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AFRICAN DEVELOPMENT BANK GROUP

PROJECT: Construction of the toll bridge “Henri Konane Bedie” (ex RIVIERA-MARCORY) and access roads

COUNTRY: COTE D’IVOIRE

EXECUTIVE SUMMARY OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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Environmental and Social Impact Assessment Summary

Project Title: **Construction of the bridge “Henri Konane Bedie” (ex RIVIERA-MARCORY) and the access roads**
Country: **COTE D’IVOIRE**
Project Reference: **P-CI-D00-001**

1. INTRODUCTION

The State of Ivory Coast has started the project of construction of the Riviera – Marcory bridge and the access roads, in order to resolve the problem of traffic congestion in the urban area of the city of Abidjan. The Government has decided to concede the execution of the project to a private contractor. After issuing a tender, the contract has been won by the group of companies BOUYGUES and SETAO, and a public limited company according to the law of Ivory Coast has been founded, called Concession Company for the Riviera – Marcory Bridge, or SOCOPRIM SA. A concession agreement was signed between the Awarding Authority and the Concession Holder on November 14, 1997. This agreement requires that the company SOCOPRIM make an investment with recourse to funds from various sources, and will obtain benefits from a toll levied on the users of the project.

This project for the connection Riviera-Marcory, also known as the project of the 3rd bridge of Abidjan, executed by SOCOPRIM (Concession Company for the Riviera-Marcory Bridge), has been the subject of an ESIS study (BURGEAP, April 1998) and an Action Plan for the Resettlement of the Persons Affected by the Project (BURGEAP - BNETD, April 1998).

As a consequence of socio-political crises, the original project was not completed. Upon resuming the project, ten years later, an update of the ESIS report has been elaborated by BURGEAP, in June, 2009, approved by the National Development Agency in February, 2010. Since then, complementary studies have been elaborated upon request by the African Development Bank: (i) a study of the lagoon environment, of the operations, pile drilling, and the update of the sounding survey, (ii) a complementary socio-economic study (a diagnostic study and a Revised Resettlement Plan meeting the requirements of the ADB), (iii) additions to the initial ESIS report (April, 1998) and to the ESIS update report (June, 2009) to meet the concerns by the financiers, and (iv) the consolidation of the data of the Revised Resettlement Plan (RRP) by including statistical data and the persons affected by the project.

On Wednesday, September 7, 2011, the first part of the work was initiated, and the connection Riviera-Marcory was denominated «the Henri Konan Bédié bridge».

This executive summary was elaborated in order to provide a brief overview of the main environmental and social vulnerabilities of the project. It does not substitute the various detailed reports (the update of the ESIS report and complementary studies: lagoon environment, sounding, socio-economical studies, and the RRP) that present a more detailed description of the impact of the project.

Its goals are:

- (i) To provide a brief description of the project activities and to justify its goals and describe the needs it will fulfil;
- (ii) To specify the political, legal, and administrative framework within which the ESIS has been elaborated;
- (iii) To describe the surroundings of the project;
- (iv) To present a comparative analysis of the alternative project solutions;
- (v) To identify its potential impact and the measures for mitigation and improvement;
- (vi) To recall the proposed security measures, the emergency plan and the analysis of potential technological accidents;
- (vii) To present the monitoring program;
- (viii) To describe the procedure of consultation with the affected persons and all interested parties, to present the main results of the public consultations, and to explain how the expressed concerns have been taken into account in the project;
- (ix) To present complementary mitigation and improvement measures.

2. PROJECT DESCRIPTION AND JUSTIFICATION

The connection Riviera-Marcory, generally known as the "3rd bridge" and denominated the «Henri Konan Bédié bridge», constitutes a fast urban road connecting the municipalities of Cocody and Marcory by means of a bridge over the lagoon of Ebrié. From North to South, its route is as follows:

- The Boulevard Mitterrand, to which it connects by means of an intersection;
- The old Bingerville road;
- The valley of Blingué between the University and the allotments of la Riviera;
- The Boulevard de France;
- The Residence of Madame Thérèse Houphouët-Boigny;
- The lagoon Ebrié, which is crossed by a viaduct with a length of 1,500 metres. On the embankment, the toll office will be built, as well as the exploitation buildings;
- The National Institute of Youth and Sports (INJS, in French), alongside the channel and the bridge of Anoumabo;
- The Avenue Pierre et Marie CURIE;
- The Boulevard Valéry Giscard d'Estaing, where an intersection is planned, marking the end of the project.

