, while making sure not to create shortages in the area.	Sensitization	PMU EDG and NGO	CEF/PMU EDG/ BGEEE
Cultural and religious heritage	Loss of heritage sites	Ensure archaeological monitoring during earthwork, levelling and digging activities during construction of host sites.	Technical Conditions of Contract	PMU EDM-SA	CEF/PMU EDM-SA /CNS
	Discovery of heritage sites and cultural items during construction activities	Involve traditional authorities in the monitoring of cultural, religious, historical and aesthetic sites and resources during the various project phases. In the event of the discovery of heritage sites and cultural items, suspend construction work, take appropriate protective measures, and contact the relevant public authorities.	Technical Conditions of Contract General Conditions of Contract	Contractors Contractors	
During the Operation Phase					
Soil	Risk of soil contamination due to the accidental spillage of dangerous products (hydrocarbons, herbicides and waste oils in the case of substations)	Maintain minimum vegetation (herbaceous or shrub) cover in the project right-of-way to avoid soil erosion.	Environmental management system certified ISO14000/ designation of a focal point in charge of the environment	Contractors / PMU EDM-SA	DNACPN
Terrestrial, aquatic and avian wildlife	Disturbance of wildlife during maintenance activities Poaching due to easier access	Prohibit power transmission line and substation operation and maintenance staff from hunting wildlife.	Coordination agreement/ Forestry services	PMU-EDM-SA	EDM-S /DNACPN
Health and safety	Risk of accidents for populations located near equipment	Development poses a risk to the local population who have no prior knowledge of the hazards involved, especially children. Thus, it is necessary to sensitize them on the risks associated with a power transmission line and substations and inform them about the measures to be taken in the event of an accident or electrocution. Protect access to power substations as much as possible by, among others things, building 1 metre-deep fences. Prepare an emergency response plan in case of a disaster such as a fire outbreak, explosion and spill. Put up a poster bearing the names and telephone numbers of the officers in charge and describing the alert situation. Train equipment operating staff in the procedures to be followed in case of spills or accidents.	Sensitization Fences Fire Safety Plan Operation	NGO/PMU EDM-SA EDM-SA EDM-SA	

Environment	Impacts	Mitigation Measures and Recommendations	Action Required	Body in Charge	
				Application	Monitoring
		Ensure that all staff comply with the Safety Plan.			
Standard of living and employment	Deterioration of landscape quality	Create a vegetation screen to cover transformer stations when their visual appearance adversely affects the local population.		EDM-SA	
	Creation of jobs related to operation activities	Encourage the recruitment of local manpower (men and women). Inform the local population (men and women) about job opportunities. Provide training that is specific and adapted to vulnerable people (illiterate people, women household heads, etc.) to enable them to have equal access to jobs.		EDM-SA EDM-SA EDM-SA	DNE
Infrastructure and services	Presence of new access roads	Maintain the access roads used to maintain equipment in good condition.		EDM-SA	DNE
	Constraints on land use in the project rights-of-way	After reaching an agreement with owners and operators, allow the controlled recultivation of crops no more than 5 metres tall in project rights-of-way. Sensitize the population on the risks involved in the use of fire near project rights-of-way.		EDM-SA	
	Development of newly accessible land	Provide for the design of development plans in case of major induced development.	Sensitization and signage	EDM-SA	

List of Villages to be Electrified

Capital	Villages to be Electrified
Talo	Talo, N'Tossa, Fani, Unknown Village 1, N'Toba, Unknown Village 2, Dokolo Bambaran, Unknown Village 3, Sofolosso, N'Teresso, Sien Markala, Unknown Village 4, Sien Bambaran, Yangasso, Ngolosso, Wakoro, Unknown Village 5, Unknown Village 6, Unknown Village 7, Tana, Unknown Village 8, Unknown Village 9, Sia, Niasso, Korobougoura, Djeguena, Diabougou, Nangoyo, Sanso, Tiomporosso, Sama, N'Gotogosso, Dieli, Unknown Village 10, Unknown Village 11, Unknown Village 12, Daelan, Unknown Village 13, and Unknown Village 14.
Djenné	Souala, Diabolo, Syn, Unknown Village 10, Madiama, Kessedougou, Bourasso, Unknown Village 2, Konio, Bangassi, Unknown Village 3, Konassiadougou, Unknown Village 4, Unknown Village 5, Unknown Village 6, Koundaraka, Unknown Village 7, Unknown Village 8, Kumaka, Unknown Village 9, Unknown Village 10, and Sofara.