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AFRICAN DEVELOPMENT BANK GROUP

PROJECT : CIPREL EXPANSION PROJECT

COUNTRY : CÔTE D'IVOIRE

SUMMARY

OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

June 2013

Project Title : **CIPREL EXPANSION PROJECT**
Project Number : **P-CI-FA0-005- CIPREL IV**
Country : **CÔTE D'IVOIRE**
Department : **OPSM** **Division: OPSM3**

A. Brief description of the project and key environmental and social components.

The Republic of Côte d'Ivoire signed an agreement with the private company CIPREL (Ivorian Electricity Production Company) by which CIPREL undertakes to design, finance, build in two phases, connect to the Ivorian grid, operate, maintain and transfer a new power generation facility using natural gas and liquid fuels.

The existing power plant comprises five (5) turbines with a total output of 321 MW:

- Phase I: Three (3) General Electric MS 6001 B-type gas turbines each with a capacity of 33MW, commissioned in March 1995.
- Phase II: One (1) General Electric MS 9001 E-type gas turbine, with a capacity of 111 MW similar to the turbines of the previous phase and commissioned in June 1997.
- Phase III: One (1) PG 9171 E-type gas turbine type, with a capacity of 111 MW, to the turbine of Phase II, which started production in December 2009.

All of these machines are equipped with multi-fuel (natural gas and oil-based fuel backup). For base load production, these turbines operate using natural gas, which comes from off-shore resources in Ivorian waters.

In 2009, the Government of Côte d'Ivoire has asked CIPREL to study the possibility of switching to combined cycle gas turbines to increase its power production, a project which was later named CIPREL IV.

The implementation of Phase III of CIPREL (111 MW) has increased the production capacity from 210 to 321 MW. CIPREL IV, which plans to implement a combined cycle on the Gas Turbine 9 (GT9) from Phase III and on the new Gas Turbine (GT10), adding a steam turbine, will strengthen power generation capacity with an increase of up to 543 MW.

Thus, CIPREL IV is meant to contribute to two major goals:

- Strengthen electricity supply of the country by increasing the capacity of the current facility;
- Develop a sustainable development approach through the recovery of heat losses from the existing system to produce electricity.

The project (CIPREL IV) which consists in developing the stage 4 of the expansion will be conducted in two phases:

- Phase A: installation of a new gas turbine (GT10) with an installed capacity of 111MW. Expected commission date is October 2013.
- Phase B: implementing a combined cycle gas turbine using GT9 (from Phase III) and GT10 (CIPREL IV) and connecting them to a Steam Turbine (ST) of 111 MW. The ST is expected to be commissioned in October 2015. The Bank intends to participate in the financing of this Phase B.

All new equipment will be of identical design, brand, and type to those already installed on the site to maximize potential synergies in terms of operation & maintenance. The combined cycle will thus have a gross capacity of 344 MW (333 MW net).

It should be noted that the main fuel for the gas turbines is natural gas without sulphur and that GT9 and GT10 will be equipped with a low-pollution combustion system (Dry Low NOx - DLN). This configuration requires the abandonment of the HVO (Heavy Vacuum Oil) as back-up fuel in favor of DDO (Distillate Diesel Oil). This technical solution was reviewed and accepted by the Government of Côte d'Ivoire in May 2013.

CIPREL is located in Vridi, on the edge of lagoon, in the town of Port-Bouet. The 222MW expansion will be installed on a site adjacent to the existing plant in the industrial area of Vridi dedicated to petroleum activities. The plant will have a minimum life of 200,000 hours, which corresponds to a lifetime of 25 years minimum. The evacuation of the power generated at 225 kV by this expansion will be made on a bay to equip the station 90/225 kV VRIDI.

Original state of the Project environment

Physical environment

The area covered by the study is located in the coastal zone of Côte d'Ivoire, Abidjan. It is a low-altitude coastal lowland area (3 m on average), comprised of Quaternary marine sands with deep waters (over 50 meters), which contain intercalated vases. Groundwater is located at shallow depth.

