



REPUBLIC OF BENIN

Fraternity - Justice - Labor



**MINISTRY OF ENVIRONMENT AND TRANSPORT IN CHARGE OF
SUSTAINABLE DEVELOPMENT**

**** (MCVT) ****

**ROAD INFRASTRUCTURE AND REGIONAL DEVELOPMENT COMPANY
SIRAT**

**JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)**



**PROJECT FOR THE CONSTRUCTION OF THE VÊDOKO FLYOVER IN
CITY OF COTONOU, PHASE 2 IN BENIN**

DETAILED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Final Report

BANCA CORPORATE

- BANCA ENGINEERING
- BANCA EXPERT
- ADVISORDUBTP (MOBILE APPLICATION)
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BANCA Engineering

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ACRONYMS AND ABBREVIATIONS

ABE	Benin Environment Agency
AGR	Income-generating activity
ANDF	National Land and Property Agency
APS	Summary preliminary project
APD	Detailed preliminary project
BAD	African Development Bank
BM	World Bank
CA	Head of District
CAGP	District Complaints Management Committee
CC	Communal Council
CCGP	Communal Complaints Management Committee
CCES	Environmental and Social Compliance Certificate
CDQ	Neighbourhood Development Committee
CFA	African Financial Community
CNGP	National Complaints Management Committee
CTN	Technical Negotiation Committee
CEB	Benin Electricity Community
SIRAT	Road Infrastructure and Territorial Development Company
SONEB	Benin National Water Company
CFAO	French Counter for West Africa
CFD	LAND AND PROPERTY CODE
CGES	Environmental and Social Management Framework
CLI	Local Compensation Committee
CTI	Technical Compensation Committee
DB	Deadline
DLE	Eligibility Deadline
DDCVDD	Departmental Directorate for the Living Environment and Sustainable Development
DST	Director of Technical Services
DUP	Declaration of Public Utility
EIES	Environmental and Social Impact Assessment
FED	European Union funding
FDF	Land Compensation Fund
JICA	Japan International Cooperation Agency
IIP	Public Interest Investment
Km	Kilometre
m ²	Square metre
MCVDD	Ministry of Environment and Sustainable Development
MCVT	Ministry of Environment and Transport responsible for Sustainable Development
MGP	Complaints Management Mechanism
MIT	Ministry of Infrastructure and Transport

MIC	Ministry of Industry and Trade
ml	Linear metre
MOD	Delegated project owner
OEV	Orphans and Vulnerable Children
NGO	Non-Governmental Organisation
OPT	Telecommunications and Post Office
PAG	Government Action Program
PAP	Person Affected by the Project
PAPC	City of Cotonou Rainwater Sanitation Project
PAR	Resettlement Action Plan
PDC	Community Development Plan
PGES	Environmental and Social Management Plan
PPD	Physically Displaced Persons
PM	For the record
PO	Operational Policy
PSR	Brief Resettlement Plan
PUGEMU	Emergency Urban Environmental Management Project
SAIC	Support Service for Community Initiatives
SBEE	Benin Electricity Company
SIRAT	Road Infrastructure and Spatial Planning Company
Qty	Quantity
RGPH	General Census of Population and Housing
SIRAT	Road Infrastructure and Town and Country Planning Company
SIDA/IST	Acquired Immune Deficiency Syndrome and Sexually Transmitted Infections
SMIG	Guaranteed Minimum Interprofessional Wage
SONEB	Benin National Water Company
U	Unit
UCP	Project Coordination Unit
UGP	Project Management Unit
W	Watt

EXECUTIVE SUMMARY

N°s.	Variables	Data
1	Project country	Benin
2	Department	Littoral
3	Municipality	Cotonou
4	Districts	10th, 11th, 13th
5	City districts	Ahogbouhouè, Houeyiho, Vêdokô
6	Activity leading to relocation	Construction of a flyover
7	Project title	Construction of VEDOKO overpass
8	Promoter	Government of Benin
9	Implementing body	SIRAT as project manager
10	Funding	Government of Japan/JICA
11	Project budget	
12	RAP budget	683 732 086 F CFA
13	Number of People Affected by the Project (PAP)	443
14	Affected structure (CFAO MOTORS)	01
15	Shop owner	188
16	Shop employees	207
17	Number of vulnerable PAPs	04
18	Owner occupying public land	45
19	Employee occupying public land	01
20	Landowners	01
21	Household members	1591
22	Shops destroyed	01
23	Fence destroyed	01
24	Total area of land lost (m ²)	565

A. Background and justification of the project

Benin is an important link in the Abidjan-Lagos corridor (international east-west corridor), which plays a key role in the regional development of the "growth ring" in West Africa. It is also at the starting point of the Cotonou-Niamey corridor (international south-north corridor).

Ensuring the safety and stability of traffic on the Abidjan-Lagos corridor is an important issue for wider regional development, in order to promote the structural transformation of the economy, including logistical improvements in the city of Cotonou, in Benin and in West Africa, and the strengthening of high-potential industries..

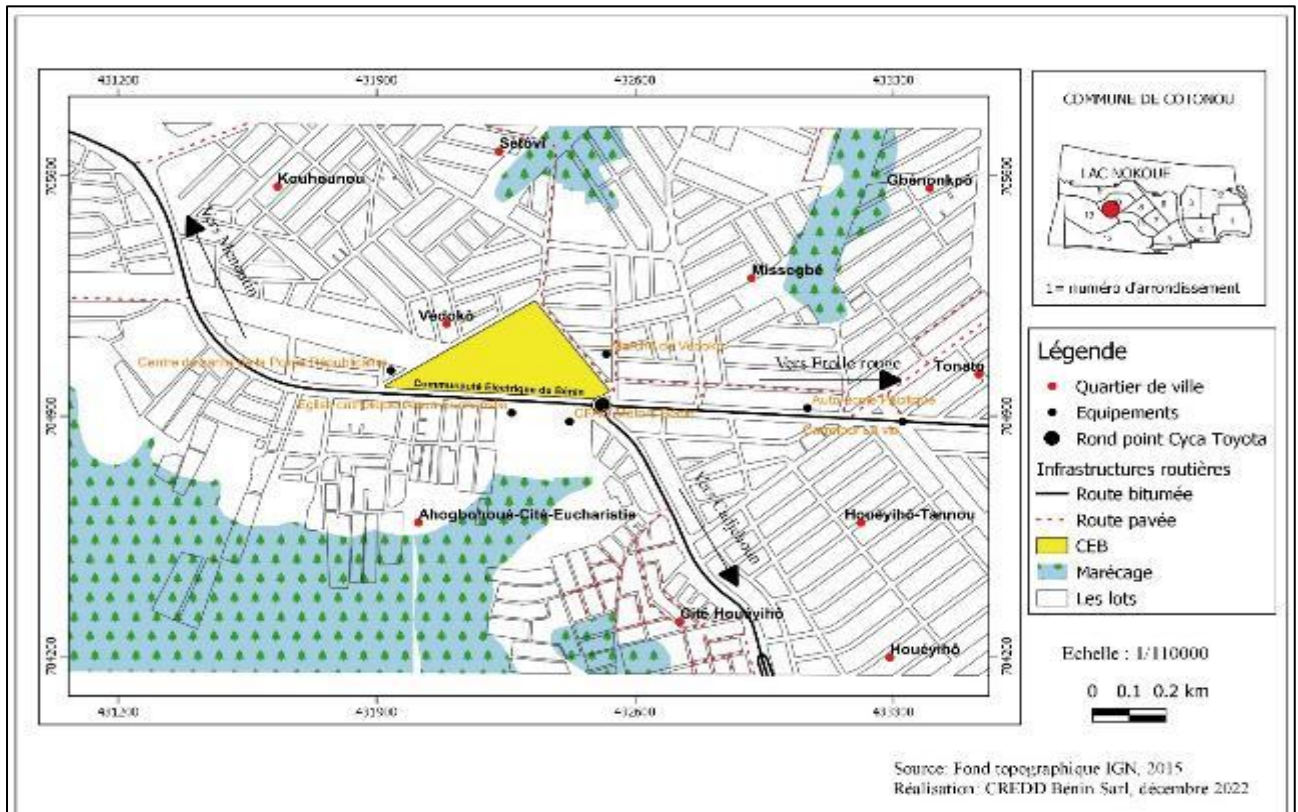


Figure 1: Perspective of the intersection
Source: CREDD BENIN Sarl, December 2022

This mission, which involves carrying out the ESIA for the Vêdoko flyover construction project, will assess the interaction between the project and the environment and propose an Environmental and Social Management Plan (ESMP).

This mission is being carried out in accordance with the legislation in force in Benin, Decree no. 2022-390 of 13 July 2022 on the organisation of environmental and social assessment procedures in the Republic of Benin and JICA's requirements. According to Annex 1 of the general guide to carrying out an EIA in Benin (ABE, 2001), this project to develop the Cotonou flyover falls into category XIII: infrastructure projects, and more specifically types XIII.2 (road repairs) and XIII.6 (bridge construction). This project must therefore undergo an in-depth ESIA (ABE, 2001), which corresponds to a category A+/- project: a significant positive/negative impact is expected.

a. Project objectives

The general aim of the project is to build a viaduct around 500 m long and a signalling system for nearby intersections. Specifically, the project will:

- ▶ Transform the roundabout into a signalised intersection;
- ▶ Improve traffic flow at the Vêdoko roundabout;
- ▶ Ensure traffic safety and stability on the Abidjan-Lagos corridor;
- ▶ Optimise the effect of the rehabilitation of the Toyota roundabout.

b. Scope of work

The local consultant shall (a) conduct field investigations and (b) prepare a supplementary and/or updated ESIA report in accordance with Decree No. 2022 - 390 of 13 July 2022 and the Guidelines for Environmental and Social Considerations (2010).

It shall also (c) undertake field investigations, related to social consideration, and (d) prepare a supplementary and/or updated RAP report (as required by Benin law and/or by the competent environmental authority in Benin and/or JICA), based on a review/update of the resettlement framework/compensation policy, which has been prepared.

c. Objectives of the ESIA

The aim of the environmental and social impact assessment is to analyse the interactions between the project and its environment, and to assess the potential environmental and social impacts of the project in order to guarantee the peace of mind of the population and the sustainability of the project.

d. Presentation of the promoter

Road Infrastructure and Land Use Company (SIRAT)/Ministry of Living Environment and Transport in charge of Sustainable Development (MCVT).

e. Presentation of the consultant

BANCA Engineering, having its office registered at 3100-I Square, Agla Hlazounto, Cotonou, tel. (+229) 95951782, registered with the Cotonou Trade and Personal Property Credit Register under number R.C RB COTONOU 2008-B3616, IFU 3200800591910 of 04 April 2008, represented by Mr ACCROMBESSY Franck, acting in his capacity as Managing Director with full powers for the purposes hereof, and referred to hereinafter as "BANCA".

B. Project components relevant to environmental and social impact

This chapter describes the project activities selected after analysing the variants and alternatives. The aim here is to provide a more or less detailed description of the project's components, based on data from the technical studies (APS and APD). This chapter therefore includes a presentation of the project's infrastructure and facilities, as well as a description of the project's activities.

a. Project infrastructure and facilities

The project involves the construction of a 500-metre-long single-lane viaduct in the north-south direction. The table below shows the objective, expected results and overview of the project.

Table: overview of project activities

Project objective :	Ensure traffic safety and stability on the Abidjan-Lagos corridor, an important issue for wider regional development, in order to promote the structural transformation of the
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	economy, including logistical improvements in the city of Cotonou, in Benin and in West Africa, and the strengthening of high-potential industries.
2) Expected results :	The crossroads in front of the Toyota dealership on the Abidjan-Lagos corridor has been relieved of traffic congestion thanks to its rehabilitation.
3) Overview: (Content of the request)	[Infrastructure] Construction of a single-lane viaduct in both directions (planned length approx. 500 m), improvement of the intersection at ground level (transformation of the roundabout into a signalised intersection). [Equipment] Signalling system for nearby intersections, etc. (Study the details in the preparatory study)

Source: JICA, 2019



Figure 2: Ordinary drawing of the integrated circuit

Source: JICA, 2019

a. Construction phase

A work schedule will be drawn up to ensure that traffic is not disrupted and that the daily activities of local residents (shopkeepers and residents) are not disrupted (see table below).

Table: Construction phase activities

2	Construction and development phase
2.1.	Topographical work
2.2.	Right-of-way clearance/demolition
2.3.	Stripping and storage
2.4.	Relocation of various networks (water, electricity and telephone)
2.5.	Creation of diversions
2.6.	Management of the company's base
2.7.	Circulation of site equipment and materials
2.8.	Management of site waste (solid and liquid)
2.9.	Excavation work
2.10.	Construction of the structure

Source: JICA, 2019

Table: Description of construction phase activities

Construction and development phase	Work description
Site installation/company signage	Setting up a worksite involves placing the equipment, materials and infrastructure to be used for the construction work in an area reserved for this purpose. Worksite signage is the set of practical and visual measures put in place to indicate the area to be developed or occupied. Its purpose is to warn and guide users in order to ensure their safety and that of the personnel working on the site, to facilitate the flow of traffic and to reduce inconvenience to local residents.
Topographical work	All geodetic work for technical studies
Right-of-way clearance	Once the RAP has been implemented, the area to be developed must be cleared of all constraints and obstacles.
Relocation of various networks (water, electricity and telephone)	This is a sensitive activity that involves moving all the buried and overhead networks (various cables belonging to different concessionaires such as SBEE, CEB, SONEB, OPT, etc.).
Construction of bypasses	To facilitate traffic flow and isolate traffic from the development zones during the works, adjoining roads will be opened or developed for the movement of people and goods. The company will carry out routine maintenance of the bypass to avoid any risk of accidents caused by the poor condition of the roads.
Management of the company base	The base camp will be set up not far from the CFAO site.
Site waste management (solid and liquid)	The various works on the lifeboat base will generate solid and liquid waste that deserves special attention during the works.
Circulation of site equipment/transport of materials	This also includes waste from masonry work, reinforcement, the infirmary, carpentry, etc.
Stripping/demolition	Construction activities and the supply of materials to the sites require heavy and light machinery and vehicles (lorries and other vehicles).
Excavation work	This involves removing the existing substrate to create the ideal layer to support the earthworks.
Extensive purging and disposal of products	Excavation work to open the trenches and bring out any buried objects that may be on the route of the collector or culvert to be built.
Earthworks for development	Removal of waste, silt and soil of poor tenure or quality