The project consists of 2 x 2 traffic lanes in the Northern section, from the Boulevard François Mitterrand to the toll office, followed by 2 x 3 traffic lanes on the viaduct and in the Southern section (Marcory). Its total length is 6,600 metres, subdivided as follows:

- 1st Section (Bd Mitterrand – Toll office: 2,600 m; This section is the North platform, forming an advance dyke of 400 m across the lagoon. On its Northern edge, the toll station will be built, as well as part of the exploitation buildings. Its southern edge will provide the Northern support of the viaduct;

- 2nd Section (Toll office - INJS (viaduct): 400 m on a dyke and 1,500 m of viaduct; It will rest on 31 pairs of foundation piles, with a spacing of 50 m (abutments C0 through C30), with a diameter of 2000, and a maximum depth of about 70 m;
- 3rd Section (INJS – Bd VGE (Marcory): 2,100 m. This section is the South platform. The last abutment of the viaduct will be placed on dry soil, at the location of the present vegetable gardens within the boundaries of the National Institute of Youth and Sports (INJS, in French). This abutment will connect to a dyke platform that will protrude into the lagoon, on the West shore of the Anoumabo channel.

The project aims to relieve the current connections crossing the lagoon Ebrié. The Southern zones are only connected to the Northern sectors by the bridges Félix Houphouët-Boigny and Charles de Gaulle, and these are congested during the better part of the day.

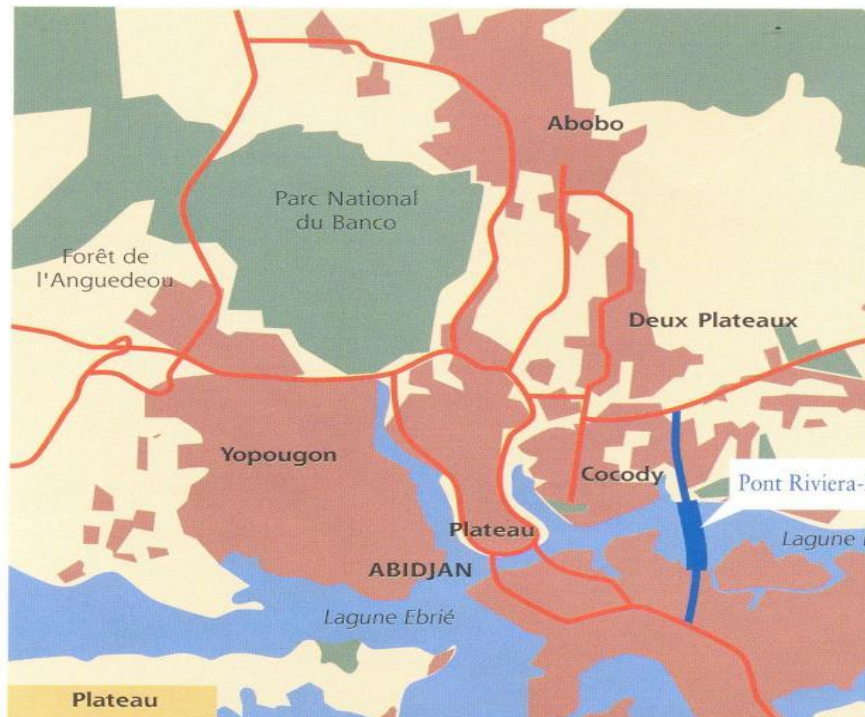
The concession agreement (for 30 years), accorded between the State of Ivory Coast and the Concession Holder, frees the State budget from any expenses related to the construction and exploitation of the works. The agreement also stipulates the general distribution of tasks between the two parties, namely:

- The Awarding Authority will make the terrains available;
- All actions associated with the resettlement of the people affected by the project are also for the account of the Awarding Authority;
- The compensatory environmental measures defined in the framework of the impact studies are for the account of the Concession Holder.

For the duration of the concession period, use of the bridge will be subject to toll payment in order to recover the investment and exploitation expenses.

After analyzing various options, the selected route of the project is the one with least impact on homes and the urban structure. It also ensures a satisfactory distribution of traffic, and forms part of a rational traffic organization plan for the larger urban area of Abidjan.

Thus, the 3rd bridge will allow achieving considerable improvements in travel distance and time with North-South displacements, which will have a positive impact on global economy and on the environment, particularly atmospheric contamination, due to the reduction of the travel distances and traffic congestion.



Source Burgeap, 1998

MAP 1 : LOCATION OF THE PROJECT

3. POLITICAL, LEGAL, AND ADMINISTRATIVE FRAMEWORK

Ivory Coast achieves independence in 1960 and adopts a Constitution that establishes a policy based on economic liberalism within a democracy under the rule of law.