The project area is surrounded by an equatorial climate (or attiéen climate) that has four seasons: two rainy seasons (March-June and September-October) and two dry seasons (July-August and November-February). This climate is characterized by high rainfall and temperatures consistently above 20 °C.

Biological Environment

The Ebrié lagoon and the Atlantic Ocean are the surface water resources within the area of influence. These habitats remain sufficiently rich in plant and animal species. Crustaceans and fish in the lagoon include several species that are of great economic and commercial importance and is a very substantial part of the biomass of the lagoon.

Socio-economic Environment

In the immediate vicinity of the project site, both formal and informal economic activities are

taking place. Twenty-five companies in the formal sector were identified. These provide services such as transit, used vehicle imports, storing and warehousing of pharmaceuticals and agricultural products and agricultural and mineral raw materials processing. The diversity and quality of processed, treated or stored products make this area an area with a high concentration of activities. There are also units of hydrocarbon processing, and entities manufacturing highly combustible chemicals.

B. Major Environmental and Social Impacts

Positive Impacts

The positive impacts of CIPREL IV apply to all phases of the project, and in particular during construction and operation. There are three main positive impacts:

- Job creation (about 50 additional jobs to CIPREL)
- Increase of the number of customers stemming from the informal sector in the vicinity of the project in the construction phase
- Building energy capacity of Côte d'Ivoire

The construction phase of the project will involve more than 600 laborers. Local subcontractors will also be involved during this phase. Subcontractors may be operators of sand and gravel, oil suppliers, suppliers of cement, etc.

Negative Impacts

During the construction phase, the negative impacts are linked to:

- The emission from construction equipment and generators used on-site;
- The emission of particles and dust;
- Noise emissions from construction activities;
- Accidental spills or leaks from storage tanks of chemicals or fuel or from construction vehicles used on the site;
- The production of wastes;
- The increase in road accidents due to vehicle traffic and trucks;
- The moving and disruption of business activities located on the project site and that of the former foundry.
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During the operational phase, negative impacts are linked to:

- The operation of turbines and engines resulting in gas emissions (NO_x, SO₂, CO);
- Noise emissions of engines and turbines;
- Contamination of surface water and groundwater by industrial waters, wastewater and on site runoff waters;
- Potential leaks or spills of products and chemical substances;

- Health and safety measures;
- The use of hazardous substances and equipment;
- Energized equipment, equipment with high temperature, flammable and explosives

C. Enhancement and Mitigation Programme

Table 1 : :Mitigation Measures during construction phase

Activity / Impact source	Mitigation measures
Potential impacts on air quality	
Emissions of pollutants from construction equipment and generators used on-site.	Construction equipment and generators will be subject to an annual maintenance plan and will be inspected by the contractor in charge of the civil works.
	Visual check of the proper functioning of the equipment
	Air emissions from vehicles used during construction (materials, excavated or filled earth, staff, etc) will be reduced by limiting the number of trips.
Dust and particles emission	Adaptive management of the storage of building materials to minimize fly ash particles and dust: store friable materials in areas sheltered from the wind, water surfaces that generate dust and the route taken by vehicles on site if access roads are not paved.
	Cover trucks when transporting friable construction materials and soil.
	Washing down the tires of vehicles leaving the site
Dust and particles emission	Limiting vehicles' speed
Potential impacts of noise	
Noise emissions due to the construction activities	Measurement of sound levels during construction on site and in the vicinity of sensitive receptors
	Systematic use of noise abating equipment by personnel on site in areas where noise exceeds 85 dB.
Noise emissions due to the construction activities	Local authorities and leaders of neighboring communities will be informed of the timing of construction. A grievance mechanism and a communication and internal monitoring plan, will also be deployed
Potential impacts on water resources	
Erosion and potential increase in underground sediment content	Drainage gutter on site and discharges into the sewer of the industrial area. Annual clean-up of the sewer in coordination with SODECI
	Protection of the temporary storage of raw materials from erosion by using a reduced angle of storage