Source: JICA, 2019

[Stage 1] Roundabout improvement	[Stage 2] Construction of the substructure
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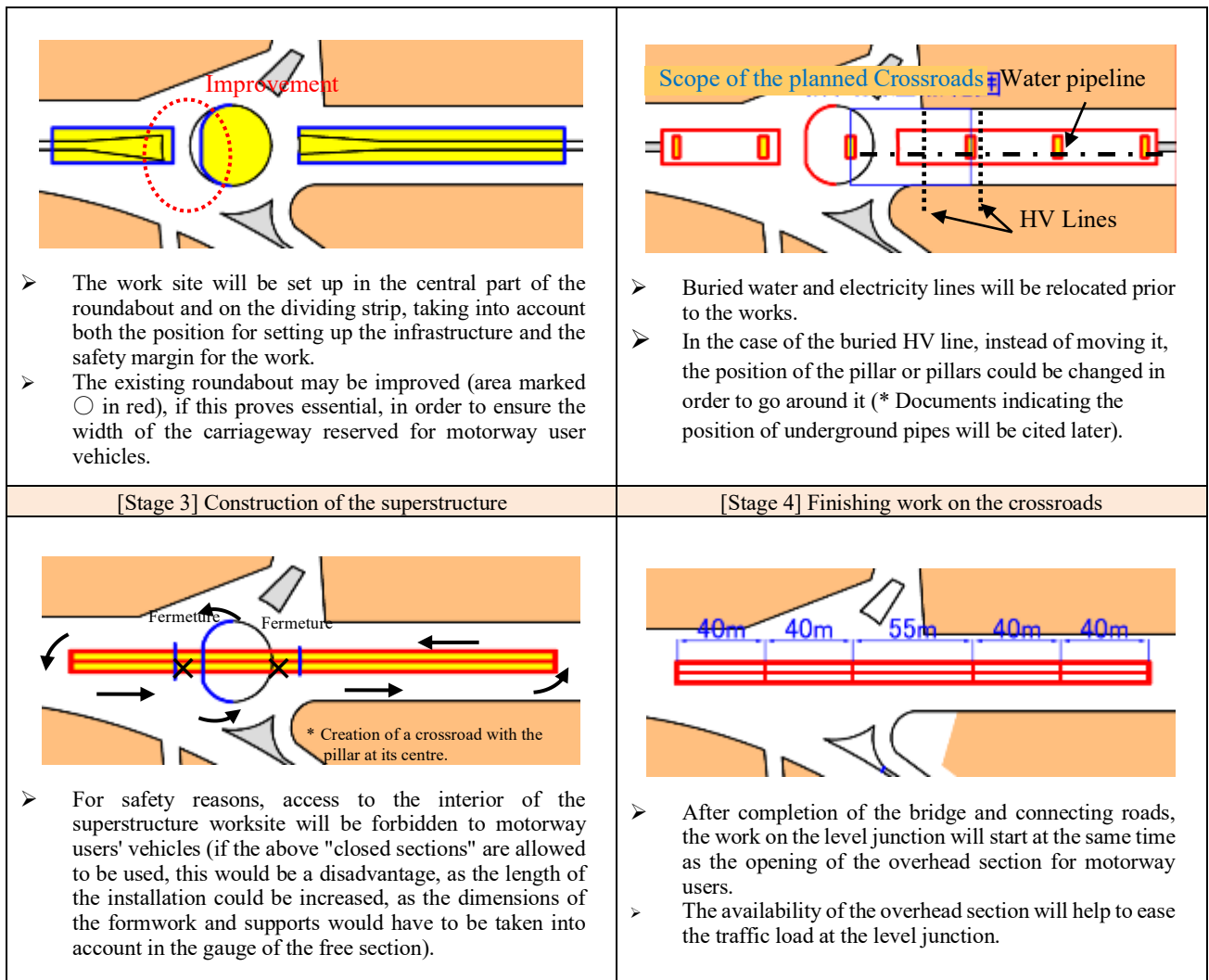


Figure: Sequence of execution steps
Source: JICA, 2019

C. Methodological approach

The methodological approach adopted for the study is based on an analytical and systemic approach that enables environmental and social considerations to be integrated into the finalisation and implementation of the project. It complies with practice and with the requirements of the general guide to carrying out EIAs in Benin. In practical terms, the approach used was based on the following stages:

- Meetings with project managers to discuss the design and working methodology for implementing the project's activities;
- Visits to the sites concerned with a view to clearly delimiting the study area;
- Review of available documentation concerning the project's technical information, and any other documents providing relevant information on all aspects of the project;
- Field data collection throughout the project's area of influence (biophysical and socio-economic data, etc.);

- Consultation and participation of all stakeholders (MIT, ACVDT, MCVT, ABE, local authorities and communities, etc.);
- Identification of risks;
- Environmental assessment of the project: identification of the impacts (positive and negative) of the project, assessment of the significance of the impacts, and proposal of mitigation and/or corrective and improvement measures;
- Field measurement and observation campaigns;
- Drawing up the project's Environmental and Social Management Plan (ESMP);
- Drafting of the ESIA report.

D. Basic data on natural and social facts

The initial state of the project site, or of the receiving environment in general, represents a reference situation which will subsequently be affected by the project. It is characterised essentially by its sensitivity, which is defined in relation to the nature of its components, but also in relation to the nature of the project. The aim of describing the initial state of the project site is to provide adequate knowledge of the environmental components that are likely to be degraded by the project's activities. This description of the initial state of the environment is based, on the one hand, on documentary and bibliographical data and, on the other hand, on field surveys and in situ measurements.

a. Geographical location of the site

The area under study is located in the 10th, 11th and 13th districts of the municipality of Cotonou (Littoral department).



Figure: Intersection perspective

Source: CREDD BENIN, June 2019



Figure: Overall view of the project area

Source: CREDD BENIN, June 2019

a. Biophysical context of the study area

From a climatic point of view, the coastal zone of Benin is characterised by a climatic anomaly that results in a decrease in rainfall from east to west along the coast and more marked variations in temperature than is generally the case in characteristic equatorial climates: this is known as a sub-equatorial climate. This type of climate is characterised by a bimodal rainfall pattern, with 60% of annual rainfall in the first rainy season and 12-20% in the second (SOSSOU-AGBO, 2013). According to climate projections up to 2100, annual rainfall will remain virtually unchanged, with variations observed every five years of no more than 0.2%.

Temperatures are relatively constant and high all year round, between 24°C and 31.5°C. Although February, March and April are the hottest months, the nights are generally cool (23-24°C) and the days sunny (31-35°C). These coastal temperature variations are due to the duration of sunshine, which averages 6.67 hours per day in Cotonou. According to the results of annual temperature projections for the year 2100, there will be a rise in temperature across the study area. Thermal variations relative to the 1971-2000 reference period would be in the order of 2.77°C.

Compared with air quality, air pollution is a phenomenon about which not enough is known. The current air quality monitoring system is limited to measuring the concentration of pollutants in ambient air. According to the results of studies carried out by SERHAU-SA (2006), the level of air

pollution in Greater Cotonou is high (72%), and the main sources of air pollution are motorbike taxis (83%), heavy goods vehicles (7%), city taxis (3%) and septic tanks (3%).

b. Biological and ecosystem aspects

The city of Cotonou is located in the coastal phytogeographical district (approximately 1% of the national territory) set between latitudes 6°20' and 6°45'N. More specifically, it is located on sandbars (exposed land) crossed by marshes.

The high levels of urbanisation (due to the accelerated growth of Cotonou's population) have led to the disappearance of the ancient vegetation that used to occupy the salt flats (ancient coastal strips similar to terraces 5 to 7 m high) and an almost total disappearance of valuable species from both the salt flats and the marshy areas and flood plains, with a host of environmental problems. The species identified in the retention basins will be presented by basin in volume 2.

Floristic inventory

To carry out a floristic inventory, a minimum of two (2) 30 m x 30 m surveys is required, i.e. 900 m² per hectare. The plant species identified during the observations were as follows: the area is overgrown with lianas and other lowland species (see plates 4 and 5), among others, we have the details recorded in the table below.

Table: Summary of plant species

Order no.	Common names	Scientific names
1	Papaya	<i>Carica papaya</i>
2	Palm tree	<i>Elaeis guineensis</i>
3	Duck fern	<i>Acrostichum aureum</i>
4	Clubmoss, cattail or Typha	<i>Typha domingensis</i>
5	Small white tamarind	<i>Phyllanthus amarus</i>
6	Christmas bush	<i>Alchornea cordifolia</i>
7	Poc-poc lily, fetid passionflower	<i>Passiflora foetida</i>
8	Bitter melon	<i>Momordica charantia</i>
9	Durand's potato	<i>Ipomoea pes-caprea</i>
10	Panicum pyramidale	<i>Echinochloa pyramidalis</i>
11	Biscuit herb	<i>Paspalum vaginatum</i>
12	Water bindweed or water crowfoot	<i>Ipomoea aquatica</i>
13	Creeping primrose	<i>Ludwigia repens</i>
14	Mexican primrose	<i>Ludwigia octovalvis</i>

Source: Field survey, November 2022

No observations of animal species were made, but a few reptiles and butterflies jumping from flower to flower were seen.

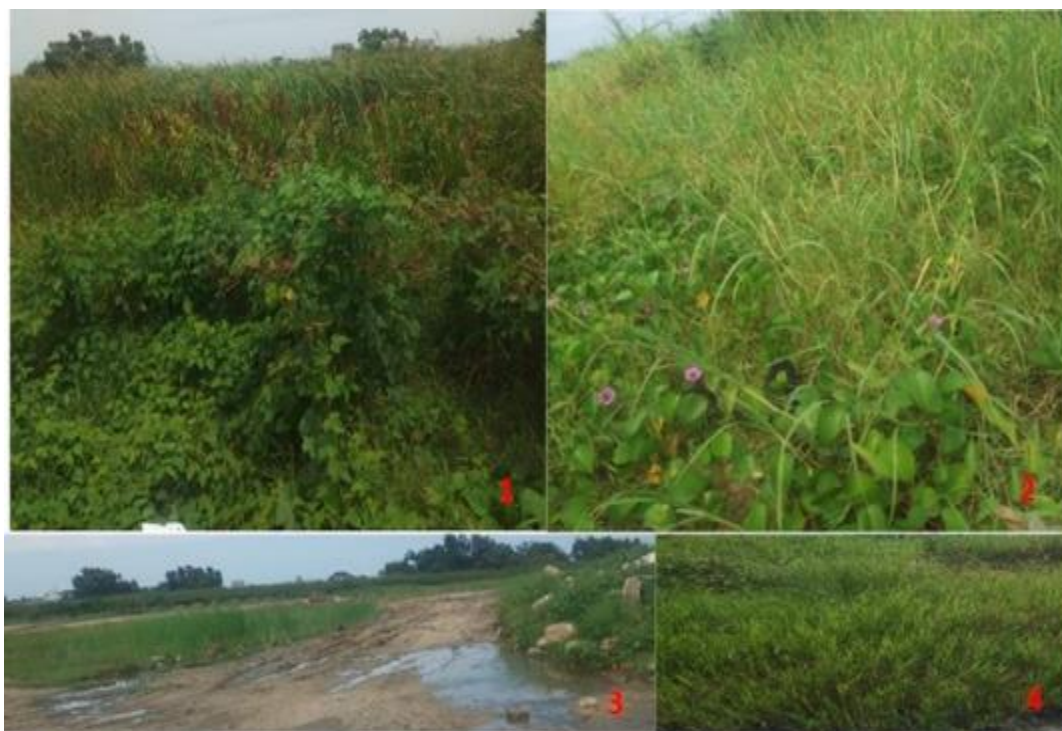


Plate 1: Images of some species encountered on the base camp site of the vèdoko overpass: *Senna occidentalis*, *Passiflora foetida* and *Echinochloa pyramidalis*; 2- *Ipomoea pes-caprae* broad-leaved flowers; Young *Typha domingensis*; 4- *Paspalum vaginatum*
Shooting: Source: CREDD BENIN, November 2022



Plate 2: Images of some species encountered on the base camp site of the vèdoko overpass: 5- *Ipomoea aquatica*; 6- a set of plants including *Acrostichum aureum*, *Ludwigia octovalvis* and *Ipomea* without flowers; 7- *Typha domingensis*; 8- *Momordica charantia*

Shooting: Source: CREDD BENIN, November 2022

These floristic data were supplemented by data from affected trees in the project footprint (Table below)

Table: Affected plants with economic value

Types of goods	Assets affected	Feet	Features	Number	%
Plants of economic value affected	Neem	Feet	Young	3	6.38
	Palm Oil tree	Feet	Adult	7	14.89
	Palm Oil tree	Feet	Young	6	12.77
	Ficus umbelata	Feet	Young	3	6.38
	Mango	Feet	Young	2	4.26
	Mango	Feet	Adult	4	8.51
	kola tree	Feet	Adult	22	46.81
	Total			47	100

Source: Results of fieldwork, November 2022

In addition to these plants, there are 22 alignment trees of the *Khaya senegalensis* type located on the central reservation (Plate 3).



Photo 1: *Terminalia catappa* (colatree) affected (south side) of the crossroads



Photo 2: *Khaya senegalensis* (Cailcedrat) affected (central reservation) of the crossroads (east side)



Photo 3: *Khaya senegalensis* (Cailcedrat) affected (central reservation) of the crossroads (east side)



Photo 4: *Terminalia catappa* (colatree) affected (CEB fence towards the market)

Plate 4: Plants of economic value and roadside trees affected
Shooting: Banca Engineering, December 2022

a. Human frame

Cotonou, the only municipality in the Littoral department, is still the leading city in Benin with 679,012 inhabitants in 2013 compared to 665,100 in 2002, i.e., a slight increase, 2.09% over the period 2002-2013, after an increase of 2.17% over the decade 1992-2002 (INSAE 2015). It should be noted that the population of Cotonou has evolved significantly from 320,332 inhabitants in 1979 to 679,012 inhabitants in 2013 (INSAE, RGPH1&2), an increase of 111.97% in 33 years. This demographic growth is due to the search for more remunerative job opportunities with a view to better living conditions, to the domestic birth rate and to the attraction of foreign populations, in particular from the West African sub-region (particularly from Nigeria).

The increase in an essentially non-agricultural population offers the opportunity for commercial and craft activities of all kinds with a view to feeding, clothing, organizing mobility and caring for such a population. This situation explains why this increase in the population of Cotonou will continue for years to come, with very little chance of being reversed.

The project area takes into account neighborhoods in the 10th, 11th and 13th districts of Cotonou. Table 3 below shows the distribution of the population of Cotonou by district.

Table 3: Distribution of the population of Cotonou by gender and by district

Districts	Genders		Total by districts
	Male	Female	
1st	28 131	29 831	57 962
2nd	29 426	32 242	61 668
3rd	33 640	36 351	69 991
4th	17 764	18 593	36 357
5th	9 942	10 097	20 039
6th	35 791	39 545	75 336
7th	12 816	14 719	27 535
8th	15 152	17 268	32 420
9th	27 506	30 185	57 691
10th	18 191	20 537	38 728
11th	17 764	17 115	34 879
12th	47 235	50 685	97 920
13th	32 514	35 972	68 486
Municipality of Cotonou Total	325 872	353 140	679 012

Source: INSAE, 2015

The ethnic groups listed in Cotonou are the Fon (32.9%), the Goun (15.2%). We also find the Mina and the Yoruba for respectively (5.9%) and (5.5%). In terms of religion, we note Catholicism (57.8%), Islam (14.2%). Other Christians and Celestial Christians are (4.4%) and (7.8%) respectively. Traditional religions represent 15.8%.

In the project's area of influence, the most dominant socio-cultural group remains the Fon and relatives (59.45%) followed by the Adja and relatives (24.09%) and the Yoruba (6.59%). Table 22 presents the sociolinguistic groups in the project's area of influence.

Table 4: Distribution of sociolinguistic profile of the project area of influence

Sociolinguistic group/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Adja and relatives	45	7.80	94	16.29	139	24.09
Other countries	4	0.69	3	0.52	7	1.21
Bariba and relatives	0	0.00	2	0.35	2	0.35
Betamaribé and relatives	2	0.35	0	0.00	2	0.35
Dendi and relatives	7	1.21	8	1.39	15	2.60
Fon and relatives	181	31.37	162	28.08	343	59.45
Neighboring countries	5	0.87	17	2.95	22	3.81
Fulani and relatives	1	0.17	4	0.69	5	0.87
Related Yoa & Lokpa	3	0.52	1	0.17	4	0.69
Yoruba and relatives	18	3.12	20	3.47	38	6.59

Source: Results of fieldwork, November 2022

The result of people surveyed during the reference study presents the religions practiced in the study environment (Table 5).