Following a difficult transition, characteristic of young democracies, marked by a state coup in 1999, political alternation was established in 2000 after the adoption, that same year, of a new Constitution approved by a very large majority (Law 2000-513 of August 1, 2000, concerning the Constitution of the Republic of Ivory Coast).

Starting September 19, 2002, the country has suffered a political and military crisis that has divided it in two zones (one governmental and one occupied). Following several peace agreements, the country embarked, on March 4, 2007, on a new process to overcome the crisis, based on a political agreement signed at Ouagadougou. The country suffered a post-electoral crisis following the 2nd round of presidential elections on November 28, 2010.

In the framework of the implementation of this project, the state institutions and organisms that intervene in the programming of the various phases of project execution are the following:

Ministry of Economical Infrastructures (MIE)

The Ministry of Economical Infrastructures is responsible for the implementation and the supervision of Government policy for the construction of infrastructures of the country by means of public works. For this reason, it acts as the Supervisor of the Works for the construction project of the connection Riviera-Marcory.

Ministry of Construction, Sewage, and Urban Planning (MCAU)

The Ministry of Construction, Sewage, and Urban Planning is responsible for the design and the implementation of Government policy regarding urban planning in Ivory Coast, through its various departments and services.

In the framework of this project, the MCAU is specifically in charge of the removal and resettlement of persons to prepare the terrains that will receive all the components of the road infrastructure. It will also supervise the Revised Resettlement Plan (RRP) of the persons affected by the project, under the responsibility of the State of Ivory Coast.

Ministry of Water and Forests (MEF)

The Ministry of Water and Forests is responsible for the management of all water resources and the national forest heritage.

Ministry of the Environment and Sustainable Development (MEDD)

The Ministry of the Environment and Sustainable Development is responsible for the design, the elaboration, and the supervision of the implementation of Government policy concerning environmental protection and the promotion of sustainable development and the improvement of the quality of life.

The **National Environment Agency (ANDE)** is an organization of the Ministry of the Environment that is responsible, in collaboration with the work supervisor, for the elaboration of the environmental and social impact study (ESIS), to establish requirements, to evaluate them, to implement public enquiries, and to monitor the environmental impact of the project.

The decree 98-18 of January 14, 1998, approves the execution of the project and declares the project of the construction of the Riviera-Marcory bridge to be of national and public interest.

The managers and policy makers of the African Development Bank and the World Bank have been consulted on matters of environmental and social evaluations and the Involuntary Removal of People in the framework of this project.

4. DESCRIPTION OF THE PROJECT ENVIRONMENT

The geographical context has evolved little since 1998. The project involves two municipalities of the larger urban area of Abidjan: Cocody and Marcory.

In the Municipality of Cocody, the major part of the route runs along the valley of Blingué, which separates the university campus from the allotments of good standing of Riviera. In the downstream section of this valley, close to Boulevard de France, a shantytown had developed, called Blingué (demolished in August, 2011, by the cleanup program of the Ministry of Higher Education and Scientific Research). Subsequently, one encounters a plateau before reaching the lagoon.

In the Municipality of Marcory, the project traverses densely populated urban areas along the Avenue Pierre et Marie Curie, close to the great market of Marcory, not far from the future road. Next, it traverses a less populated area close to the Anoumabo channel, alongside the INJS.

The global relief has not changed in ten years, with the exception of some preparatory works on the worksite. Likewise, the geological context has not changed. The periodic variations associated with the Intertropical Convergence Zone (ITCZ) govern the alternation between wet and dry seasons. Rainfall has decreased after the 1970's, while the duration of the short rain season has increased.

Generally, winds are mild at Abidjan and on the sea close to the urban area. In order to characterize the initial acoustic environment, the surroundings of the area of the new road have been studied and a calculation model was produced corresponding to the sound levels in 1998. The sound levels have not increased significantly since then.

In order to establish the initial levels of air quality, a measurement campaign using collector tubes was performed on site by BURGEAP in April 2009. The car pollution indicators measured for each station are: nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and BTEX (Benzene, Toluene, Ethyl-benzene and Xylenes). The initial air pollution levels show that the roads create possibly stagnant pollution, occasionally superseding the limits established by the WHO at specific sheltered locations. Monitoring the first two constituents will allow determining the project's impact with more precision, while benzene concentrations should be carefully monitored as they are already very elevated.

On the Riviera side, the project terrains lie mainly in the basin sloping down from East Cocody. This very sheltered basin drains East Cocody, the centre of the Two Plateaus and Western Riviera. Its urbanization is incomplete. The trough of this draining basin receives, among others, domestic sewage and hospital wastewater without treatment. This draining basin disposes of a sewage system that is both collective and autonomous.