Activity / Impact source	Mitigation measures
Spills or leaks in storage tanks of chemicals or fuel for construction equipment used on the site	Proper site management practices must be observed if the products are to be properly stored on site (secondary retentions, double wall tanks, over-filling alarm, etc.) and construction equipment inspected and maintained properly and regularly.
Potential impacts on soils	
Soil excavation	Limit excavation works to a minimum
	Confine soil contaminated by the groundwater on the site and reuse it in the deep layer screeds (near or in contact with the groundwater).
Potential impacts linked to waste generation	
Waste generation	All hazardous waste will be collected, stored, transported and disposed of safely and in a manner respectful of the environment by KEPCO, in accordance with the requirements and applicable regulations.
Waste generation	Confirm that all clearings and waste will be removed and disposed of. Note that much of the healthy cuttings will be used on site to level the site up to 40 cm in height.
	A Waste Management Plan (WMP) will be developed before the start of construction and will integrate the collection and management of waste
Potential impacts on health & safety	
Congested routes that can lead to traffic accident	Ensure that exceptional convoys accompanied by two warning vehicles. These vehicles will be driving in front and behind the convoy.
	Install appropriate road signaling on the vehicle ahead and behind the convoy. Avoid stopping convoys in dangerous areas (in turns, downhill, etc.).
Increased accidents due to vehicle traffic and trucks	In order to reduce road accidents, the following measures will be implemented during the construction phase: applying speed limits for project trucks and construction vehicles, renovate et rehabilitate roads if necessary, and report on the busiest routes used
Construction and equipment installation works	Implement measures on site to avoid accidents (wearing of personal protective equipment (PPE), public display of instructions, deny access to any person other than the site personnel, etc.).

Activity / Impact source	Mitigation measures
	Train and sensitize the personnel on risks and measures to prevent accidents
Potential impacts on the population	
Displacement and disruptions of the business activities located on the project site and that of the old foundry.	Relocate and compensate project-affected companies (LDC-CI GETMA-CI, MOVIS, CAP LOGISTICS). Compensation is covered by the State of RCI. Compensation and complaints are handled and implemented through a Resettlement Action Plan (RAP).

Table 2 : Mitigation measures during Operation Phase

Activity / Impact sources	Environmental Management Measures
Potential impacts on air quality	
Operating the turbines which can lead to harmful gas emissions (NO _x , SO ₂ , CO)	Ensure a monitoring of emissions in the vicinity of the stacks by a specialized and independent certified firm focusing on: NO _x , SO ₂ , PM ₁₀ and PM _{2.5}
	Conduct a monitoring of the air quality in the area of influence of the Project at the sensitive receivers using passive diffusion tubes
Operating the turbines which can lead to gas emissions (NO _x , SO ₂ , CO)	Raising stack height of GT9 and GT10 to 40m and 60m for recovery boilers in order to reduce the air concentration of pollutants released into the immediate environment.
Potential noise impacts	
Noise linked to engines and turbines	Monitoring of the noise in the vicinity of the noisiest equipment and receptors
	Implementation of the following mitigation measures: compulsory wearing of PPE (helmets, caps ergonomic ears), noise boxes laying around the noisiest equipment (> 85dB).
Potential impacts on water resources	
Contamination of surface water and groundwater industrial water, wastewater and stormwater on-site	Industrial water will be treated by an oil separator and a decanter before being sent to a pool of chemical neutralization. Out of a total flow of 12m ³ /h, 3m ³ /h will be recycled to minimize waste in the lagoon
	Wastewater (showers, toilets) are treated in septic tanks.
	Rainwater is drained into risk areas (fuel tanks, boilers, machinery, etc.) by a separate system and will be processed by an oil separator before being discharged into the pool of existing storm drainage system.

Activity / Impact sources	Environmental Management Measures
Potential leaks or spills of products and chemical substances	Best management practices and site storage must be observed to ensure no spillage or leakage affects other sub-soil and surface water and groundwater using (secondary retentions, double wall tanks, alarms over-filling, etc.).
Potential impacts linked to waste generation	
Waste generation on site during operations causing soil pollution (leaching, accidental spills, etc.)	Implement the waste management plan of CIPREL II and III updated with CIPREL IV to ensure proper storage, collection and disposal of waste, including liquid and solid hazardous and non-hazardous waste. The plan will describe storage, transfer and disposal in suitable locations (provided by CIAPOL of Côte d'Ivoire). This plan will include a procedure for monitoring the performance of all subcontractors.
	Implementation of the following mitigation measures: properly storing waste in garbage bins, storing hazardous materials in retention, sealing the floor, and removing waste on a biweekly basis.
Health & safety	
Use of hazardous materials and equipment: energized equipment, high temperature equipment, flammable and explosive products, etc.	Train and educate staff to risks and safety measures, as well as wearing appropriate PPE.
	Revising the POI to incorporate the provisions of the new site and issue permits for works involving hot spots.