Table 5: Distribution of populations in the project area of influence by religion

Religion/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
no religion	11	1.91	16	2.77	27	4.68
Catholic	131	22.70	113	19.58	244	42.29
Celestial	15	2.60	30	5.20	45	7.80
Evangelist	83	14.38	77	13.34	160	27.73
Islam	16	2.77	49	8.49	65	11.27
Protestant Methodist	5	0.87	7	1.21	12	2.08
Jehovah's Witness	0	0.00	2	0.35	2	0.35
Vodoun	3	0.52	13	2.25	16	2.77
Apostolic	0	0.00	1	0.17	1	0.17
Buddhism	1	0.17	0	0.00	1	0.17
Pentecost	1	0.17	2	0.35	3	0.52
rebirth union	0	0.00	1	0.17	1	0.17

Source: Results of fieldwork, November 2022

The most dominant religion is Catholicism (42.29%) and the Evangelical Church (27.73%) followed by Methodist Protestants (11.27%).

b. Restricted Environment Quality

The environmental framework of the study area was analyzed on the basis of our observations, analyzes and taking into account the information obtained on the commune of Cotonou and especially on the 10th, 11th and 13th districts.

In the Municipality of Cotonou, the management of the environment and the respect of the rules of Hygiene by the populations is marked by a lack of sanitation works in the city (primary and

secondary collectors) and a waste management system inefficient household solid (PDM 2016-2020). But it must be said that with the various sanitation works undertaken by the State, the situation will improve. The management of household solid waste has seen a lot of improvement in recent years, however there are still some anomalies. Garbage removal structures certainly exist, but we note that the lowlands continue to receive waste. Indeed, some carters come and dump garbage collected from households in the swamps.

Air quality and other nuisance

The main mode of transport for the population is the “Zémidjan”. This mode of transport is not without impact on the health of populations for two reasons. On the one hand, these drivers use adulterated gasoline and, moreover, the gasoline-motor oil mixture they use exceeds the recommended proportions. On the other hand, these machines are often purchased second-hand with old and poorly tuned engines.

The combination of all these parameters results in the release of smoke made up of toxic gases such as carbon monoxide (CO), carbon dioxide (CO₂), volatile organic compounds (VOC), non-methane volatile organic compounds (NMVOC), lead (Pb), nitrogen oxide (NO), methane (CH₄) etc. all these gases released have effects on the health of populations. As ailments generated, mention may be made of acute respiratory infections (ARI), eye diseases, allergy/sneezing, asthma. Many studies have shown the link between an unhealthy environment and the prevalence of certain diseases. The use of dirty water, the non-existence of an appropriate wastewater treatment system, poor management of domestic and biomedical waste, atmospheric pollution, are factors that compromise the environmental balance. However, it is good to see that the population has a fairly precise perception of the causal relationships between environment and health.

E. Political, legal and insitutional framework of the study

a. Project and ESIA policy framework

The National Conference of Living Forces in February 1990 enabled Benin to enter into a dynamic of social change for the well-being of the population. This has resulted in political and institutional stability of its democracy for more than two decades. It therefore encouraged the various Governments to lift the country out of poverty and put it in a phase of economic emergence, through accelerated growth and sustainable human development. The policy framework also takes into account:

- ✓ Government Action Program (PAG);
- ✓ The Environmental Action Plan (EAP).

b. Legal frame

The practice of environmental assessment has become a legal requirement in Benin which applies to both private developers and the public sector. Thus, this study is carried out in accordance with Beninese legislation in force, both in terms of environmental protection and that governing other areas related to the nature of the project (urban development, infrastructure, land, security, etc.) in order to respond strictly to the need for socio-economic development combined with environmental protection.

The legal framework has been defined in accordance with: i) international and national environmental requirements and ii) urban development and infrastructure project requirements. The legislative and regulatory provisions that constitute the legal framework are of three types:

- international texts comprising, on the one hand, the Agreements, Conventions and Treaties to which Benin has acceded and which have been ratified and signed by Benin and whose contents relate to the environment and the living conditions of the populations;
- the national texts including the Constitution of the Republic of Benin, the Beninese laws in force concerning the environment, and in relation to infrastructure projects and the living conditions of the populations, the regulatory texts in force in Benin and relating to the environment and the living environment (decrees, orders, circulars).
- Bank guidelines and standards.

c. Cadre institutionnel

A number of actors will be involved in implementing the project, including the relevant government departments, local authorities, NGOs and development associations. The institutional framework of the project includes the structures covered by the following analysis.

- ✓ **Ministry of Infrastructure and Transport (MIT)**
 - The Departmental Directorate of Infrastructures and Transport of the Littoral (DDIT)
 - Road infrastructure and land Development Company
 - The National Road Safety Centre (CNSR).
- ✓ **Ministry of the Economy and Finance (MEF)**
 - National Land and Property Agency (ANDF)
- ✓ **Ministry of Health**
 - Atlantic-Littoral Departmental Health Directorate
- ✓ **Ministry of Living Environment and Transport (MCVT)**
 - Directorate-General for the Environment and Climate (DGEC) ;

- Departmental Directorate of Living Environment and Transport of Littoral (DDCVT_lit);
- Land and Air Transport Department (DTTA);
- National Land Transport Agency (ANTT);
- Benin Environment Agency (ABE);
- General Directorate of Water, Forests and Hunting (DGEFC);
- General Directorate of Urban Development (DGDU).
- ✓ Littoral Prefecture
 - The Municipality of Cotonou
 - Development NGOs and associations

F. Analysis of the project site

a. Description of the project Site

The Toyota Junction is a roundabout intersection with the inside diameter of 36 m, the outside diameter of 61 m and the lane width of 12.5 m. A traffic light was installed there according to the growing traffic. As for the roads linked to the Toyota crossroads, the lane widths are disparate: 39.6 m for the western road, 35.5 m for the eastern road, and 20 m for the northern road and 35.2 m for the southern route according to the preliminary study carried out.

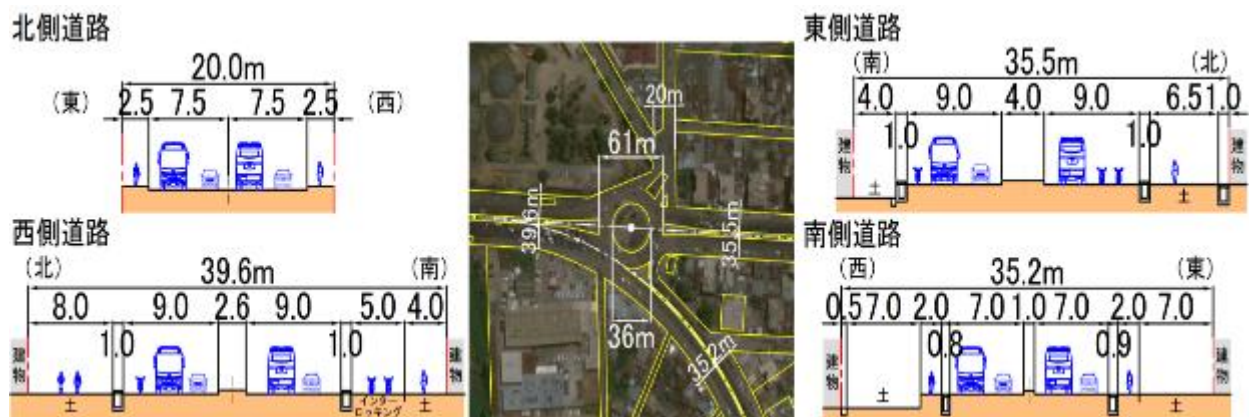


Figure 5: Situation of the roads linked to the Toyota crossroads

Source: JICA, 2019

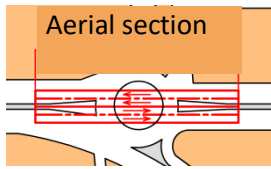
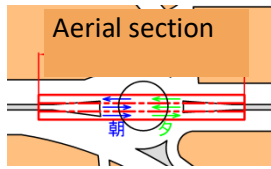
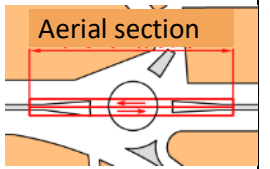
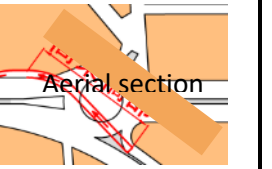
b. Analysis of project variants

✚ Principle of air traffic system study

Three systems contributed to the decision of the most favorable variant. These systems take into consideration "the effect of reducing traffic congestion, while taking into account the reality of local transport", "the ease of commissioning the system, including the acquisition of equipment and the costs involved", "ease of maintenance and operation activities", "power source" and "transmission network".

Technically and economically viable means of carrying out the project have been studied. This analysis considered options as well as the general environmental effects associated with these options, and justified the option chosen. Particular attention has been paid to the following sets of options:

Option Group 1: Example plans for bridge and number of lanes

Basic options A, B, C and D [Aerial section]				
Schematic plan				
	Plan 1.A: 4-lane road "East ↔ West"	Map 1.B: 3-lane road "East ↔ West"	Plan 1.C: road to 2 lanes "East ↔ West"	Plan 1.D: 2-lane road "South → West"
Characteristic	Always 2 lanes of traffic for each direction	The separating strip moved in the morning and in the evening, in order to leave 2 lanes on the busy side.	1 lane for each direction	1 lane road
Theoretical traffic capacity	1500 vehicles / hour / lane	1500 vehicles / hour / lane (when using 2 lanes)	1250 vehicles / hour / lane	1250 vehicles / hour / lane

Option Set 2: Examples of at-grade intersection improvement plans

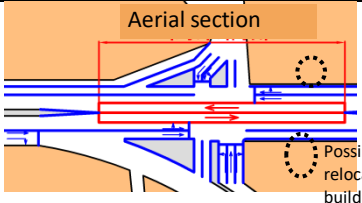
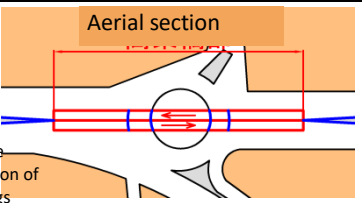
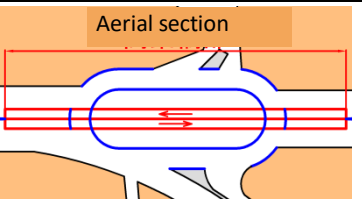
Basic Improvement Policy - Plan II [At-grade intersection (A rough sketch, in case plan C above is promising)]			
Schematic plan			
	Plan 2A: Intersection with traffic lights	Map 2B: Roundabout	Plan 2C: Deformed roundabout
Particularity	⊙ : Large traffic capacity	△ : Limited traffic capacity	○ : Larger capacity than Plan 2B
Impact on the environment	△ : A certain number of buildings to be reinstalled	○ : Few buildings to relocate	△ : A number of buildings to be relocated
Effects on the structure of the bridge	○ : As the length of the bridge remains almost the same as the b-plane that of the span at the crossing is larger.	○ : Span length at the lesser passage (this plane for placing pillars in the crossroads)	△ : Span length at the lesser passage (this plan for placing pillars in the crossroads), on the other hand, the bridge will be longer.
Economic efficiency	○ : Construction costs and compensatory allowances are larger than plan b, but its traffic capacity is the highest.	○ : Lower construction costs and compensatory allowances, but small traffic capacity.	△ : Construction costs and compensatory allowances are high.

Figure 6: Junction plan development procedures

Source: JICA, 2019

Regarding the groups 1 option, since the aerial sections are reserved for vehicles, it turns out that the traffic capacity of the two-lane road (one lane for each direction) will be exceeded, because the

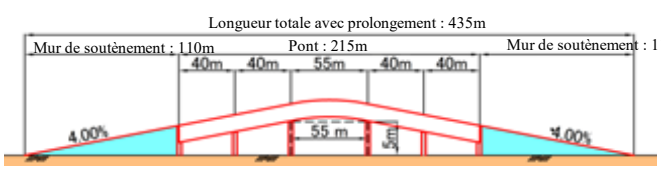
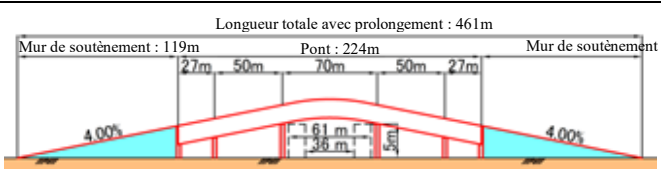
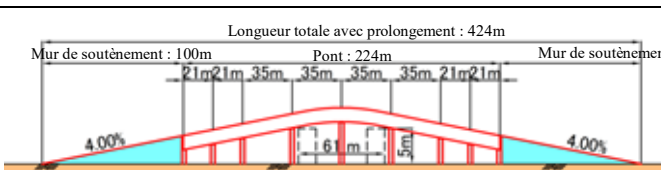
volume of vehicle traffic circulating "from west to east", estimated according to the available results of traffic analysis, will reach in 2035 a figure of 1873 light and heavy vehicles all combined. As the definition of the number of lanes to be built has a direct impact on the whole project and in terms of implementation and costs, as part of this analysis, a counter-survey of the volume of future road traffic will be carried out, taking into account the cost-effectiveness ratio, as well as other projects that may affect the plans at hand.

Principles of study of the fire control system

As part of the development of a plan for the realization of an at-grade intersection, when the introduction of traffic lights in the intersection proves effective. Since there is an old network of traffic lights, the electrical source must be available. However, a study for the introduction of a new power supply system will be conducted to ensure the stability of the power grid.

To optimize the option of air traffic, the concept of the longitudinal slope of 4 to 6% in accordance with the standard of the reference work of design "ICTAVRU" in force in French-speaking Africa was taken into consideration of the gauge of the free section at the intersection with traffic lights (assuming it is 55m (wide) x 5m (high)): * the width having been determined taking into account the pedestrian crossings and the distance of visibility at the intersection (details below -after); the size of the free section at the roundabout (for example 61m (wide) x 5m (high)), and a height of 3m for the superstructure beam.

The longitudinal slope significantly influencing the drivability, the characteristics of the vehicles which use the highway, the ease of access to the access road and the economic efficiency. Taking these clarifications into account, the following variants (25) in relation to the bridge plan (project) for different types of intersection when the slope is 4%, as well as their characteristics.

Junction type	Profile view	Features
Crossroads with traffic lights [Range: 55m]	 Longueur totale avec prolongement : 435m Mur de soutènement : 110m Pont : 215m Mur de soutènement : 110m 4.00% 40m 40m 55m 40m 40m 4.00%	- The greatest range will be around 55m for crossing the traffic light intersection. - The bridge will be made of prestressed concrete box girder or steel box girder. - The bridge is very expensive.
roundabout (without pillar in the center) [Range: 70m]	 Longueur totale avec prolongement : 461m Mur de soutènement : 119m Pont : 224m Mur de soutènement : 119m 4.00% 27m 50m 70m 50m 27m 4.00%	- The greatest range will be around 70m to cross the roundabout. - The bridge will be made of steel box girder. - This solution is more expensive than the above solution.
roundabout (with pillar in the center) [Range: 35m]	 Longueur totale avec prolongement : 424m Mur de soutènement : 100m Pont : 224m Mur de soutènement : 100m 4.00% 21m 21m 35m 35m 35m 35m 21m 21m 4.00%	- The bridge crossing the roundabout with a pillar in the center of the crossroads, the span will be approximately 35m. - The bridge will be a prestressed concrete T-beam.

		• This solution may be the cheapest (depending on the design of the foundations).
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Source: JICA, 2019

It was also important to ensure good visibility for cars arriving at the intersection via the service road.