Towards the South, at Marcory, only the terrains of INJS are not urbanized. The vegetation consists of herbs and shrubs without significant value.

Towards the North, the terrains are cultivated (market gardens and horticulture) between the lagoon and the residence of Mrs. Thérèse Houphouët-Boigny.

Many plantations exist along the valley trough (bananas, oil palms, avocado's, manioc, and maize). Also, other pioneering brush and herb species can be found, particularly in the fallows between the cultivated plots.

The botanical inventory of the island of Riviera, within the project zone, has shown the presence of isolated young plants of *Rhizophora racemosa*, typical of West African mangrove forests, but the majority of the vegetation consists of shrub species: *Ceratopteris cornuta*, *Dalbergia ecastaphyllum*, and *Drepanocarpus lunatus*. The island Riviera harbours some vestiges of the mangroves that in the past populated the lagoon Ebrié.

The arboretum of the National Flower Centre is the only natural area in the vicinity of the project. Some sprouts of species originating from the centre have sprung up outside its enclosure. Generally, these sprouts are destroyed by slash and burn agriculture.

The lagoon Ebrié in the zone of study lies in an ancient valley of fluvial origin, oriented East-West (main channel) and secondary valleys oriented North-South (the bay of Cocody, the bay Thérèse). These depressions, converging towards the undersea canyon called «bottomless hole» offshore from Port Boué, have been carved out during the latest quaternary transgression.

The bathymetry of the study zone is characterized by:

- A central channel, oriented along the axis W-SW/ E-NE, with a maximum depth of 5 to 6 m. The base of the channel is relatively flat along about 400 m, and covered by sediments.
- High beds (< 2 m), irregularly distributed along the shores. On the North shore, they form a continuous fringe with a length of about 400 m, between the bay Thérèse and the terrains of the future platform. Sand islets emerge at the locations where the bank is longest. On the South shore, the fringe of high beds right of the future Southern platform is interrupted by a trench with a depth of 4 m at the mouth of the Anoumabo channel.
- Very marked and relatively regular slopes flanking the depression of the central channel, up to the high beds at the shores.

The sedimentary stratigraphy of the project zone (of the surface of the bedding) is as follows:

- (i) A superficial mud layer, with a thickness of approximately 10 m in the central section of the channel and decreasing or disappearing towards the shores,
- (ii) A very thick layer of loose sand on the North shore (approximately 15 m), diminishing towards the central channel (2 to 3 m),
- (iii) A thick layer of compact clay;
- (iv) Further down, the enveloping substrate of the ancient valley consists of compact sand.

Generally speaking, the lagoon accumulated mud in the central channel, and possesses high sandy beds on the North and South fringes. Even so, sedimentology studies performed in 1998 and 2010 have shown that the muddy sediments are also present close to the shores, particularly close to the outlet of the used water discharge of Riviera on the North shore, and of the Anoumabo channel on the South shore and on the interior of the high sandy beds.

The work site on the North shore cuts through a high sandy bed (with a depth less than 1,5 m, and emerging islets), which potentially constitutes a source of filling material for the future platform.

The reference work by Martin and Marchand (1985) has shown that, in 1983, the sediments of the project zone were less polluted than those of the urban and industrial bays (the bays of Biétry, Cocody, Banco, Marcory) or the zone of the harbour, but clearly more so than those of the Eastern, non urbanized region of the lagoon Ebrié.

The concentration of micro-pollutants (heavy metals, HAP, PCB, and organic chlorines) sampled at 5 locations in 2010 has shown:

- an increase, by approximately a factor of 2, of the heavy metal concentration measured in 1983;
- a large variation of the type of contamination from one sample location to the next, while at least one parameter (Cu, Ni, Cd, Hg or HAP) had a value exceeding the European reference value. By contrast, no significant contamination by organic chlorines (PCBs and insecticides) was found.
- In the project zone, the «natural» sediment discharge was found to be considerable (of the order of 120 mg/l, averaged over the year) due to contributions by the Comoé river and pollutants that stimulate the development of phytoplankton. It should be noted that the discharge of solid material varied considerably from one day to the next, in synchrony with precipitation. Thus, the impact of the works on the discharge of solid material should be monitored and compared to the «natural» solid discharge.

During the construction phase, complementary studies will monitor how sediment discharge is affected by the works, in order to verify that the contamination levels agree with the levels observed in the reference studies.