Table 3 : Measures during Decommissioning Phase

Activity / Impact sources	Mitigation/Management Measure
Decommissioning works could have an impact on the physical, biological and socio-cultural environments	Develop a detailed decommissioning plan to evaluate options related to environmental, health and safety, technical and financial aspects.
	The Ivorian authorities will be consulted and informed and any necessary permissions will be sought
	The measures outlined in the section related to the construction phase will apply to the decommissioning of the power plant: <ul style="list-style-type: none"> • Compliance with noise limits; • Control of the limits of emissions of particles and dust • Compliance with safety standards

Activity / Impact sources	Mitigation/Management Measure
Deconstruction waste and used chemicals used to be disposed of	Waste as well as products and chemical substances will be disposed of by an independent company specialized in waste management.

Noises and vibrations

- The main sources of noise are rotating machines (turbogenerator, fans for ventilation of hot areas and extraction of dusts in the air filter), the ducts of combustion air intake and exhaust gas chimney flue. Noise levels vary between 100 and 114 dB (A). In order to limit the impact of noise, personnel working under noise conditions that are above the regulatory limit will be equipped with earmuffs.
- Noise mapping was carried out in the context of environmental and social assessment of the project which has identified areas at risk of noise problems. The nearest dwellings (houses) of the CIE agents are within 60 m of the site. The noise in the vicinity of the turbines is slightly above 85 dB (threshold of noise provided by the SDIIC value). It should be noted that the tanks of boilers will be equipped with safety valves whose operation will emit high noise levels.
- But generally, in pedestrian areas and areas where there are no turbines, the noise level is below 85 dB. These values reflect the high level of noise in the predominantly industrial zone of Vridi. The direct source is firstly due to the sirens and secondly, to the very dense traffic in this area.
- The new facility will be constructed, equipped and operated so that its operation cannot be the source of mechanical vibrations likely to jeopardize the health or safety of the neighborhood or be a nuisance to it. It will be designed and fitted to limit the production of vibrations and their propagation. The emitted vibrations comply with the technical rules annexed to Circular No. 86-23 of 23 July 1986 relating to mechanical vibrations in the environment by *Classified Installations*.

Air Emissions

For the CIPREL power plant, the gaseous fuel is sulfur-free and consists primarily of methane, therefore emissions stemming from the activity of the plant will be the nitrogen oxides, in terms of both nitrogen oxides (NO_x) and nitrogen dioxide (NO₂), carbon monoxide (CO) and particulate matter (PM).

Two emission scenarios were investigated in this study:

- The current scenario, representing the current emissions by CIPREL,
- The future scenario once the project is implemented.

The air modeling revealed the following conclusions:

- Emissions from existing gas turbines GT5, GT6, GT7, GT8 are the same for the present and the future ;

- The contribution of the plant in terms of concentrations of CO and PM, is negligible for the present and future project design.
- The contribution of the plant in terms of NO₂, is minor in the long term for both the present and the future, but seems to be more important in the short term: NO₂ concentrations occasionally exceed IFC's Performance Standards at a maximum distance of 1 km from the power plant, within the industrial area of Vridi.

D- Monitoring programme and complementary initiatives

Environmental and social monitoring programme

Monitoring is meant to ensure that the environmental management measures are effectively implemented. This monitoring will be conducted by CIPREL's EH&S supervisor. He/she will conduct regular audits of facilities during construction and operation phases. His/her role will be to showcase best practices and management measures to be applied to each project activity. Any deviation will be recorded in a written report. In addition, the EH&S supervisor will conduct internal audits to monitor the correct implementation of the ESMP.