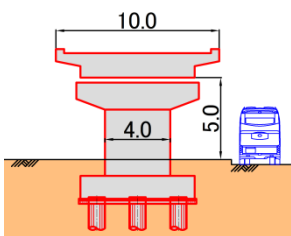
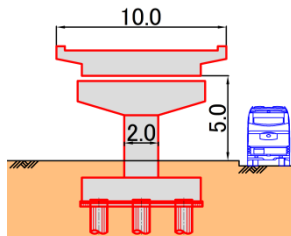
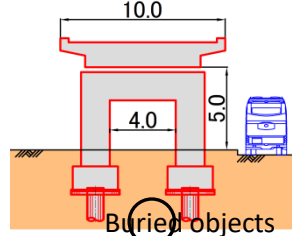
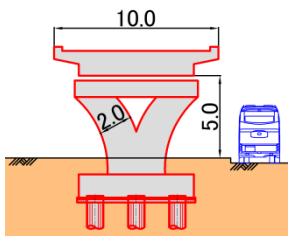
Reinforced concrete veil pillar	Single row of concrete pillars	Reinforced concrete portal	Veil pillar with two support points
			
Conventional pillar Usual construction method therefore inexpensive	Reduced pillar width for visibility If the cantilevered parts are too long, they need to be prestressed.	Solution to avoid non-transferable underground objects	Pillars in harmony with the site Solution already adopted in the country Its execution entails constraints.

Figure: Pillar profiles and their particularities

Source: JICA, 2019

The best solution must take into account the existence of the networks in place. The results of the working sessions with the network concessionaires (SBEE, SONEB, and Benin Telecom) and MCA-Benin II require rational management of space, network movements, or a construction variant that facilitates the pulling of cables of MCA-Benin II and the operation of the networks of SBEE, SONEB and Benin Telecom.

This variant turns out to be, the variant whose pillars can avoid non-transferable underground objects. It is then the bridge with reinforced concrete gables (figures 8, 9 and 10).

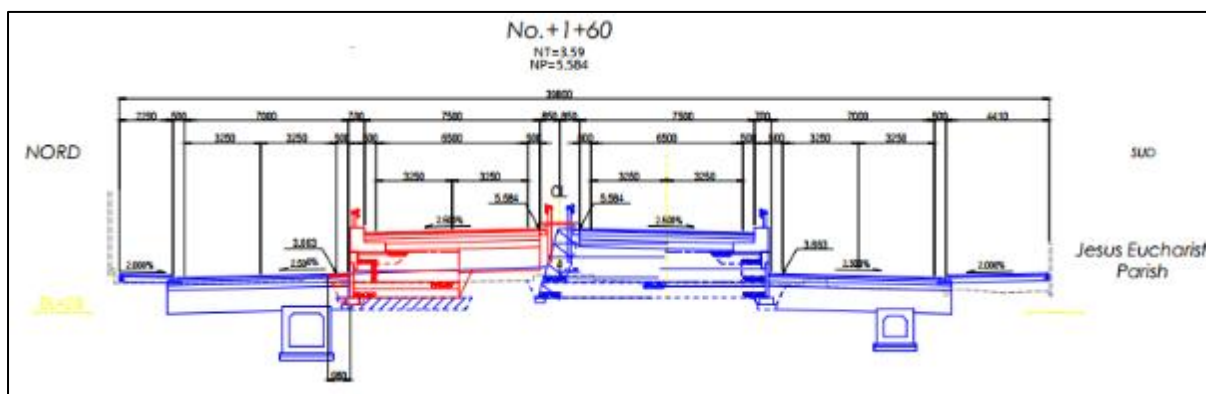


Figure: Cross section West side (NO.1+60)

Source: JICA, 2022

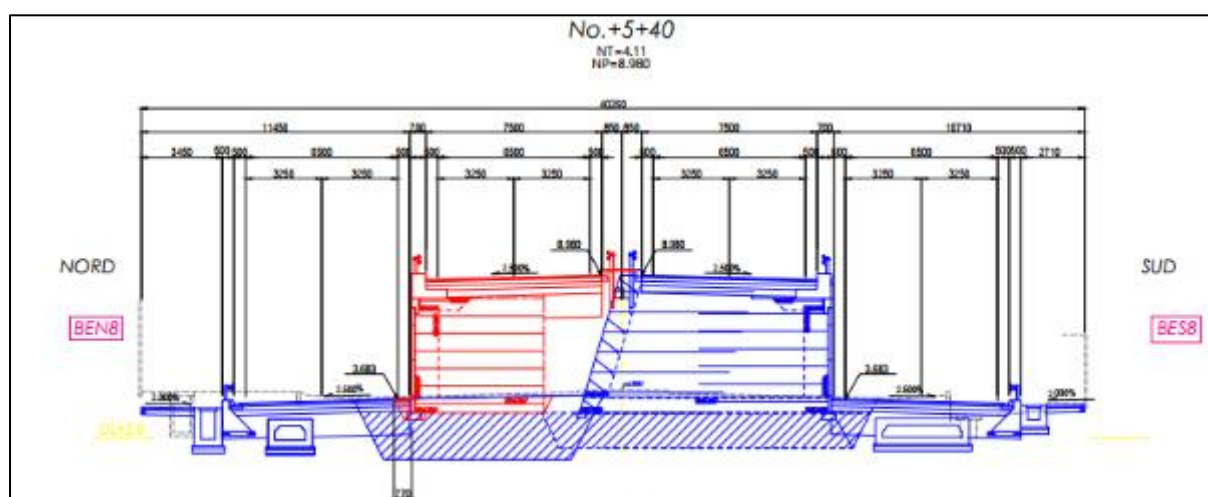


Figure 9: Transverse section East side (NO.5+40)

Source: JICA, 2022

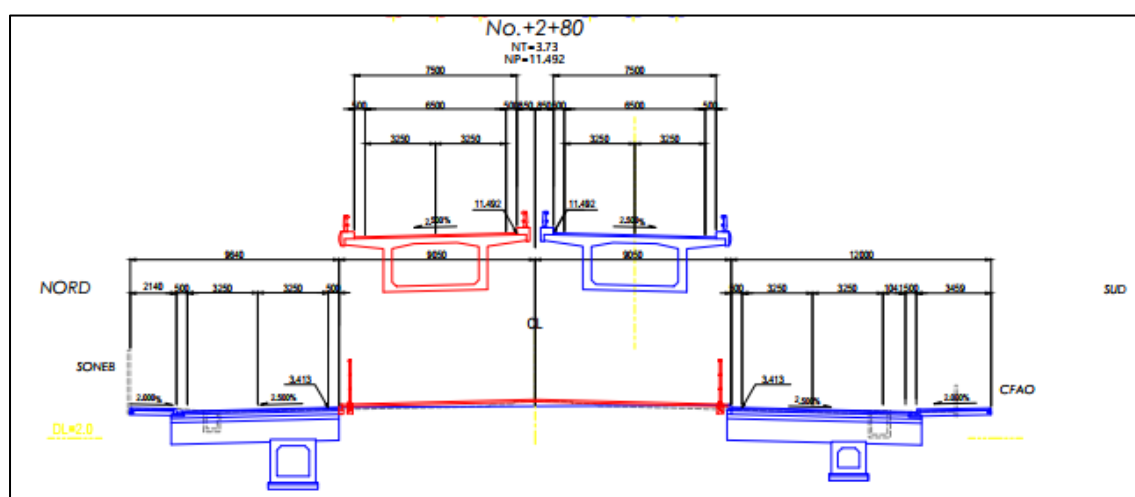


Figure 10: Cross section West side (NO.2+80)

Source: JICA, 2022

G. Results of the survey

a. Inventory of affected assets and persons

The census operations made it possible to inventory the assets of the people affected by the project and who are eligible for compensation.

The results of the surveys show 167 women or 37.70 % and 276 men or 62.30%. These PAPs have varied statuses depending on their installation, the mode of occupation of the space (table 6).

Table 6: Number of Affected Persons in the works area

Status of PAPs/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Store employee	60	13.54	147	33.18	207	46.73
Employee Occupant of the public domain	1	0.23	0	0.00	1	0.23
Occupant of the public domain	22	4.97	23	5.19	45	10.16
Shop owner	84	18.96	105	23.70	189	42.66

Owner Heir	0	0.00	1	0.23	1	0.23
Total	167	37.70	276	62.30	443	100,00

Source: Fieldwork results of, November 2022

The results in table 6 show that there were 207 shop employees, divided into 60 women and 147 men, i.e. 33.18% men against 13.54% women. It is also listed in the rights-of-way of the works of the employees of the owners occupying the public domains. It should be noted that in the right-of-way of the project, two categories of owners have been identified, the owners of places of business (shops, hangar, barracks and others) and the owners of land housing these infrastructures. On the side of private land properties for commercial use, the manager of CFAO Motors is added. Table 28 shows this number.

Store owners represent 42.66%, of which 23.70% are men compared to 18.96% of women.

Public social infrastructure services affected, and social and cultural characteristics of displaced communities

The loss of socio-collective infrastructure gives rise to the loss of access to public social services. In the right-of-way of the project, no socio-community or collective infrastructure has been assessed for destruction. On the other hand, a church, a mosque, a primary school and a private institute are identified in the area of influence of the project. Users of these infrastructures will experience restricted access and noise pollution. Provisions must be made during the implementation of the project to reduce its disturbances as much as possible.

The construction of the flyover will also cause the displacement of various networks (water, electricity and telephone). In order to limit the disturbances in the supply of public services in connection with these trips, it is planned that the construction company, in concert with the decentralized services of SONEB, SBEE and Telecommunications, will limit the duration of the interventions and inform beforehand the populations of said disturbances.

Compensation for loss

In this part, it is a question of highlighting the results of the evaluations of the compensations of all the categories of the goods and the costs of compensation of each PAP as well as the specific support measures granted to the PAPs within the framework of the Action plan of Resettlement.

The total cost of the allowances is estimated at **484 030 124 F.CFA (four hundred and eighty-four million thirty thousand one hundred and twenty-four francs)**. This budget includes the following allowances:

- Compensation for loss of private land for commercial use;
- Compensation for the loss of private land for residential use;
- Compensation for losses of private buildings for commercial use;

- Compensation for loss of private residential buildings;
- Compensation for temporary loss of income;
- Compensation for tree losses;
- Support to vulnerable PAPs.

H. Main environmental and social issues of the project

The analysis of biophysical and social issues was based on public consultations carried out in the boroughs and local surveys and discussions with the authorities concerned. The impact receptors of the project activities are the components of the physical and biological environments that will directly receive the positive or negative effects of the said activities, depending on the phases. The issues identified are:

- ✓ Physical issues;
- ✓ Biological issues;
- ✓ Social and economic issues;
- ✓ Land issues;
- ✓ Issues related to access, circulation, surroundings and household living conditions.

Estimated number of people affected by the project

Socio-economic and security receptors concern public health, land, economic activities, the security of people and property, etc.

Estimated number of people affected by the project

The calculation of the number of people to be impacted by the project infrastructure started from the determination of the area (in ha or Km²) of the area of influence of the infrastructure (IGIP, 2018). Then, the area of the area of influence of the infrastructure was multiplied by the population density per km² of this area to find the total number of people directly impacted by the project. The footprint of the Vêdoko flyover construction project takes into account five (05) districts of Cotonou. These are Vêdoko, Missogbé, Houéyiho 2, Kouhounou and Ahogbohoulé Cité Eucharistie. Figures 34 and 35 illustrate the footprint of the project.



Figure 11: Perspective of the integrated circuit
Source: JICA, 2019

a. Environmental and social impacts assessment

The environmental analysis of the Cotonou flyover construction project uses the same methodological approach as most projects which, due to their nature, can generate pollution or degradation of the environment.

The sources of impact, represented by all the activities marking the different phases of the project, directly or indirectly, qualitatively or quantitatively affect the different components of the environment. The changes generated are either negative or positive in nature and material or not.

b. Negative impacts on the natural environment and mitigation measures in the preparatory phase

The activities prior to the work are limited to the installation of the site, the installation of site machinery and equipment (concrete mixers, wheelbarrows, trucks, and compactor), the movement of trucks for the supply (gravel, sand, iron, cement, etc.).

The significant impacts are identified at the level of the soil (degradation, digging, development of space and modification of the landscape, modification of drainage during rainy weather) and water (slight increase in turbidity and drainage of materials towards the outlets).

c. Negative impacts on the natural environment and mitigation measures during the construction phase

During the works phase, the impacts identified are:

- ✓ Soil degradation (modification of profile, properties and erosion) will be due to the movement of heavy machinery, and to earthworks and excavations;

- ✓ Rain erosion and soil sealing;
- ✓ Compaction and partial sealing of the soil;
- ✓ Emission of construction site noise;
- ✓ Dust emission;
- ✓ Greenhouse gas emissions;
- ✓ Traffic disruption;
- ✓ Production of site waste
- ✓ Soil pollution by used oils
- ✓ Pollution of surface water and groundwater;
- ✓ Risk of noise-related illnesses
- ✓ Road accidents and construction accidents
- ✓ Increase in disease prevalence rate
- ✓ Increase in the rate of unwanted pregnancies
- ✓ Public health attacks
- ✓ Increase in the prevalence rate related to Sexually Transmitted Diseases and HIV/AIDS
- ✓ Involuntary displacement of people affected by the Project;
- ✓ Cuts in electricity, water or telephone due to the displacement of dealer networks (SBEE and OPT)
- ✓ Violations of travel conditions
- ✓ Disruption of economic activities

d. Impacts of the project during the operation phase

After the works, during the operation of the structure, the impacts are positive with regard to urban mobility, income and social organization. Depending on the activities to be carried out and the environmental dimensions affected, the summary of the environmental repercussions is presented as specified in the table below.

Table: Environmental Impact Assessment Results

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
Preventive measure against	1	Air pollution	B-	B±	B-	B±	During the works: Following the use of construction machinery, the quality of the atmosphere may deteriorate, even temporarily. In use: Depending on the increase in traffic, there may be an increase in air pollution due to

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
							exhaust gases. Moreover, the improvement in circulation reducing traffic jams, it can contribute to improving the quality of the atmosphere.
	2	Water pollution	B-	B-	B-	B-	During the works: The waste water resulting from the use of the work machinery evacuated from the site risks polluting the watercourse system. In use: Rainfall can carry dust and hydrocarbons present on the surface of the site.
	3	Waste	B-	D	B-	D	During the works: There may be excess soil and rubble. There will be no waste that could affect the environment.
	4	Soil pollution	D	D	D	C	The soil on the project site has been analysed in a laboratory due to possible contamination e.g. the Electricity Community of Benin. However, the purpose of this project is limited to the improvement of an existing road, i.e. the creation of a graded crossroads) and there are no works planned that could lead to soil pollution.
	5	Noises / Vibrations	B-	C	B-	D	During the work: The use of construction machinery and vehicle traffic can generate noise. In use: Increased traffic means increased noise level. Moreover, as the road will be raised, there will be a greater distance between the flow of traffic, sources of noise, and neighboring buildings, therefore less noise pollution.
	6	Ground subsidence	D	D	D	D	During the works and in use: As the objective of this project is to improve an existing road (construction of a grade-separated crossroads), no works likely to cause ground subsidence are planned.
	7	Bad smell	D	D	D	D	During the works: Given the nature of the project works, no operation that could cause odor nuisance is planned. In use: No activities that could generate bad odors will take place within the framework of the project.
	8	Alluvium	D	D	D	D	During the work and in use: There are no watercourses in the vicinity of the project site, and no earthworks are planned that could upset the sediment deposits.
	-	Sunshine	D	D	D	D	During the works and in use: The problem of sunlight loss will not arise, given the latitude of

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
							the site, and given the height of the intersection, as well as the density of neighboring buildings.
	-	Radio interference	D	D	D	D	During the work and in use: Given the location of the TV transmitting station, the height of the intersection and that of the antennas mounted on neighboring buildings, there cannot be any radio interference.
	-	Light pollution	D	D	D	D	During the works and in use: Around the site, there are no cultivated fields, nor habitats for rare insects, which exhibit phototaxis. So there should be no light pollution problems during the works and with the work put into service because of the lighting.
Natural environment	9	reserve area	C	C	B-	C	During the works and in use: A large part of the area of Cotonou is on the Ramsar list; however, the project site and its surroundings are significantly urbanized.
	10	Ecosystem	C	C	B-	C	During the works and in use: The objective of this project, which is to improve an existing road (construction of a grade-separated intersection), does not require "significant rights-of-way, nor modification of the environment", which makes it possible to avoid impacts on the natural environment and the ecosystem, such as "the significant degradation of the flora and the habitats of wild animals".
	11	Hydromete or	D	D	D	D	During the works: No operation is planned that could modify the watercourse system and their bed. In use: As this project does not cross any watercourse or body of water, there is no underwater construction, so there will be no perverse effects on the hydrometeor.
	12	Terrestrial relief and the nature of the terrain	D	D	D	D	During works and in use: The purpose of this project, which is to improve an existing road (construction of a grade-separated junction), does not require "significant excavation work or backfilling; the modification of the land relief, nor that of the nature of the terrain are not to be feared.