The various uses of the lagoon are:

- Transport, fishery and navigation: The project zone is frequently crossed by boats transporting people or merchandise (fishing boats, canoes, tourist boats). It does not overlap with any boat-bus lines. Recreational navigation is very limited. Canoe and kayak sports are practiced by the INJS, and regular competitions are held in the project zone.
- Fishing is limited to individual fishing, based on the use of fishing nets from canoes, or cast nets from a standing position. The number of canoes is not very high.
- Sand extraction: For some years now, active sand boats (with dredger) have not been seen on the North shore, where this activity is prohibited. By contrast, the exploitation is liable to continue at Marcory and Koumassi, and, in a less industrial fashion (manual extraction) on the North shore.
- Sewage: The outlet of used water from the Riviéra quarter (where the water treatment plant is inoperative) discharges on the North shore, right of the platform. Likewise, the South section of the project zone receives, via the Anoumabo channel, domestic refuse - direct or collected – of part of the population of Marcory and Koumassi.

Along the bridge and its access routes, land use is as follows:

On the Northern section of the project route,

- In the valley, permanent crops are found: mainly bananas, about twenty oil palm tree plantations, and a few avocado plantations and annual or biannual crops such as manioc and maize. This valley also harbours other species of trees and herbs of some interest, particularly in the fallow zones between crop plots. The presence of the arboretum of the University of Abidjan close to the valley can be noted, harbouring many interesting species of trees but not located on the project route.
- In the plateau zone, apart from some trees along the road Madame Houphouët-Boigny, houses nor plantations are found. Rather, in this zone of the project of limited width (250 m) although quite long, horticulturists and some garden produce fields are found, as well as a grand villa surrounded by a park, a house under construction and its corresponding terrains.

On the Southern section of the project route, near the lagoon, lies the terrain belonging to the INJS (Institute of Youth and Sports). This terrain is covered in brushes and trees without any particular ecological interest. Between the INJS and the channel, one finds small pig farms and a handicraft zone (sand shops and garages), as well as a platform for waste collection. Next, one encounters the very urbanized popular quarter of Marcory.

In the two concerned municipalities, numerical population data have been estimated for the year 2002 based on the census data of 1989 and 1998, by extrapolating the evolution between 1989 and 1998 in order to obtain the population value of 2002, after which a similar method was used to obtain the population value of 2015 (the annual growth rate is of the order of 3.5%). Thus, for 2015, the population at Cocody is estimated at 690,000 and 350,000 at Marcory, while the total population of Abidjan is estimated at 5,252,000.

The Municipality of Marcory (with a total area of about 12.5 km²) is almost completely urbanized, while about half the total surface (132 km²) of the Municipality of Cocody is still unoccupied, caused mainly by the presence of a cultivated valley subject to flooding.

A study performed in 1998 provides an inventory of the people and buildings that are affected by the project; they have been compensated in the framework of the initial Resettlement Plan. A complementary socio-economic study has been performed in April 2009, updated in August, 2010 and containing a Revised Resettlement Plan meeting the requirements of the ADB. This study has produced two reports: a diagnostic study and a RRP identifying all persons newly settled on the project terrains after its liberation in 1998, eliminating all land rights.

In September 2011, a study was performed to consolidate the data of the Revised Resettlement Plan (RRP), including the permanent structures and persons affected by the project. A summary of the Revised Resettlement Plan is attached to this summary of the environmental and social evaluation.

5. PROJECT ALTERNATIVES

Several project routes were proposed when preparing the ESIS of 1998. The impact of each route was evaluated for its technical, economical, environmental, and social merits, including measures to minimize the number of persons affected by the project. The selected route is feasible with regard to the four mentioned aspects while offering an optimal balance between having a low impact on the environment and attracting as much traffic as possible to the connection Riviera-Marcory.

The optimization of the project route has allowed, a priori, minimizing the number of expropriations. In the future, this optimization will further allow liberating an important area for parking space and commercial activities.

Since 1998, after deciding the route and analyzing the various proposed optional solutions for technical, economical, environmental, and social issues in order to achieve the smallest negative impact on the people and the environment, while considering technical viability, economical feasibility, and the fulfilment of the needs of the people, the option «no project» was no longer acceptable to the partners. Said otherwise, taking into account all the guarantees provided by the concession holder and the awarding authority for compliance with technical, economical, environmental, and social requirements, in accordance with the national and international political, regulatory, and administrative framework for the execution of development projects, the option «no project» no longer made sense.

6. POTENTIAL IMPACTS AND MITIGATION/ENHANCEMENT MEASURES

The potential impact of all project phases (construction and exploitation) is identified, and mitigation and improvement measures are proposed.