The environmental monitoring is meant to ensure the adequacy of the environmental management measures and to assess their effectiveness. On the other hand, the impacts of which the scope would be different from what was anticipated could be identified. This environmental and social monitoring concerns themes for which the potential impacts of the project before mitigation are relatively high. Monitoring will cover the environmental parameters and socio-economic characteristics of the impacts resulting from the implementation of the CIPREL IV project.

Table 4 : Environmental and Social Monitoring Plan

Aspect	Type of monitoring	Methodology/indicator to be followed	Frequency	Implementation date
Air quality	Monitoring of the Plant's emission into the atmosphere	Ensure the monitoring of emissions in the vicinity of the stacks by a specialized and independent certified firm focusing on: NO _x , SO ₂ , PM ₁₀ and PM _{2.5}	Annual monitoring	Starting from commissioning of the power plant
		Conduct a monitoring of the air quality in the area of influence of the Project at the sensitive receivers using passive diffusion tubes.	Every two months during the first year of operation. After the first year, this monitoring will be repeated every 3 years.	Starting from commissioning of the power plant

Noise levels	Monitoring of noise levels associated with engines and turbines operation	Monitoring of noise levels near the noisiest equipment and sensitive receptors. Comparison of measurements with standards defined by the regulations, Ivorian standards, and IFC	Quarterly review and annual report	During the construction and operation phases of the power plant.
Quality of water discharges	Monitoring of the quality of industrial water discharges	Monitoring of the quality of discharges will be carried out at the outset of treatment process (oil separator, decanter, neutralization basin) Parameters analyzed will include: T ° C, pH, TSS, COD, BOD5, oil, lead, cadmium	Continuously	Starting from commissioning of the power plant
	Monitoring of onsite surface water runoff	In case of an event leading to suspect a risk of pollution, a test of the content in hydrocarbons will be made	Punctual in case of a doubt of an accidental pollution	Starting from commissioning of the power plant
Water consumption	Water consumption monitoring and identification of any possible over-consumption	Monitoring and analysis of EH&S reports on water consumption to detect any abnormality	Monthly control	During the construction and operation phases of the power plant.
Waste management	Monitoring of waste management	Implementing the waste management plan of CIPREL II and III, updated with CIPREL IV to allow storage, collection and disposal of waste load, and including the liquid and solid hazardous and non-hazardous waste. This plan will include a procedure for monitoring the performance of all subcontractors.	Monthly control	During the construction and operation phases of the power plant.
Health & Safety	Monitoring of occupational accidents	Monitoring of the number, type, and frequency of accidents related to the power plant. The types of accidents include road accidents, construction site accidents, and accident in the operation, during maintenance etc.	Monthly control	During the construction and operation phases of the power plant.
Relocation of companies affected by the project	Monitoring of the relocation and compensation plan for	Relocation and compensation of the companies affected by the project	Until the last business/company is relocated and	Compensation scheme before the start of the construction

Aspect	Type of monitoring	Methodology/indicator to be followed	Frequency	Implementation date
	companies affected by the project		compensated	activities

Relocation of companies located on the site of the former foundry and compensation of LDC-CI

The site of the CIPREL IV project is adjacent to the existing site. It is a land with an area of 45,000 m² belonging to LDC-CI (Louis Dreyfus Commodities - Ivory Coast) (formerly STEPC) to be transferred to CIPREL. Only this company will be relocated and no population will be moved or resettled.

However, the shift of part of the activities of LDC-CI on the site of a former foundry will affect three companies: CAP LOGISTICS, GETMA-CI and MOVIS-CI. These three companies are sub-tenants of the new site allocated to LDC-CI. The deadline is the date of granting another site to the company LDC-CI, or August 22, 2012, the date of the special meeting of the Interministerial Commission On assignment of Industrial Lots (CIDLI) during which the Commission analyzed the application for awarding the site of the former foundry to LDC-CI and issued a positive opinion for the allocation of the site with an area of 4.5 hectares to LDC-CI. This favorable opinion was followed on April 3, 2013 by the issuance of "administrative authorization" allowing LDC-CI to undertake works on its new operating site.