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
Social environment	13	Occupation of the site and resettlement of the inhabitants	B-	D	B-	D	Before the work: During the engineering phase, for the right-of-way of the land necessary for the extension of the road, it will be necessary to proceed with the acquisition of land from private properties. During the works: The acquisition of private land will be completed before the start of the works. In use: After the commissioning of the engineering structures, there will be no additional rights-of-way or resettlement of local residents.
	14	Poor class	C	B+	B-	C	Before and during the works: Street vendors may suffer the repercussions of the works. In use: The construction of a grade-separated intersection in place of the existing level intersection will alleviate traffic congestion, thanks to which spin-offs will facilitate access to the market and social services, such as school, hospital, even for the poor class.
	15	Ethnic minority and indigenous ethnicity	C	C	D	C	Before, during the works and in use: This project will have no adverse effects for the ethnic minority and the indigenous ethnic group.
	16	Local economy providing the population with jobs and subsistence	B-/B+	B-/B+	B-/B+	B+	During the works: These intersection improvement works may have repercussions on some of the existing stores. This work will create jobs. In use: The development of the intersection, once completed, could provide benefits to some of the existing stores. The local economy will be revitalized through improved logistics.
	17	Use of land and local resources	D	D	D	D	During construction and in use: As the purpose of this project is to improve an existing road (construction of a grade intersection), there will be no impact on the use of local land and resources.
	18	Use of water	C	C	D	C	Before and during the works: The works of the project will not have repercussions on the use of water, since there will be no evacuation of muddy water during the works. In use: There cannot be adverse effects on the use of water.
	19	Existing social infrastructure	B-	B+	B-	B+	During the works: There must be traffic jams during the works. In use: The number of road accidents should decrease following the development of the

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
		e and social services					existing intersection (in a grade-separated intersection).
	20	Social fabrics, such as social capitals and decision-making bodies	D	D	D	D	During works and in use: As this project aims to improve an existing road (construction of a grade-separated intersection), it is not expected to have repercussions on the social fabric, including social capital and decision-making bodies.
	21	Unequal distribution of damages and benefits	C	D	B-	C	During the works: Due to road traffic restrictions introduced during the works, the free movement of local residents and access to stores could be hampered or restricted. As for the possible implementation of a relief route, the residents of this route risk suffering the consequences of the traffic jam caused and the noise of the traffic. In use: As the present project aims to improve an existing road (construction of a grade-separated intersection), it will not bring the neighboring districts either benefit or unfair damage.
	22	Competition of interests in the region	D	D	D	D	Before and during the works, and in use: As this project aims to improve an existing road (construction of a grade-separated junction), it will not have a significant impact on the competition of interests in the region.
	23	Cultural Heritage	C	C	D	C	Before and during the works, and in use: No cultural heritage is known either in the area covered by this project, or in its surroundings.
	24	Landscape	D	D	D	D	During the works and in use: As this project aims to improve an existing road (construction of a grade-separated junction), the landscape will not be affected.
	25	gender aspect	C	D	D	C	Before and during the works: The gender problem will not be particularly aggravated by the implementation of the project. In use: The gender problem will not be particularly heightened by the implementation of the project.
	26	Children's rights	C	D	B-	D	During the works: It will be necessary to ensure the absence of child workers on the construction site. In use: As part of this project, the rights of children will not be infringed.

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In use	Before the works / After the works	In use	
	27	Infectious diseases, such as HIV/AIDS	B-	D	B-	D	During the works: Large-scale works are not planned, however the risk of the epidemic spreading is not ruled out at the site level due to the massive arrival of construction workers. In use: The road works themselves will not have any particular effects on infectious diseases.
	28	Work environment (including work safety)	B-	D	B-	D	During the works: It is necessary to take care of the working environment of the construction workers. In use: No operation is programmed to the detriment of the workers, during commissioning.
Others	29	Accident	B-	B+	B-	B+	During the work: Accidents may occur during the work. In use: After the completion of the grade-separated intersection, it is expected that the volume of traffic and travel speed will increase, however with the new grade-separated intersection, the number of accidents would be reduced.
	30	Impact on the natural environment in a transboundary context, and change climatic	D	B+	D	B+	Before and during the works: The objective of this project is to improve an existing road (construction of a grade-separated junction), and given its smaller scale, there are no impacts from the cross-border context and climate change. In use: The emission of greenhouse gases will be reduced due to the reduction of traffic congestion.

A+/- : significant positive/negative influences expected

B+/- : Minor positive/negative influences expected

C : Influence that may or may not occur, the intensity and extent of which is uncertain. Further analysis will be required

D : No or minimal influence. No need for further study.

Source: JICA Study Team

e. Positive impacts of the study

The clearing, earthworks, construction and exploitation works constitute a real source of temporary and permanent jobs likely to improve the level of income of the workers, in particular the competent young people of the area of influence of the project. To do this, the recruitment of workers and employees must be done primarily at the local level for the skills available on site.

The increase in activities and income will affect the people who work for the site (staff of the companies and the control office), as well as those who benefit from the performance of this work (various suppliers, sellers of foodstuffs, owners renting rooms for workers, etc.). These impacts are significant and of medium importance.

The implementation of the preparation, construction and operation works could be an opportunity for women to improve their income by carrying out petty trade and catering activities in the vicinity of the site. This impact is significantly positive for the project.

The presence of the flyover will facilitate traffic at Vêdoko and reduce traffic conflicts during peak hours. It will contribute to the safety and stability of traffic on the Abidjan-Lagos corridor. The major traffic problems around this axis will therefore be reduced. This will save user's time. The impact is positive and of major importance.

f. Reduction measures

Presented above, they are summarized in the following table and will contribute to significantly reducing the anticipated impacts and improving the project in order to develop the environmental reflex among the populations and the promoter of this project:

- ✓ Carry out a reforestation in compensation on a site identified with the population
- ✓ Inform the PAPs of the start of the works
- ✓ Pay compensation or resettlement aid before the beginning of work
- ✓ Set up a complaints management mechanism
- ✓ Develop, indicate and maintain temporary diversions
- ✓ Put in place traffic control devices to avoid traffic conflicts in the vicinity of the site
- ✓ Regularly educate truck drivers on road safety rules
- ✓ Avoid noisy work during rest hours
- ✓ Provide workers with Personal Protective Equipment (PPE) and ensure that they are actually worn
- ✓ Exploit quarries and borrow areas that have been the subject of an EIEIS (equipped with a CCE)
- ✓ Ensure the restoration of exploited quarries and borrow areas (restitution of topsoil, planting and other site development activities).
- ✓ Plan and minimize the delays of possible interruptions of dealer networks
- ✓ Inform populations about periods of disturbance
- ✓ Provide men with flags to organize traffic on the site
- ✓ With equal skills, give priority to local labor
- ✓ Respect the contractual deadlines for the execution of the work

- ✓ Develop and implement a Hygiene, Health, Safety and Environment Plan
- ✓ Periodically educate workers on safety measures at work
- ✓ Provide the construction site with a medicine box
- ✓ Recruit an HSE manager on site
- ✓ Develop and implement an emergency plan (POI or PU) in case of accidents and/or fire
- ✓ Raise awareness among site personnel and local residents on preventive methods to fight against STIs and HIV/AIDS
- ✓ Provide the base of the construction site with garbage cans and subscribe to a pre-waste collection structure
- ✓ Equip the construction site with toilets
- ✓ Define and implement a site waste disposal plan (solid waste, toilets, inert waste, etc.)
- ✓ Install a watertight platform for handling hydrocarbons
- ✓ Set up an adequate collection system for used oils and monitor it.
- ✓ Install speed limit devices when descending the flyover

I. Environmental Management Plan with mitigation measures and cost estimate

This environmental and social management plan includes several activities which are nothing other than the maximization and mitigation measures proposed for the successful outcome of the project on the environmental level. Impacts, activities, impact indicators, types and mechanisms of monitoring as well as those responsible for monitoring and surveillance. Some measures include the intervention of state structures and local authorities. The implementation of this plan is coordinated by the Benin Environmental Agency (ABE). It integrates:

- activities aimed at impact mitigation;
- the list of indicators for monitoring the implementation and impact of activities;
- the timetable for implementing the various measures/activities;
- the description of the different actors, their roles and responsibilities;
- implementation costs (if required);
- the development of the monitoring and environmental monitoring program;
- The protocol(s) for the acquisition and use of the measures carried out recommended by the ESMP (if necessary).

a. ESMP objective

The Environmental and Social Management Plan (ESMP) is the program implementing and monitoring the measures planned to eliminate, reduce and possibly compensate the harmful consequences of the project on the various components of the environment.

This program will make it possible to establish the environmental specifications which will accompany the environmental compliance certificate (CCE) issued by the Ministry of the Living Environment and Sustainable Development. The integration of the measures envisaged into the already existing environmental management provisions will reflect the commitment of the promoter of the rainwater drainage project of the city of Cotonou for sustainable development. The organizational framework to be put in place must make it possible to achieve several objectives if we want to ensure the success of the ESMP in the short and long term. To do this, the Project promoter and the Client must seek to achieve the objectives below:

- ensure that the populations directly concerned can actively participate in the choice of options;
- Guarantee that all the legitimate needs of the populations concerned are taken into account in an equitable manner. It will therefore be necessary to have an organization which will be able, on the one hand, to identify the real needs, and on the other hand, which will have sufficient authority to refute the unjustified requests or emanating from groups which will see in the project opportunities to seize;
- ensure that the means that will be planned and implemented are effectively distributed for the benefit of the populations concerned and in the most profitable way possible;
- ensure that the follow-up of the actions that will be undertaken is sufficient to prevent the negative effects from compromising the sustainable development of the city of Cotonou and its surroundings;
- Ensure that there is always very good coordination between stakeholders. Perfect coordination will also ensure information in a coordinated manner for all the parties concerned;
- Ensure that the basic objectives of the project are achieved. Thus, some options that could be decided cannot jeopardize the project itself;
- Ensure that the organizational structure that will be put in place can also ensure good continuity in the actions and their medium-term follow-up.

b. Organizational structure of environmental management and monitoring

Table: Roles and responsibilities of the organizations concerned in the implementation of environmental management

Stage	Organization name	Roles and responsibilities
Before and during the	Control mission	
	MCVTDD/SIRAT	It coordinates with each organization concerned with a view to implementing the environmental and social management plan (ESMP). He oversees the ESMP implemented by the construction company.

works (3 years)		It examines and approves the environmental monitoring report submitted by the construction supervisor consultant and the environmental consultant, and gives them the necessary instructions. After approval of the report, it sends it to the ABE.
	Project Management Consultant	Based in the site office, he oversees the construction contractor for the Project on a full-time basis, working with the environmental consultant within the construction supervisor consultant. He oversees the technical, schedule and safety of the Project.
	Environmental consultant	He oversees the monitoring and mitigation measures for negative impacts, approved and implemented on site. In addition, he periodically participates in meetings with the construction supervising consultant, the executing agency and the contractor to share information. It examines and revises the environmental monitoring report (ESR) submitted by the Project construction company and forwards it to the executing organization (MIT and SEES).
	Project construction company:	
	Construction company (Contractor)	Under instructions from the construction supervisor consultant and the environmental consultant, it implements the approved EMP. It sends periodically and on a weekly or monthly basis to the environmental consultant the report (CSR) relating to all the measures to mitigate the negative impacts implemented on the site.
	Administration	
	Benin Environment Agency (ABE)	It is responsible for the implementation of the national environmental policy. It works in collaboration with the other sectoral Ministries, local authorities, non-governmental structures, civil society and the private sector. It manages all environmental assessment procedures and is legally responsible for validating ESAs and other types of environmental assessments.
After commissioning (3 years)	Cotonou City Hall	The municipality gives its opinion each time it is envisaged on its territory, the realization of a project likely to harm the environment. The Mayor of Cotonou, as the beneficiary of the Project for the development of a flyover in Cotonou, has a double responsibility. Specifically, before the starting of the construction works, he has the duty to manage all issues related to the involuntary displacement of populations. In this perspective, it will set up in each affected district, a Local Resettlement Committee.
	Executing agency:	
	SIRAT	Based on the approved ESIA, it provides environmental monitoring and environmental management for 3 years. It periodically transmits the results of environmental monitoring to the ABE.
	Administration	
	Benin Environment Agency (ABE)	It is responsible for implementing the national environmental policy adopted by the government as part of its development plan. It works in collaboration with the other sector Ministries, local authorities, non-governmental structures, civil society and the private sector.
	Cotonou City Hall	After the construction of the flyover, he is responsible for the maintenance of the structure.

Source: JICA study mission

For a targeted intervention, a monitoring plan is proposed for the implementation period and after the completion of the Project.

g. Environmental monitoring plan

The environmental monitoring and follow-up program makes it possible to ensure the application of mitigation measures and to document certain long-term impacts of the project on the environment, including those that cannot be anticipated. In this case, it will be necessary to ensure that the mitigation measures are correctly applied.