The positive impact is, mainly:

- The improvement of traffic flow between the South and the North (rapid access to infrastructures such as the CHU of Cocody, the Airport Félix Houphouët-Boigny, the University of Cocody, etc., for people living on the Island of Petit-Bassam and other Municipalities located to the North of the District of Abidjan),
- Improved access to the influence zone of the project and increased real estate value,
- The creation of direct jobs: 840 jobs are created during the construction phase and 120 jobs during the exploitation phase, of which 40 females. The creation of indirect jobs will be favoured by to the increased facility of crossing the lagoon and the creation of services and shops in the intervention zone of the project,
- Improvement of the quality of life of the people.

The negative impact of the project on real estate, buildings, commercial and handicraft activity, agricultural activity, income and employment, communal infrastructure and neighbouring municipalities is associated with expropriation. This issue was treated in the Resettlement Plan elaborated in 1998 and implemented by the Government of Ivory Coast.

A Revised Resettlement Plan was prepared in 2010, in accordance with the policy of the African Development Bank. It has allowed identifying modifications to real estate and buildings, as well as the people who have newly settled in the area after the compensation campaign of 1998.

This list of new persons settled after 2000 has been included in a detailed inventory and a plan for compensation and resettlement. The date to be eligible for a flat rate compensation or resettlement has been set at August 6, 2010.

In September 2011, the study to consolidate of the data of the Revised Resettlement Plan (RRP) concerning the permanent structures and the persons affected by the project has allowed identifying 2,493 persons affected by the project, of which 103 at Cocody and 2,390 at Marcory. All these persons have received special attention and have the right to receive help with resettlement and/or compensation, according to ADB policy on involuntary removal. The summary of the Resettlement Plan is attached to this summary.

Concerning the environmental plan, tables 1 & 2 summarize the impact of all the elements of the project on the lagoon and terrestrial environments.

Table 1 – Environmental impact of the project during the construction and exploitation phases, and the specific impact of activities.

	Activities	Environmental impact on the lagoon environment	Importance of residual impact
Works	Works in North section		
	Remodelling of docking quay	Impact on surrounding vegetation	Medium
		Noise due to the driving of sheet piles	Medium
	Dredging of platform zone	Re-suspension of fine particles and associated effects (increased turbidity, possible liberation of microscopic pollutants, impact on biocenosis)	Minor (since the MES are sucked away by the dredge)
		Modification of the characteristics of the bed – bathymetry, type of sediment, benthic biocenosis	Minor (since the area is small and will be filled)
	The deposit of mud in the lagoon (dispersion cone)	Re-suspension of fine particles and associated effects	Medium (since the effect is diluted across the dispersion cone)
	Construction of the gabion dam	Re-suspension of fine particles and associated effects	Minor
	Intercepting the bank circulation	Re-suspension of fine particles and associated effects	Medium (mitigated by the use of specific dredging techniques)
		Modification of the characteristics of the bed – bathymetry and benthic biocenosis	Minor (since the superficial sediments are not disturbed much)
		Impact on the protection of the groundwater of the soil	Minor (since the extraction zone is of limited size, only affects the first metres of sediment, which is only a small part of the sediments accumulated below the lagoon)
Filling of the North platform	Re-suspension of fine particles and associated effects	Minor (due to the installation of geotextiles around the gabion dyke)	

	Other works		
	Soundings prior to the works	No significant impact	Not significant
	Installation of piles	Small bentonite and liquid cement leaks	Minor (since the leaks are small)
		Re-suspension of fine particles and associated effects	Medium
		Modification of the characteristics of the bed – bathymetry, type of sediments, water biocenosis	Minor (since the volume of the deposits is relatively small)
	Works in the Southern zone	Re-suspension of fine particles and associated effects	Medium (since the effect is diluted across the dispersion cone)
		Modification of the characteristics of the beds – bathymetry, water biocenosis	Medium (since the affected volume will be significant)
	Circulation of floating equipment	Risk of fuel dispersion	Minor
	The worksite of the viaduct and linear works	Production of common industrial solid waste (wood, steel, inert waste, paper and carton, other) and special waste (oil, hydrocarbons...)	Medium to significant The total is estimated at 1,542 tons, of which 18 tons of special waste.
Exploitation	Narrowing of the lagoon channel	A mild increase of the top and tide currents, and turbulence near the piles	Minor
		Modification of the bathymetry and the dynamics of sedimentation due to deposits on the banks and the channel crossing	Minor to medium (to be monitored)
	Circulation of vehicles on the bridge	Degradation of the water quality of the lagoon due to the release of rainwater from the contaminated surface, containing micro-pollutants	Minor (thanks to the projected drainage system of the EPs of the project, and considering the totality of contamination sources containing micro-pollutants affecting the lagoon).