Following discussions with the three companies (GETMA-CI, MOVIS-CI and CAP LOGISTICS), it appears that they were informed of the implementation of CIPREL IV project and they agreed to sell the site to the company LDC -CI for the general interest. However, they asked the State for their relocation to another site and the payment of compensation.

In early January 2013, companies MOVIS-CI and GETMA-CI have relocated their operations to other sites belonging to them in the port area. The company CAP LOGISTICS is currently being relocated to the industrial zone of VRIDI.

Although the relocation of companies to the new site of LDC-CI is considered indirect and LDC-CI is the only company directly affected by the project, a Resettlement Action Plan (PAR) was prepared and transmitted to the Ministry of Construction dated 24 April 2013. The PAR also reported negotiations between the Ministry and LDC-CI.

E. Institutional arrangements and capacity-building requirements

CIPREL's responsibilities

The main persons in charge of environmental and social management are the following:

- The EH&S Supervisor of CIPREL IV, specifically in charge of the CIPREL IV project. He plays the role of coordinator to ensure a proper coordination between the stakeholders. The good coordination also ensures information in a coordinated

manner for all parties involved. The EH&S supervisor also ensures compliance by the various subcontractors of the ESMP actions which are under their responsibility.

- The EH&S Engineer is in charge of the quality, environment, health, and safety management systems, along with his/her team. The EH&S engineer guarantees consistency, relevance and effectiveness of the existing system of environmental management. He/she also leads the "sustainable development" project within CIPREL. His role is specifically to audit the implementation and the compliance with the ESMP.

Subcontractors' responsibilities

CIPREL's subcontractors will be responsible for developing their own procedures for environmental and social management in relation to the works they have to complete and in compliance with the ESMP. This plan will be reviewed and approved by CIPREL before the start of operations.

The EH&S supervisor of the subcontracting company will be responsible for implementing the ESMP during the construction phase.

Monitoring of the Resettlement Action Plan

The implementation of the RAP is under the responsibility of the Ministry of Construction of Housing, Sanitation, and Urbanism (MCLAU). However, in the context of the project, CIPREL committed to conduct the following additional initiatives:

- With respect to LDC-CI: ensure a successful compensation of LDC-CI (the replacement land has already been allocated, the monetary compensation remains pending).
- With respect to CAP LOGISTICS: monitor the successful compensation of CAP LOGISTICS. If the State of RCI does not cover such compensation, CIPREL undertakes to cover the compensation on behalf of the State up to 58 million FCFA (requested by CAP LOGISTICS during the meeting of 28 May 2013)
- To transfer complaints to the monitoring committee of the RAP (responsible of the MCLAU in compliance with the RAP) and monitor their processing.

F. Public consultations and disclosure requirements

The public consultation was carried out during the drafting of the Project's Environmental and Social Impact Studies. A fact-finding mission was conducted with the administrative authorities, companies located close to the CIPREL IV site, and surrounding local populations of the municipality of Port-Bouet to collect their views and concerns. These meetings were held from 26 November to 09 December 2011. In addition, as part of the preparation of the Resettlement Action Plan, the companies affected by the project were met from 30 October 2012 to 18 March 2013.

The administrative authorities, the representatives of technical structures, the companies affected by the project and the populations were informed by mails and consulted directly. These meetings led to:

- Informing and educating the administrative authorities;
- Informing and collecting the opinions and concerns of adjoining companies in the area of influence that could be interested by the Project;
- Collecting opinions and suggestions of local communities surrounding the town of Port-Bouet.

It appears from the various meetings of public consultations, that the CIPREL IV project is perceived as beneficial by the local population, notably in light of the benefits it will generate: increasing the production of electricity to meet the growing demand both nationally and internationally, and the creation of jobs.

In addition, and in accordance with the procedures of the African Development Bank (AfDB), this summary of the ESMP will be published on the website of the AfDB at least 30 days before submitting the Project to the Board of Directors of the AfDB.