Table 9: Environmental monitoring program and mitigation measures (plan

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
Before the works									
Natural environm ent	1	Ecosystem	Release of rights of way	If necessary, draw up an afforestation program for the crossroads and the edges of the roads.	Road geometry Selection and layout of fixed installation sites	Consultant under contract	SEES and the authorities concerned	City hall of Cotonou ABE	
	2	Acquisition of land and resettlement of inhabitants	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those concerning assistance in the recovery of means of subsistence. The implementation of the monitoring of the living standards of the resettled residents, according to the defined abbreviated resettlement plan.	Compliance with RAP	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou ABE	
Social environment	3	Poor class	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those concerning assistance in the recovery of means of subsistence. The implementation of the monitoring of the living standards of the resettled residents,	Compliance with RAP	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou ABE	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
				according to the defined abbreviated resettlement plan.					
	4	Local economy providing the way population with jobs and subsistence	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those relating to the recovery of livelihoods.	Road geometry Information and public consultation (for the record) Compensation for expropriated persons (for the record) Preservation of constructions on rights- of-way Information of the populations on the interruptions of networks	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou ABE	
During the works									
Measure against pollution	5	Air pollution	Realization of infrastructure: - work on the right- of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	[Measurement against fine suspended particles] Watering in construction areas and temporary installations; Dust screens will be placed around the demarcation lines, as required.	Coverage of material transport trucks Installation of the asphalt plant Compliance with gas emission standards Standard-compliant gas emission measurements	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	
	6	Water pollution	Discharge of construction wastewater	Installation, as needed, of a temporary grit trap Appropriate management, treatment and disposal of hydrocarbons Installation of latrines at the base of the project; Appropriate treatment and disposal of human excrement collected at the base camp;	Stream bed cleaning and restoration Management of liquid pollutants and solid waste Wastewater analysis results	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
	7	Waste	Discharge of construction waste	[Construction site waste] Construction site waste (felled trees, excess earth, cuttings) will be managed as necessary, depending on the nature of the waste to be reused or disposed of in the public dump, in accordance with the regulations in force in the country; Appropriate management, treatment and disposal of waste from the base camp; Human excreta will be disposed of at the designated sewage treatment plant, after temporary storage within the project in a slop tank.	Management of liquid pollutants and solid waste Presence of latrines on the site	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	
	8	Noises and vibrations	Realization of infrastructure: - work on the right-of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	Use of low-noise construction machinery and equipment, limitation of the work schedule; If necessary, installation of a noise barrier (sheet piling or tarpaulins)	Arrangement of working hours	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	
Natural environment	9	Nature reserve	Ditto	refer to Air Pollution, Water-Pollution, Waste, Noise and Vibration	-	-	-	-	
	10	Ecosystem	Ditto	Carrying out the program by planting trees.	Reforestation actions Preservation of alignment plantations Line plantings	Co-Sensitization of staff environmental protection consulting under contract	SEES and the authorities concerned	City hall of Cotonou ABE	
Social environment	11	Local economy providing the	Realization of infrastructure:	In order to ensure traffic at avenue François Mitterrand, a relief route	income level	Construction contractor	SEES	City hall of Cotonou ABE	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
		population with jobs and subsistence	work on the right-of-way, earthworks, pavement layers and coating	will be set up and, if necessary, other routes giving access to commercial facilities located along the road. Public car parks will be set up which will be used during the works. Losses of earnings suffered by local traders will be subject to compensation, if applicable.		(Construction company) Compensation for loss of earnings will be provided by Benin.			
	12	Existing social infrastructure and social services	Ditto	The transfer of utilities and public facilities through consultation with the authorities concerned. Provide in the work schedule for road traffic to be maintained during the work. The traffic management plan to ensure traffic flow	access to infrastructure	Construction contractor (Construction company)	SEES and the authorities concerned	the City hall of Cotonou ABE	
	13	Unequal distribution of damages and benefits	Ditto	Provide in the work schedule for road traffic to be maintained during the work. The traffic management plan to ensure traffic flow	income level access to houses / shops / infrastructure	Construction contractor (Construction company)	SEES and the authorities concerned	the City hall of Cotonou ABE	
	14	Gender	Employment of construction workers	of equal pay for men and women facilities for female workers	salary facilities	Construction contractor (Construction company)	SEES and the authorities concerned	the City hall of Cotonou ABE	
	15	Children's rights	Employment of construction workers	of The prohibition of child labor will be stipulated in the contract for construction works. The possible presence of working children will be monitored and strictly controlled.	detection of child labor	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	
	16	Infectious disease	Influx of construction workers	of The site will be equipped with a proper drainage system with the aim of eliminating any mosquito habitat. Sanitary facilities (latrines) will be made available to workers. The implementation of medical examinations and the mandatory periodic medical visit.	Staff awareness of STIs/AIDS	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
				For the prevention of infectious diseases, organize educational activities not only for construction workers, but also for local residents.					
	17	Work environment (including work safety)	Realization of infrastructure: - work on the right-of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	Ensure the working environment in accordance with the requirements of IFC(SFI) (Performance Standard 2 Workers and Working Conditions)	The emergency plan is implemented Monthly IEC reports Annual internal audit report Compliance with work safety rules	Construction contractor (Construction company)	SEES	City hall of Cotonou ABE	
Others	18	accidents	Passage of construction vehicles	Installation of traffic controllers Installation of safety panels Marking of the work area, using signs and barriers of security Lighting for night work Development of car parks and waiting areas for works machinery Traffic speed limit on site Organization of safety training for construction workers. Implementation of detour routes, during the work period, for the safety of local residents, commuters and schoolchildren.	Specific road signs and traffic officers are visible Weekly outreach reports Activity reports Number of awareness sessions carried out Signaling of construction sites and maintenance of traffic	Construction contractor (Construction company)	SEES		

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
In service									
Measure against pollution	19	Air pollution	Passing vehicles more	proper vehicle maintenance	Compliance with gas emission standards Standard-compliant gas emission measurements	Road operator	SEES and authorities concerned	the City hall of Cotonou-ABE	
	20	Water pollution	Road discharge	adequate road drainage	Wastewater analysis results	Road operator	SEES and authorities concerned	the City hall of Cotonou-ABE	
	21	Noises and vibrations	Passing vehicles more	Depending on the need, noise barriers will be installed.	noise and vibration level	Road operator	SEES and authorities concerned	the City hall of Cotonou-ABE	
Others	22	accidents	Passing vehicles more	Installation of safety signs (Speed limit, prohibition to cross, except at the passage provided for this purpose, etc.)	Number of accidents	-	SEES	City hall of Cotonou-ABE	

Source: JICA Study Team

J. Stakeholder engagement (two-stage consultation meetings for public engagement)

In the general ESIA guide, it is clearly indicated that if the impact study proves to be an essential tool in the identification and evaluation of the consequences and repercussions that certain projects may have on the natural and human environments, however, it cannot be exhaustive. It can neither determine with a sufficient degree of precision what is desirable or a priority, nor evaluate according to a scale of values what is compatible with the quality of life of the citizens of a given region or locality. Public participation allows people, groups or municipalities affected by the project to have access to technical information, to express their opinions on the project and to highlight the collective values that must be considered in decision-making.

The public consultation makes it possible to verify whether there are no unforeseen consequences to the implementation of a project. In addition, it makes it possible to carry out a summary inventory of the goods and people affected. It is separate from the public hearing procedure. The public consultation also makes it possible to identify the blocking factors of the project and to provide adequate responses to them for the benefit of the stakeholders. Concerning the project of construction of the flyover, the questions of land, the questions of displacement of networks and commercial position, if they are not treated with tact, risk hindering the process of implementation of the said project.

In addition to the public nature of the meetings, the target groups identified were officially invited through the heads of the districts and heads of neighborhoods who actively invested in mobilizing the public. It emerges from the various public consultations that the participants and especially the local populations are aware of the relevance of the project. They are aware of the causes of traffic jams and their consequences. They also recognize their role in the realization of projects, but sometimes take the politico-administrative authorities as responsible. However, concerns have been registered everywhere else, including:

- informing the affected people before the demolition works;
- for affected persons;
- pollution problems and various nuisances;
- local staff recruitment;
- raising workers' awareness of bad behaviour;
- the safety of users during the work;
- traffic problems during the works;
- accident risks;

- the involvement of the town hall, local elected officials and local residents (local residents' committee) in raising awareness and monitoring the work;
- etc.

Table 10: Result of the first stakeholder consultation

Date	Location	Number of participants	Concerns and issues	Responses and countermeasures
October 6, 2022	13th district	0 Person Heads of neighborhoods involved in the project	The diversions route must be well considered, as it would have a significant impact on the neighborhood. It is desirable that the intersection be designed taking into consideration all surrounding roads. It is desirable to give preference to local labour It is desirable that flood risk management measures be included in the Project. What is the exact extent of the area that is impacted? Will access during the works be provided?	It is being considered as part of the study. The project will be designed so as not to interrupt the traffic flow of the intersection. These are taken into consideration during the study. Provisions will be made to ensure the recruitment of local labour Flood prevention measures are included in the Project. The physical impact only concerns the mobile phone shop and the wall in front of the CAD/CAM building. Access arrangements will be considered in the planning of the construction works.
October 8, 2022	13th district	6 people	The diversion route needs to be well considered as it would have a significant impact on the neighborhood. It is desirable to include flood risk management measures in the Project. It is desirable to consider the possibility of employing local people for the works. There is concern about limiting access to shops during the works.	These issues will be addressed in the EMP. The project will be designed so as not to interrupt the traffic flow of the intersection. Flood prevention measures are included in the Project. It will be considered as part of the ESIA and PRTAP. The design of the access will be considered in the construction planning.
October 10, 2022	13th district	17 people The head of the 13 th district, neighborhood leaders and resource persons	How long will the work take? The detour route needs to be well studied, as it would have a significant impact on the neighborhood. Consider flood risk management measures in the Project. Examine the possibility of hiring local residents for the work. Work together with local authorities to better define the route of the bypasses. Establish a project management committee at the district level	It is estimated to last approximately 4 years. These issues will be addressed in the EMP. The Project will be designed so as not to disrupt intersection traffic. Flood prevention measures are included in the Project. It will be considered as part of the EIA and PRTAP.

K. Complaint management mechanism

a. Mode d'accès au Mécanisme de Gestion des Plaintes

The complaints submission process will be diversified to respect the principle of accessibility and contextualisation. Various points and channels will be used for lodging complaints:

- ✓ by self-referral to the various complaints management committees;
- ✓ by formal letter;
- ✓ by e-mail;
- ✓ by telephone call, SMS, WhatsApp;
- ✓ by sending an anonymous message depending on the sensitivity of the complaint;
- ✓ by contact via the SIRAT website;
- ✓ by presentation of the complainant,
- ✓ Through an intermediary.

A communication plan on the MGP with a focus on procedures for managing sensitive complaints will be developed in order to inform all Project stakeholders through the various channels, with particular attention paid to communicating with vulnerable groups in beneficiary communities, employees and workers associated with the Project.

b. Organisational framework of the MGP

The implementation of the MGP will be based on a three (03) level organisation chart, namely: the base committee (neighbourhood/district), the communal level and the higher level (Project Management Unit). This arrangement will be put in place to ensure better accessibility and facilitate local management of complaints.

- ◆ **Level 1:** This is the District Complaints Management Committee (CAGP), which will be set up in the districts in the project area. It will be chaired by the Heads of District. The Committee will be set up and formalised by means of a municipal by-law..
- ◆ **Level 2:** This is the Communal Complaints Management Committee (CCGP), which will be set up at Cotonou Town Hall. This is the body responsible for resolving complaints that have not been resolved at the first level of management (CAGP). If a complaint cannot be resolved at first level (neighbourhood/district), an amicable settlement will be sought through arbitration by the committee at municipal level, insofar as possible, with a view to reaching a consensus. The Committee will be set up and formalised by municipal decree. It will be chaired by the Mayor or his representative.
- ◆ **Level 3:** the National Complaints Management Committee (CNGP), which is based in the Project Coordination Unit. This committee is responsible for steering the MGP. To this end,

it is the supreme body for resolving complaints and appeals not settled by the Committees set up at levels 1 and 2.

- ◆ Not settled by the Committees set up at levels 1 and 2.

NB: when a quorum is reached, the committee members can sit and take decisions.

Any complainant may refer the matter to any level that suits him or her, either in person or in writing (email, text message, WhatsApp, hard copy) or by calling the dedicated telephone number. The complaint will be recorded and dealt with within the time limits set out in the specific procedures for each level and on a case-by-case basis. However, it should be noted that any complaint received by any level and/or format must be notified in writing and recorded on the computerised complaints management platform.

c. Operating procedure for the management mechanism for non-sensitive complaints

The procedure for managing complaints under the project involves nine (9) stages, from the registration of the complaint to its complete extinction and the archiving of the resolution file.

- Stage 1: Receipt, registration and acknowledgement of complaints;
- Stage 2: Examination of complaints;
- Stage 3: Investigation into the merits of the complaint;
- Stage 4: Proposals for a response or preparation of a draft response;
- Stage 5: Review of responses in the event of non-resolution at first instance;
- Stage 6: Implementation of corrective measures;
- Stage 7: Closure or termination of the complaint;
- Stage 8: Reporting ;
- Stage 9: Archiving.

The figure below summarises the various stages involved in resolving a non-sensitive complaint in the context of this Project.

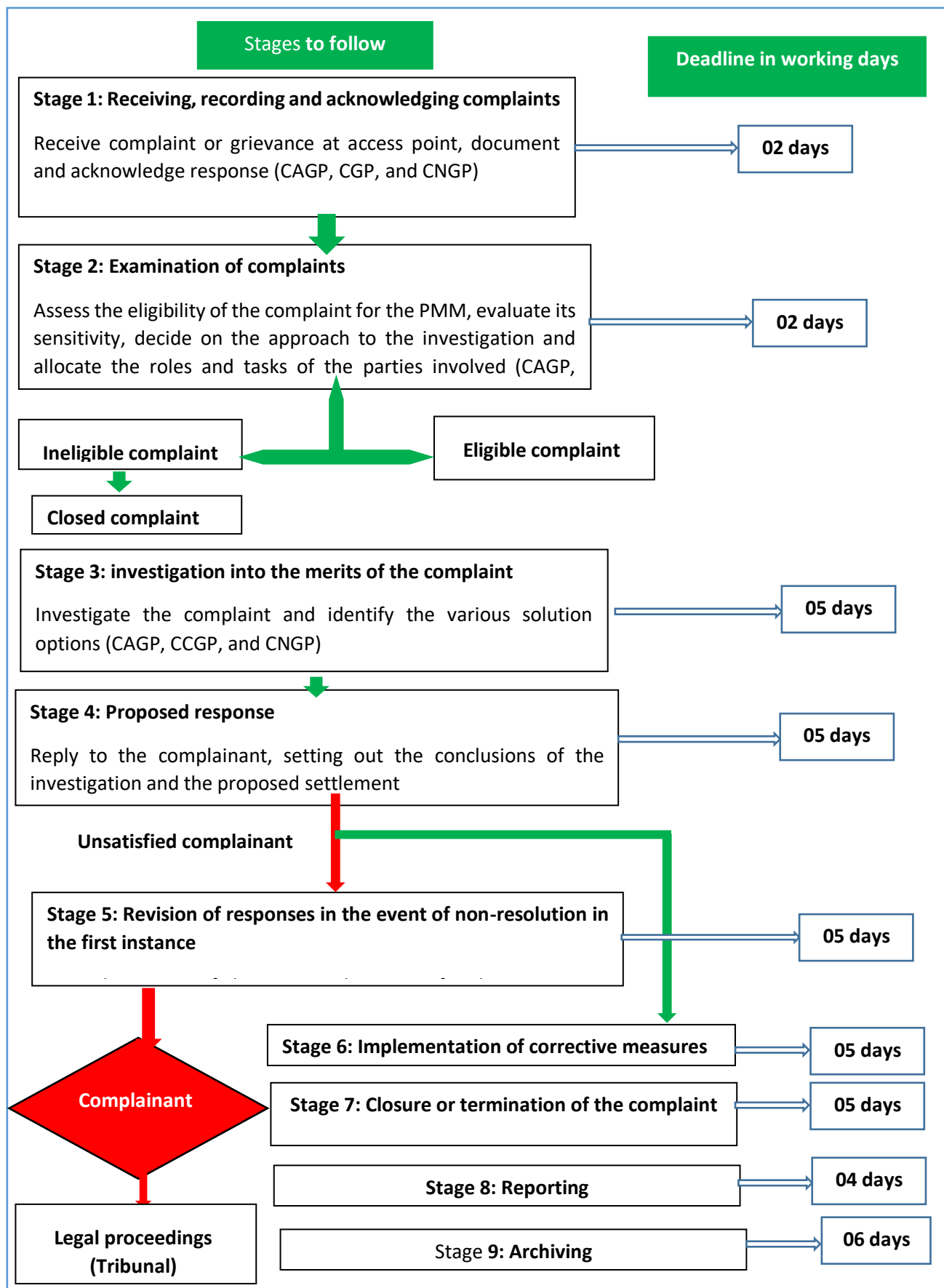


Figure: Stages in the management of non-sensitive complaints

Source: Adapted from FP2E project, November 2022

d. Sensitive complaints management procedure (GBV/EAS/HS)

Due to the specific requirements of managing sensitive complaints, such as confidentiality and the safety of survivors, the amicable conflict management procedure is neither applicable nor authorised for this category of GBV/EAS/HS-related complaints. Specific procedures have been developed for this purpose. A committee will be set up at municipal level, made up of representatives of the bodies most specialised in handling sensitive complaints. The composition of this committee is as follows:

- a representative of the Social Promotion Centre (CPS) in Cotonou;
- a representative of the Cotonou Health Centre closest to the project;
- a representative of the Republican Police (Judicial Police);
- a representative of the National Women's Institute (INF);
- A representative of an NGO involved in social protection (GBV/ASR/HS management) at local level.