		Risk of degradation of the water quality of the lagoon due to the spillage of dangerous products in case of an accident on the bridge	Minor (in view of the installation of a system of gutters and collection basins)
	Refuse water from the exploitation buildings	Degradation of the water quality of the lagoon	Minor (since this waste water will be drained to a EU collector at Riviera)

Table 2 – Environmental impact of the project on the terrestrial environment, and the specific impact of activities.

	Activities	Environmental impact on the terrestrial environment	Importance of residual impact
Works	- Mechanical equipment and materials transport, engine maintenance	Nuisance due to lighting, noise (mobile equipment, generators, compressors...)	Minor
		Degradation of the soil	Medium
		Generation of dust, mud on the public roads	Minor
		Accidental spillage of petroleum products (fracture of an equipment or vehicle fuel tank, erroneous manipulation when refuelling equipment or vehicle)	Minor to major
	- Ground works: clearing of trees, layout of tracks, technical platforms, sewer networks, bridge works, rerouting of water courses and channels, if needed	The disappearance of vegetation, the production of solid waste, the generation of mud, the destruction of the biological environment, the production of dust	Minor
		Destruction of the vegetation cover and the disappearance of the remains of the mangroves on the islet of Riviera	Medium
		The degradation of the soil and the banks	Medium
- Construction of buildings	Nuisance due to noise	Minor	

		Soil degradation, production of liquid waste (including domestic waste)	Minor
	- Steel works, assembly of cranes	Nuisance due to noise	Minor
		Production of solid waste	Minor
	- Surface foundations	Nuisance due to noise	Medium
		Soil degradation, liquid waste, generation of mud and solid waste	Minor
	- Concrete slabs	Soil contamination	Minor
	- Construction and pavement of the road	Production of solid waste	Minor
		Generation of liquid waste (residues of coating products) and contamination of the water and soil (accidental spillage of coating products)	Minor to major
		Soil degradation, air pollution	Minor
		Nuisance due to noise	Medium
Exploitation	- Intense high speed traffic and increase of impermeable surface area	Rainwater runoff and production of liquid waste (water containing hydrocarbons, leakage of petroleum products from rolling stock ...)	Weak to major
		Nuisance due to noise	Medium
		Air pollution (gas emissions from rolling stock)	Major
		Degradation of air quality	Major
		Soil contamination due to the infiltration of contaminated water	Minor to major
	Presence of the viaduct	Impact on the landscape	Minor
	Traffic and congestion, presence of the intersection	Soil contamination due to the infiltration of contaminated water	Minor to major
		Nuisance due to noise	Medium
		Generation of household waste	Minor

Table 3 – Summary of environmental and social measures (outside the PR) for mitigation and improvement concerning soil degradation under the responsibility of the works supervisor

Category	Description of the measure	Phase
Environmental and social measures for mitigation and improvement (lagoon environment)	Perform sediment studies in the zones affected by the works	Prior to construction
	Identify a deposit for the clays extracted from the excavations	Prior to construction
	Mark the manoeuvring and docking zones of the floating equipment	Construction
	Design and implement measures to avoid contamination of the lagoon by rainwater and waste water	Exploitation
Environmental and social measures for mitigation and improvement (terrestrial environment)	Restore vehicle and pedestrian traffic access to the bridge-channel of Anoumabo	Construction
	Restore vehicle and pedestrian traffic access to the bridge-channel of Anoumabo	Construction
	Restore pedestrian traffic across the South connection	Construction
	Restore pedestrian traffic across the North connection	Construction
	Installation of a sound wall for the South connection	Exploitation
	Installation of a sound wall for the North connection	Exploitation

A waste management plan will be designed as part of the soil degradation plan, in which waste will either be dumped in an appropriate manner or treated according to its nature, always respecting current regulations and norms.

7. ENVIRONMENTAL HAZARD MANAGEMENT

In accordance with the policy of the awarding authority, a Safety, Health and Environment plan has been drawn up in compliance with current norms and laws, in order to identify and control the risk of accidents on the worksite (e.g.: a fire in a fuel deposit, etc.) during the various construction works, dredging activities, pile drilling, exploitation of the works, etc.