G. Cost estimation

For most of the proposed measures, which are common practice in the energy industry, the cost is included into the total project cost. All prevention and protection measures for the environment as well as their associated costs are detailed in the following tables:

Table 5: Cost of mitigation measures during the construction phase

Mitigation measures	Estimated Budget
Potential impacts on air quality	
Construction equipment and generators will be inspected and maintained annually by the contractor in charge of the works	Included in the civil works budget
Visual check of proper operation of construction equipment	Included in the civil works budget
Air emissions from vehicles used during construction (materials, excavated or filled lands, staff, etc) will be minimized by limiting the number of trips	Included in the civil works budget
Management adapted to the storage of building materials to minimize fly ash particles and dust: store friable materials in areas sheltered from the wind, water surfaces that generate dust and the route taken by vehicles on site if access roads are not paved	Included in the civil works budget
Cover trucks when transporting friable construction materials and soil	Included in the civil works budget
Washing down the tires of vehicles leaving the site	Included in the civil works budget
Limiting vehicles' speed	Included in the civil works budget
Potential impacts of noise	

Mitigation measures	Estimated Budget
Measurement of sound levels during on site construction and in the vicinity of receptors	Cost not-included in the civil works budget - Approx €500/month
Systematic use of noise abating equipment by personnel on site in areas where noise exceeds 85 dB.	Included in the civil works budget
Local authorities and leaders of neighboring communities will be informed of the timing of construction. A grievance mechanism and communication and internal monitoring plan will also be deployed	No additional cost as compared to current practices
Potential impacts on water resources	
Drainage by on site gutter and discharges into the sewer of the industrial area. Annual clean-up of the sewer in coordination with SODECI	FCFA 5 million/year
Protect the temporary storage of raw materials from erosion by using a reduced angle of storage	No additional cost as compared to current practices
Proper site management practices must be observed if the products are to be properly stored on site (secondary retentions, double wall tanks, over-filling alarm, etc.) and construction equipment inspected and maintained properly and regularly	No additional cost as compared to current practices
Potential impacts on soils	
Limit excavation works to a minimum	No additional cost as compared to current practices
Confine soil contaminated by the groundwater on the site and reuse it in the deep layer screeds (near or in contact with the groundwater	No additional cost as compared to current practices
Potential impacts linked to waste generation	
All hazardous waste will be collected, stored, transported and disposed of safely and in a manner respectful of the environment by KEPCO, in accordance with the requirements and applicable regulations	Cost included in the civil works budget: the builder must dispose of the waste in authorized and regulated landfills
Confirm that all clearings and waste will be removed and disposed of. Note that much of the healthy cuttings will be used on site to level the site up to 40 cm in height	Cost included in the civil works budget: the builder must dispose of the waste in authorized and regulated landfills
A Waste Management Plan (WMP) will be developed before the start of construction and will integrate the collection and management of waste	Included in the civil works budget
Potential impacts on health & safety	

Mitigation measures	Estimated Budget
Ensure that exceptional convoys be accompanied by two warning vehicles. These vehicles will be driving in front and behind the convoy.	No additional cost as compared to current practices
Install appropriate road signaling on the vehicle ahead and behind the convoy. Avoid stopping convoys in dangerous areas (in turns, downhill, etc.)	No additional cost as compared to current practices
To reduce road accidents, the following measures will be implemented during the construction phase: applying speed limits for project trucks and construction vehicles, renovate et rehabilitate roads if necessary, and report on the busiest routes used	No additional cost as compared to current practices
Implement measures on site to avoid accidents (wearing of personal protective equipment (PPE), public display of instructions, deny access to any person other than the site personnel, etc.)	No additional cost as compared to current practices
Train and sensitize the personnel on risks and measures to prevent accidents	Training cost to be borne by the EPC contractor (KEPCO)
Potential impacts on the population	
Relocate and compensate project-affected companies (LDC-CI-CI GETMA, MOVIS LOGISTICS CAP).	Compensation to be borne by the State (amount requested by project-affected entities : CFAF 4.265 billion)
CAP LOGISTICS compensation	CFAF 58 million
Monitoring and processing of complaints and conflicts: within the framework of the PDR, a procedure of monitoring the complaints and conflict is implemented	No cost
Monitorinf of housing conditions of KEPCO workers	No cost
Total cost for the construction phase to be borne by the State of Cote d'Ivoire	CFAF 4.323 billion