These complaints are systematically forwarded to the national level by the local GBV management committee. A maximum of ten (10) working days is allowed for the proposed response. The complainants concerned will be informed of any additional deadlines. The following steps will be taken to deal with these complaints:

- ✓ Receiving and registering a GBV/EAS/HS complaint
- ✓ Sorting and processing a GBV/EAS/HS complaint
- ✓ VBG/EAS/HS complaint verification process
- ✓ Follow-up and proposed response

e. Administrative provisions and recourse to the courts to settle complaints

Anyone who feels aggrieved by the implementation of the Project's activities must submit a request to the complaints management bodies, preferably for amicable resolution. If the dispute is not settled, recourse is made to the PCU. This avenue of appeal should be strongly encouraged and supported. But if the claimant is still not satisfied, he or she can take the matter to court. The costs of legal action will be borne by the complainant (non-sensitive complaint). It is therefore in the interest of all Project stakeholders to facilitate participation in the out-of-court settlement process in order to limit recourse to the courts.

f. Operationalisation of the complaints management mechanism

The complaints management system will only be useful if the beneficiary communities, the people likely to be affected by the project or to influence its proper implementation, are informed. It is therefore important to make communities understand that they have the right to complain and that all complaints will be dealt with fairly, efficiently and as simply as possible. This will ensure the effectiveness of this PGM. The information, awareness and training sessions will be reinforced by:

- broadcasting the MGP on community radio stations without language barriers (easy French and local languages of the areas concerned);
- The production of kakemonos to be displayed in the Districts (10th, 11th and 12th) and the Cotonou town hall, as well as on the project site;
- the printing and distribution of brochures/prospectuses on the MGP in the localities concerned and on the SIRAT and UCP websites;
- the production of audio-visual capsules for sensitive and non-sensitive complaints;
- The use of these audio-visual clips in training or capacity-building sessions for the committees and during community information and awareness-raising sessions.

Capacity-building of stakeholders

Implementation of the MGP for the Vedôkô flyover construction project requires the setting up of bodies to manage sensitive and non-sensitive complaints.

Monitoring and evaluation of the MGP

The aim of the MGP's Monitoring and Evaluation is to improve the project's performance in the complaints management process. It also aims to ensure that the information associated with complaints is used to correct actual or potential problems encountered in the implementation of project activities. It will answer the following questions:

- ✓ Are all those involved in implementing the project aware of the MGP's procedures?
- ✓ How many complaints have been received and by who?
- ✓ Which levels received and managed the complaints?
- ✓ What is the profile of complainants (headcount by age, gender, level of education, etc.)?
- ✓ What are the subjects of the complaints?
- ✓ When and how did the complaints management committees handle complaints?
- ✓ How were the proposed responses communicated to the complainants?
- ✓ Do more complaints come from a particular village?
- ✓ Do certain types of complaint recur systematically?
- ✓ Are there any lessons to be learned from the way the MGP operates?
- ✓ Can the solutions be replicated in other contexts?
- ✓ What should be done in the future to avoid this type of complaint?

Monitoring indicators

The PCU is responsible for the overall implementation and monitoring of this PMM. As such, it will ensure that the system for receiving and monitoring complaints is improved. Particular attention will be paid to claims and complaints from vulnerable people.

g. Cost and budget of the complaints management mechanism

- h. The implementation cost is estimated at **39,800,000 CFA francs (thirty-nine million eight hundred and seventy thousand francs).**

L. Risk and accident management

Personal risks for each type of activity

The activities concerned by this project are: the construction of infrastructure, the development of adjacent service streets and those whose development will contribute to improving water drainage.

Key activities in the construction and operation phases will be considered. These risks concern:

- ✓ Risks associated with work to relocate various networks (water, electricity, telephone lines, etc.)
- ✓ Risks associated with the construction of bypasses;
- ✓ risks associated with earthworks, stripping, excavation work and storage;
- ✓ Risks associated with the construction of wastewater treatment works (structural work and placement of compacted backfill);
- ✓ risks associated with earthworks for road construction;
- ✓ risks relating to the commissioning of the works and maintenance during the warranty period;
- ✓ Risks to property and the natural environment for each type of activity.

a. General preventive measures and minimising risks during the works

The company must provide its personnel with the PPE necessary for their protection, in particular:

- helmets and safety shoes, which must be worn everywhere on the site;
- gloves, which must be worn for manual demolition work, jackhammer work, digging with shovels, etc.; and
- Noise protection for work exposed to noise (using a compressor, sinking a road, demolition work with a jackhammer, explosions, etc.);
- Eye protection (or visors) and respiratory protection against dust, gases, splashes (solid or liquid) and radiation (welding goggles, etc.);
- High-visibility fluorescent waistcoats to avoid being run over by a vehicle or handling equipment, etc.

In the same vein, there should be:

- protection against the risks of electrification, electrocution or static electricity: electrician's gloves, earthing devices (bracelets, poles), etc. ;
- gloves, goggles and masks to protect against 1) chemical or biological splashes 2) intense sources of heat and the risk of fire and 3) wound risks (cuts, abrasions, etc.);
- Lifejackets to protect against the risk of drowning.

Safety materials and equipment must be in perfect condition and worn, which justifies training in the use of PPE and the risks they protect against.

I. CONTEXT OF THE PROJECT

1.1. Context and justification of the project

In Benin, the Government's vision and will revolve around a strong principle: quickly commit to the investments necessary for sustainable urban development that guarantees the satisfaction of the needs of the populations. The Government's Action Program (PAG) aims to profoundly transform Benin's economy while strengthening social protection and the living conditions of the population. The PAG is based on three pillars:

Pillar 1 – the consolidation of democracy, the rule of law and good governance;

Pillar 2 – structural transformation of the economy;

Pillar 3 – improving people's living conditions.

The "strengthening of transport infrastructure" is one of the strategic axes, focusing on the structural transformation of the economy, the development of infrastructure, the strengthening of transport, logistics and trade infrastructure. Benin is an important passage of the Abidjan-Lagos corridor (international east-west corridor) which fulfills a primordial role in the regional development of the "growth ring" in West Africa. It is also located at the starting point of the Cotonou-Niamey corridor (south-north international corridor). These factors explain the essential place of this country in the African policy of Japan.

Ensuring the security and stability of traffic on the Abidjan-Lagos corridor is an important issue of the wider regional development, in order to promote the structural transformation of the economy, including the improvement of logistics in the city of Cotonou, in the Benin and West Africa and the strengthening of industries with high potential. The city is served by the axes of the RNIE (National Inter-State Road) 1 (connecting the east and the west), the urban road, the RNIE 2 (located west of the RNIE 1, leaving from the port of Cotonou to the north passing through the city) and from the RNIE 3 (located to the east and passing through Porto-Novo the capital to the north).

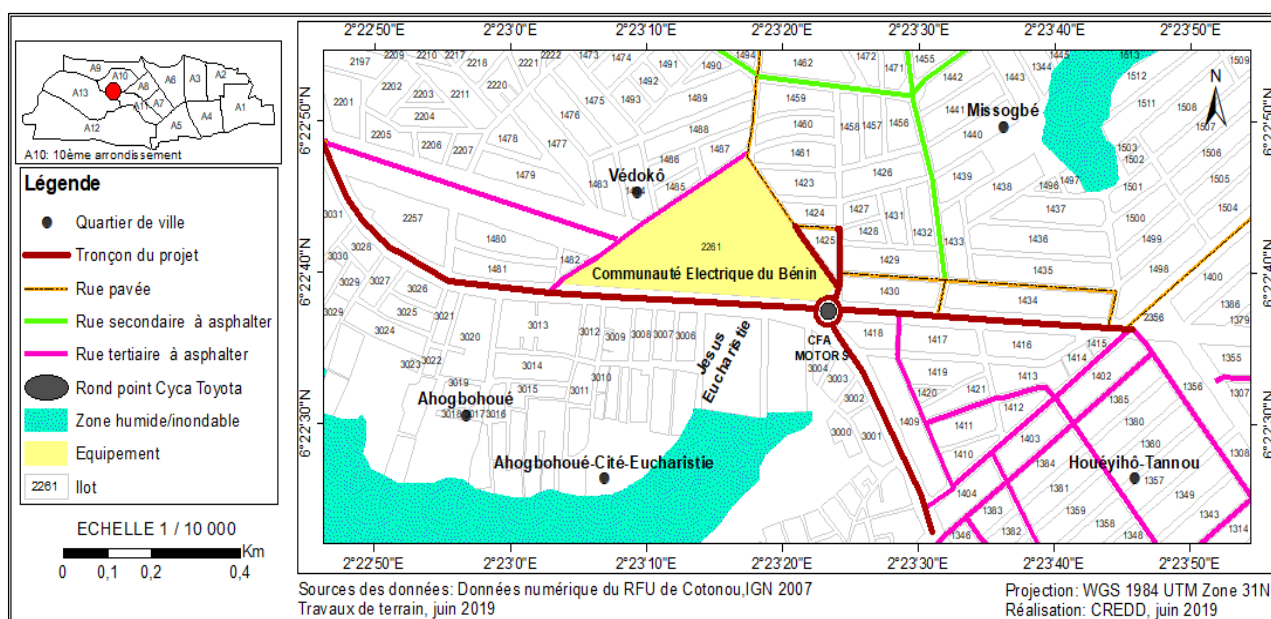


Figure 1: Perspective of the intersection
Source: Fieldwork, 2019

The doubled sections of RNIE 1 and RNIE 3 are chargeable. In addition, the development of the northern ring road is planned, considered as an important measure to alleviate the concentration of road traffic in the heart of the city where not only traffic passes between the center and the suburbs of the city but also transport international freight.

According to the report of the study of the French company EIFFAGE, dated December 2015 and the traffic study within the framework of the development of the national road master plan, implemented as an EU project (report of March 2017 written by the American company Louis Berger), the composition of Cotonou's urban traffic is as follows: 17% car, 1% truck and 82% motorcycle (two wheels). The share of two-wheelers is very high. This observation was confirmed by the preliminary study carried out on the initiative of our group. The study of the development of the master plan on the Beninese traffic network carried out by Louis Berger presents the forecast traffic on the axes of the city of Cotonou for the years 2020, 2026 and 2035.

This forecast is based on the scenario for the commissioning of the northern ring road, currently under development, the current situation of the project of the said ring road, the trends in traffic increase as well as the policies of the Beninese government, among others will have to be scrupulously checked during the present study, in order to obtain a relevant forecast. The forecast studies above mention a concentration of traffic on the Vêdoko crossroads (site of the construction project for the Vêdoko crossroads flyover in the city of Cotonou in Benin and four intersections in the city).

This mission, which relates to the realization of the ESIA of the Vêdoko flyover construction project, will assess the interaction between the project and the environment and will propose an environmental and social management plan (ESMP).

The Framework Law on the Environment n ° 98-030 of February 12, 1999 establishes the principle of environmental protection in Benin. This law stipulates in its article 88 that "no one can undertake developments, operations, installations, plans, projects and programs or the construction of works without following the procedure of environmental impact study, when the latter is required by laws and regulations". This will involve making an inventory of the project site, presenting the project activities, analyzing the probable risks related to the implementation of its activities and updating the Resettlement Action Plan. (RAP) existing, taking into account the requirements of the Japan International Cooperation Agency (JICA) and the texts in force in Benin.

According to the texts in force in Benin, Decree No. 2022-390 of 13 July 2022 on the organization of environmental and social assessment procedures in the Republic of Benin, provides details on the main lines of carrying out the Environmental and Social Impact Assessment (ESIA) and the procedures to be followed. For JICA, the analysis will be carried out according to the guidelines and its application especially with regard to environmental and social considerations (2010) (JICA Guidelines). According to annex 1 of the general guide for carrying out an EIA in Benin (ABE, 2001), this project for the development of the Cotonou flyover is classified in category XIII: infrastructure projects and more precisely types XIII.2 (road rehabilitation) and XIII.6 (bridge construction). This project must therefore be submitted to an in-depth ESIA (ABE, 2001) which corresponds to the category A+/- project: A significant positive/negative impact is expected.

1.2. Project type

The terms of this in-depth environmental and social impact study are defined by Decree No. 2022 - 390 of 13 July 2022 on the organization of environmental assessment procedures in the Republic of Benin. This decree presents the main guidelines for carrying out ESIA's and the procedures to be followed. The decree will be supported by JICA's guidelines for environmental and social considerations. Thus, the present development project for the flyover at the Vêdoko crossroads in the city of Cotonou has been subject to an in-depth ESIA (cf. titles XIII.2 and XIII.6) of the general guide to ESIA's in Benin; EBA, 2001).

1.3. The project's objectives

The general objective of this project is to build a viaduct approximately 270 m long and a signaling system for the surrounding intersections. Specifically, the project will:

- ▶ Transform the roundabout into a signalized intersection;
- ▶ Make traffic flow at the Vêdoko roundabout;
- ▶ Ensure traffic safety and stability on the Abidjan-Lagos corridor;
- ▶ Optimize the effect of the rehabilitation of the Toyota roundabout.

1.4. Scope of the work

The consultant shall (a) conduct field work and (b) prepare an additional and/or updated ESIA report following Decree No. 2022 - 390 of 13 July 2022 and Guidelines for Environmental and Social Considerations (2010).

The Consultant shall also (c) undertake field surveys, related to social consideration, and (d) prepare an additional and/or updated RAP report (as required by Benin law and/or by environmental authority in Benin and/or or JICA), based on a review/update of the resettlement framework/compensation policy, which has been prepared.

All reports should be prepared in accordance with JICA guidelines and the latest Beninese legislation. Consultants are requested to propose work items/bids, which are not covered by these terms of reference, but required by the latest Beninese legislation.

1.5. Objectives of ESIA

1.1.1. Main objective

The objective of the mission to carry out the environmental and social impact study of this project is to analyze the interactions between the project and its environment, and to assess the potential impacts of the project on the environment and on the society in order to guarantee the safety of the population and the sustainability of the project.

1.1.2. Specific objectives

Specifically, this will be:

- Analyze the legal and institutional framework of the project as well as the legislative and regulatory aspects of ESIA in Benin;
- Analyze international guidelines and requirements for the project;
- Describe the project site, in particular by the physical, biological, social and human aspects;
- Analyze the various activities to be carried out within the framework of the Project;
- Analyze the different variants proposed by the design;
- Identify the negative and positive impacts of the various project activities likely to disturb the balance of the receiving environment;
- Identify the fundamental risks and issues that will govern the implementation of the Project and that will allow, if necessary, to specify the related infrastructure and equipment that will facilitate the operation of the Vêdoko flyover;
- Assess the technological risks associated with the project;
- Identify the measures and recommendations likely to reduce, mitigate or compensate for the negative effects associated with the various components and phases of the project;

- Define a risk management plan related to the environment, health and safety of populations by phase (before the works, during the works and during the operational phase), in accordance with the requirements of Beninese legislation;
- Propose measures to mitigate or maximize environmental and social impacts and then to protect against the risks of accidents and insecurity;
- Propose an Environmental and Social Management Plan (ESMP).

1.6. Presentation of the promoter

Road Infrastructure and Land Management Company (SIRAT)

Quartier Awhanlèko Plage Ouest - 04 BP 1109 Cotonou.

+229 21 60 45 45 / 64 89 20 20

contact@sirat.bj

1.7. Presentation of the consultant

BANCA Engineering, having its head office at 3100-I square, Agla Hlazounto in Cotonou, tel. (+229) 95951782, registered in the Cotonou Trade and Personal Property Credit Register under the number R.C RB COTONOU 2008-B3616, IFU 3200800591910 of April 4, 2008, represented by Mr. ACCROMBESSY Franck, as the General Manager, with full powers for the purposes of the present contract, and referred to hereinafter as: "BANCA"

N ^o	Name and Surnames	Position within the team
1	GUEDEGBE B. Ilarion S.	Environmental and Social Assessment Expert, Head of Mission
2	AGOSSOU Maxime	Sociologist and lawyer
3	GUELNODJI Benjamin	Coordination of the collection and processing of socio-economic data
4	HOUEDANOU Félicité	Junior consultant in environmental and social assessment
5	LEFFI Latifou	Associate cartographic expert
6	OGOUE Serge	Quality analysis

II. PROJECT COMPONENTS RELEVANT TO ENVIRONMENTAL AND SOCIAL IMPACT

This chapter describes the project activities selected after the analysis of variants and alternatives. The concern here is to describe the components of the project in more or less detail according to the data from the technical studies (APS and APD). This chapter therefore includes the presentation of the project's infrastructure and facilities as well as the description of the project's activities.