The awarding authority commits himself to elaborating all documents related to the management of environmental risks, namely:

- (i) the elaboration of a specific Safety and Health Plan for the project;
- (ii) the elaboration of an Emergency Response Plan for handling accidental spillage and accidents, in accordance with current regulations and norms; This Emergency response Plan will specify the responsibilities of the company, SOCOPRIM and competent authorities (MIE, the Ministry of Environment, civil protection, etc.) during the construction and operation phase. Socoprim ensures its implementation and its update as needed. Such emergency plans will be part of the ESMP and will be ready before the start of works, and the other prior to the bridge service. Loan agreements and the concession contract require an ESMP, which states inter alia an emergency plan.
- (iii) the elaboration of a brief safety plan (traffic and displacements on the worksite, individual protection gear, signs, protection equipment for technological risks, good practices on the worksite, a personnel training program, an evacuation plan); and
- (iv) the elaboration of a provisional traffic plan during the construction phase.

The mentioned management plans will form part of the detailed soil degradation action plan.

8. MONITORING PROGRAM

The monitoring program is based on a set of environmental and social indicators, with the objective to characterize the impact of the project and the compliance with national norms and those of the financiers, and to implement corrective measures, if needed.

The program consists of two parts: monitoring measures during the works (measures in the construction phase) and monitoring measures during the exploitation phase.

Among others, this program includes the control of the quality of drainage water from sediment deposits, quality control of sediments in the dredging zones prior to the works by drilling for micro-pollutants (HAP, hydrocarbons, metals), performed in first approximation on a square grid with a grid size of 25 m, an annual inventory of the fauna and flora in the water and in the surroundings during the work phase and the exploitation phase, and an annual inventory of the lagoon bed during the work phase and the exploitation phase, including a bathymetric and sediment study.

9. PUBLIC CONSULTATIONS AND PUBLIC DISCLOSURE

In 1998, various actions were taken in relation to public enquiries and the dissemination of information. These included: (i) an enquiry to establish public acceptance of the declaration of public interest of the implementation of the PAR; (ii) enquiries to gather information from and consult all the participating parties in the framework of the presentation of the project by SOCOPRIM, and (iii) public start and stop enquiries at the municipal level to gather advice.

The concerned registers and reports are attached to the 1998 reports.

When the ESIS was updated, random public consultations and information campaigns were organized by the concerned municipalities, particularly Marcory, where the project terrains had been newly occupied by persons, settled provisionally after the finalizing the recognition of rights holders in 1998. Several public meetings were held in August, 2010, and in September, 2011, in the rooms of the polyvalent hall and the marriage chamber of the City Hall of Marcory, in order to inform the temporary occupants about the liberation of the project terrains prior to initiation of the works. Such meetings were also held in Cocody at the municipal hotel and at the technical service of the said municipality. Some meetings were held at the workplace of the affected people.

All the persons installed on the terrains were identified again (September, 2011) and consulted. The lists of the persons identified in this socio-economic study are attached to the PR.

The concerns of the PAPs centred on their need for Government help to find alternative settlement locations, or else to grant them financial support so that they might continue their economical activities elsewhere without problems, their desire not to lose their work, and the importance of safeguarding their interests during the resettlement process. The various needs and expectations of the PAPs have been taken into account in the resettlement measures of the RRP, in particular: help with resettlement, the guidance process, the selection of reception areas, specific accompanying measures, etc.

10. COMPLEMENTARY INITIATIVES

In order to minimize the negative effects of the project on the affected persons, a plan was designed to provide resettlement support in accordance with the desires expressed by the people, supported by the State, in order to protect them against the fate that has befallen other persons illegally occupying similar locations elsewhere. Thus, solutions were adopted to guarantee their resettlement under good conditions. The various measures selected for each population category have all been approved during the consultation meetings. The working group has drawn up reports of the negotiations, which are attached to the PR of September, 2011.

11. CONCLUSION

The negative consequences of the project have been identified exhaustively and in all detail by means of studies (initial, updated, and complementary), and suitable mitigation measures have been proposed.

In order to minimize environmental risks associated with the management of sediments dredged up from the lagoon, the awarding authority has proposed specific technical modifications, as a consequence of the complementary study of the lagoon environment, for the dredging operations, the drilling of piles, and the bathymetric updates (July, 2010), that will be described in a detailed Environmental and Social Management Plan (soil degradation).

On the social level, the complementary socio-economic study and the revision of the RRP focus on the residual cases of the PAR of 1998 and new settlers on the project terrains, after clearing the compensation and resettlement rights with the Government of Ivory Coast.

The Government has proposed resolving the residual cases of 1998, and the implementation of consensual measures by the working group according to each category, as a consequence of a number of consultations that have been very free, truly open, enriching, and civil.

12. REFERENCES AND CONTACTS

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