Table 6 : Cost of mitigation measures during the operation phase

Mitigation measure	Estimated budget
Potential impacts on air quality	
Ensure the monitoring of emissions in the vicinity of the stacks by a specialized and independent certified firm focusing on: NO _x , SO ₂ , PM ₁₀ and PM _{2.5}	Included in the operation costs
Conduct surveillance of the air quality in the area of influence of the Project at the sensitive receivers using passive diffusion tubes	Around 6,000€ per year of measurement
Raising stacks height of GT9 and GT10 to 40m and 60m for recovery boilers to reduce the air concentration of pollutants released into the	Included in the construction cost

Mitigation measure	Estimated budget
immediate environment	
Potential noise impacts	
Monitoring of the noise in the vicinity of the noisiest equipment and receptors	Around FCFA 0.5 million per year
Implementation of the following mitigation measures: compulsory wearing of PPE (helmets, caps ergonomic ears), noise boxes laying around the noisiest equipment (> 85dB)	Around CFAF 2 million/year
Potential impacts on water resources	
Industrial water will be treated by an oil separator and a decanter before being sent to a pool of chemical neutralization. Out of a total flow of 12m ³ /h, 3m ³ /h will be recycled to minimize waste in the lagoon	Included in the investment costs
Wastewater (showers, toilets) are treated in septic tanks	No additional cost as compared to current practices
Rainwater is drained into risk areas (fuel tanks, boilers, machinery, etc.) by a separate system and will be processed by an oil separator before being discharged into the pool of existing storm drainage system.	Included in the investment costs
Best management practices of site and storage must be observed to ensure no spillage or leakage affects other sub-soil and surface water and groundwater using (secondary retentions, double wall tanks, over-filling alarms, etc.).	No additional cost as compared to current practices
Potential impacts linked to waste generation	
Implement the waste management plan of CIPREL II and III updated with CIPREL IV to ensure proper storage, collection and disposal of waste, including liquid and solid hazardous and non-hazardous waste. The plan will describe storage, transfer and disposal in suitable locations. This plan will include a procedure for monitoring the performance of all subcontractors.	Management time : 5 days to update the WMP at €70/day + 1 day/month for monitoring at €70/day, or approx. €1500/year
Implementation of the following mitigation measures: properly storing waste in garbage bins, storing hazardous materials in retention, sealing the floor, and removing waste on a biweekly basis.	No additional cost as compared to current practices
Health & Safety	
Train and educate staff to risks and safety measures, as well as wearing appropriate PPE	CFAF 5 million/year in training costs
Revising the POI to incorporate the provisions of the new site and issue permits for works in hot spots	No additional cost as compared to current practices

Mitigation measure	Estimated budget
Total cost under the operation phase	CFAF 12.5 million/year

Table 7: Cost of mitigation measures during the decommissioning phase

Environmental management measure	Estimated budget
Develop a detailed decommissioning plan to evaluate options related to environmental, health and safety, technical and financial aspects. The Ivorian authorities will be consulted and informed and any necessary authorizations will be sought	To be confirmed during decommissioning (BOT-type of contract)
The measures outlined in the section related to the construction phase will apply to the decommissioning of the power plant: <ul style="list-style-type: none"> • Compliance with noise limits; • Control the limits of emissions of particles and dust • Compliance with safety standards 	To be confirmed during decommissioning (BOT-type of contract)
Waste as well as products and chemical substances will be disposed of by an independent company specializing in waste management and disposal	Associated costs are not borne by CIPREL (BOT-type of contract)

H. Implementation schedule & reporting timeline

The CIPREL’s EH&S team will implement the measures and activities associated with environmental impacts mitigation and improvement. The timeline for the implementation and reporting of such activities is the same as for the Project itself.

AfDB will also conduct a detailed project implementation review during regular supervision missions. The reports provided by the project will include the works’ physical progress, the environmental impact assessment evaluation forms and audits conducted.

The environmental and social monitoring reports will be submitted annually to the AfDB.