1.8. Project infrastructure and facilities

The activities planned as part of this project are the construction of a two-lane overpass in both directions (expected to be around 500 m long), improvement of the level crossroads (transformation of the roundabout into a signalised intersection). Table 1 shows the objective, expected results and overview of the project.

Table 1: Overview of the project activities

Project Objective:	Ensure traffic safety and stability on the Abidjan-Lagos corridor, an important issue for broader regional development, in order to promote the structural transformation of the economy, including logistical improvements in the city of Cotonou, Benin and West Africa, and the strengthening of high potential industries.
2) Expected Results:	The intersection in front of the Toyota dealership on the Abidjan-Lagos corridor is decongested thanks to its rehabilitation.
3) Overview:	[Infrastructure] Construction of a one-lane viaduct in both directions (about 500 m long), improvement of the intersection at ground level (transformation of the traffic circle into a signalized intersection) [Equipment] Signalization system for nearby intersections, etc. (Study details in the preparatory study)

Source: JICA, 2019



Figure 2: Ordinary drawing of the integrated circuit

Source: JICA, 2019

1.9. Presentation of project activities by phase

1.9.1. Preparatory phase*

It includes all the activities required to start the works under the best possible conditions, i.e. :

- Site clean-up and installation,
- Recruiting the workforce
- Deployment of site machinery and equipment (concrete mixers, mechanical shovels, cranes, trucks, compactors....),
- Supplying the site with materials (gravel, granite, sand, iron, cement, etc.).

Table 2 shows the significant activities for impact analysis purposes.

Table 2: Activities in the preparation phase

N°	Activities by phase
1.	Start-up phase
1.1.	Clearing the site and setting up the living quarters
1.2.	Recruitment
1.3.	Deployment of machinery and equipment
1.4.	Supply of construction materials

1.9.2. Technical studies

1.9.2.1. Study of the work schedule

The Toyota junction is a traffic hotspot, so the volume of traffic there is intense. This is why shortening the construction period is a key issue for the project. Table 3 shows the points to be considered for the bridge project.

Table 3: Provisional work plans to reduce the time required to complete the work

Tip	Project components	Flyover project policy	Rate of time reduction
Reducing the number of pillars	Rotating pile	- This is a tubular steel pile, the tip of which is fitted with fins to give it greater load-bearing capacity. - As the base plate is smaller, excavation work is reduced and the environmental impact is minimised.	45% (compared with cast-in-ground piles)
	Tubular steel soil-cement pile	- Compound pile combining the tubular ribbed steel pile and the soil-cement pile - Uses local soil, reducing excavation and environmental impact	50% (compared to cast-in-ground pile)
	Direct connection between	Use of large-diameter cast-in-ground piles that also act as pillars	60

Tip	Project components	Flyover project policy	Rate of time reduction
Omission of the sole	reinforced concrete pillar and foundation pile	The omission of a footing will reduce the execution time.	(Compared to the ordinary pile with sole)
	Direct connection of steel pillar and foundation pile	- Use of large-diameter driven piles to integrate with the steel pillar - The omission of the footing will reduce the construction time.	55 % (Compared to ordinary pile with sole)

Table 4: Considerations to be taken into account in the bridge plan

Elements	Important points to consider (proposal)
Measures to prevent salt damage	- As the bridge site is located in the coastal zone, measures to prevent salt damage are essential. - In accordance with the standard for road bridges, the reinforcement will be of the rustproof type and protected under a sufficient layer of concrete. As salt content varies from region to region, salt content analyses should be carried out to ensure that this factor is taken into account in the design and quantity survey.
Safety measures against falling vehicles	The safety barrier must be strong enough to withstand any loads from a vehicle.
Measures for placing objects after the work has been completed	- The project program will be designed in such a way as to allow lines such as the water main to be laid after the works have been completed. - In the case of other lines, a survey of future projects should be carried out so that they can be taken into account in the design.

1.9.2.2. Study of the drainage works plan

The southern region of Benin, in the centre of which lies the city of Cotonou, is a region classified as a flood zone, because it is a marshy area bordered by lagoons, with a river nearby, and densely populated. In recent years, as rainfall has intensified, the risk of flooding has increased. And for the roads, each flood affects the strength of the road surface. There is therefore a pressing need to carry out drainage works in the region, which will ensure that the roads are not under water.

Figure 3 shows the flooded areas and the direction of rainwater run-off observed during our own survey. In the vicinity of the Toyota crossroads, there is no sewage system worthy of the name and the water flows naturally into depressions.



Figure 3: Section of road flooded and direction of water flow

Source: JICA, 2019

In the course of this study, the results of the JICA cooperation project ("The 1995 Cotonou sewerage development project") will be analysed; secondly, the actions of the authorities concerned will be assessed with a view to evaluating the damage caused by flooding, grasping the reality of the sewerage situation in the city, and establishing an appropriate road network sanitation program.

1.9.2.3. Study of the road surface plan

Due to traffic jams, heavy traffic and frequent flooding, the interlocking paving stones at the crossroads are, in places, worn, broken or simply missing, if they are not uneven. The condition of the road is the main cause of jolting and traffic noise, which is why the choice of the optimum pavement structure and method of work is vital when designing the new pavement.

Account must be taken of the volume of traffic passing through the junction, the slowing of the flow, and rainwater drainage conditions, as well as the problems of sourcing materials (distance to the quarry where crushed stone is produced; recovering materials from the existing pavement could be an option). The new pavement must also be designed to be easy to maintain and durable.

1.9.3. Construction phase

A plan for carrying out the work will be drawn up so as not to interrupt traffic or disrupt the daily activities of local residents (shopkeepers and residents) (table 5).

Table 5: Construction phase activities

2	Construction and development phase
2.1.	Topographical work
2.2.	Right-of-way clearance/demolition
2.3.	Stripping and storage
2.4.	Relocation of various networks (water, electricity and telephone)
2.5.	Creation of diversions
2.6.	Management of the company's base
2.7.	Circulation of site equipment and materials
2.8.	Management of site waste (solid and liquid)
2.9.	Excavation work

2.10.	Construction of the structure
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T5Source: JICA, 2019

Table 6: Description of construction phase activities

Works and development phase	Work description
Site installation/company signage	The installation of the construction site consists in placing in an area reserved for this purpose the equipment, materials and infrastructures to be used for the construction work. Company signage is the set of practical and visual arrangements put in place to indicate the space to be fitted out or occupied. Its purpose is to warn and guide the user in order to ensure his safety and that of the personnel working on the site, to promote the fluidity of traffic and to reduce inconvenience to local residents.
Topographical work	It is the set of geodetic works for technical studies
Clearance of rights of way	It is the action which consists in making available after the implementation of the RAP the space to be developed free of all constraints and obstacles.
Relocation of various networks (water, electricity and telephone)	It is a sensitive activity which consists of moving the entire underground and aerial network (various cables belonging to various concessionaires such as SBEE, CEB, SONEB, OPT, etc.)
Development of bypasses	To facilitate traffic and isolate traffic from the areas being developed during the works, adjoining roads are opened or fitted out for the movement of people and goods. The company will ensure routine maintenance of the detour to avoid any risk of accident caused by the poor condition of the tracks.
Management of the company's living quarters	The base camp will be installed not far from the CFAO site.
Management of construction site waste (solid and liquid)	The various works on the living quarters will generate solid and liquid waste which deserves special attention during the works. It also includes waste from masonry work, ironwork, the infirmary, carpentry, etc.
Movement of site equipment and materials/transport of materials	Construction activities and supplying construction sites with materials require the traffic of machines (heavy and light) and vehicles (trucks and others).
Stripping / demolition	This involves removing the existing substrate to achieve the ideal layer that will support the earthworks
Excavation work	These are the excavation works allowing the opening of the trenches to bring out all the buried objects which would be found on the route of the collector or gutter to be built
Major purging and disposal of products	It is the removal of waste, silt and soil of poor tenure or quality
Earthworks for development	It is the removal or the disbursement of the existing within the limits prescribed by the specifications of the company and the demolition of the various works existing in the roadway.

Source: JICA, 2019

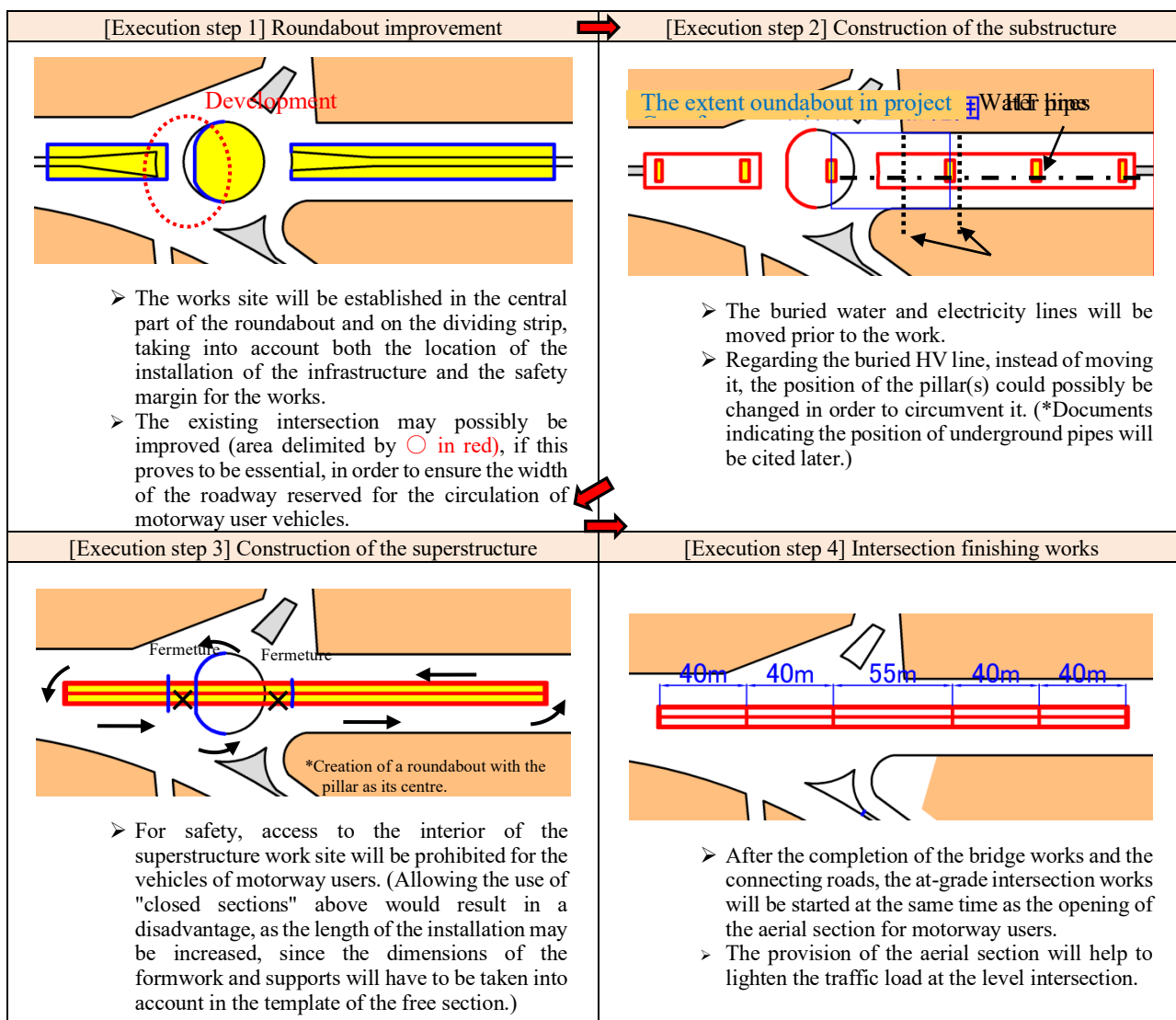


Figure 4: Sequence of execution steps
Source: JICA, 2019

1.9.3.1. Storage area for equipment and materials

The Toyota crossroads and the adjoining roads have been improved over time. A “private property” located between Toyota and the church acts as a stockyard for equipment and materials. On the basis of this information, an inventory of the storage parks of available equipment and materials will be carried out as part of this study, in close collaboration with the concerned authorities, in order to find some suitable parks.

1.9.3.2. Study on the transfer of high voltage (HV) lines

Useful information on the buried objects (water pipe and electric cables) under the Toyota crossroads was obtained by analyzing the plans of the public facilities concerned provided by the authorities, but also during the hearings of the officials concerned. For more information on electrical cables, see Table 7 given below.

Table 7: Listed buried electrical cables

Type	System	Cable section (mm ²)	Depth from ground surface (m)
63kV (63,000V) HV Power Transmission Cable	1 system (or 2 systems)	400	about 1.5m
MV 15kV electrical transmission cable (15,000V)	3 systems	250	1.0 to 1.2m

Source: CEB

The 63kV line being the international connection line between the neighboring countries, in this case Togo and Benin; as for the 15kV line, it is probably a distribution line for the city, belonging to the Beninese-Togolese electricity group and the Beninese Electricity Company. In addition, the development of the electricity network in Benin is currently underway as part of a non-reimbursable financial cooperation project from the United States “MCA2 (Millennium Challenge Account 2). The basic policy for the HV line handover plan is shown in Table 8 below.

Table 8: Basic policy for the HV line transfer plan

Element	Politics	
Identification of competent authorities and bodies to be consulted	➤ There are many authorities, administrative services and executive bodies which operate or are responsible for carrying out works related to public facilities, managed by these authorities or services, which probably depend on several ministries. It will be necessary to verify the organizational system with these authorities. ➤ The study mission, responsible for coordination and progress control, will study the means of reducing the costs relating to the transfer of obstacles to the work or to the taking of protective measures for the area subject to transfer, and will make the results of the study of the transfer program available to the concerned authorities. The means intended to reduce the incurred costs by the operations incumbent on the Beninese authorities will also be proposed to them. ➤ Before the investigation and the establishment of the program, it will be necessary to ask the Beninese government to anticipate the establishment of a working group comprising central government officers and representatives of public utility operators, so that one can get an idea of the organizations, both administrative and executive in the country managing the public services, so as to prepare the ground to ensure the necessary budget for the transfer of the obstacles of the Client.	
Points to note regarding the transfer of HV lines/protective measures	➤ The transfer of HV lines will be examined under two aspects, either their transfer and replacement, or their return to service, by means of the protection of existing lines ➤ The methods of work cited below will be examined taking into account the margin of safety, their reliability, economic efficiency, and the possibility of shortening the execution times.	
	[Transfer case and replacement] • Pedestrian crossings too scattered to group together. • Adoption of precast concrete perforated pipes. • Traditional method of work which implements pipes. • Small Scale Precast Concrete Mass Ditch	[Existing line protection case] • The protection provided by the use, among other things, of concrete-encased PVC pipes • Protection by means of precast concrete troughs.

1.9.3.3. Improvement plan (example):

Figure 5 shows the intersection improvement plan (provisional example), drawn up using the current state of the documents available to date, in order to facilitate understanding of the entire plan.



Figure 5: Crossroads plan (provisional)

Source: JICA, 2019

The currently designed bridge plan (example) is shown in Figure 6, and the current and post-improvement sections of the West-East Freeway (example) in Table 31.

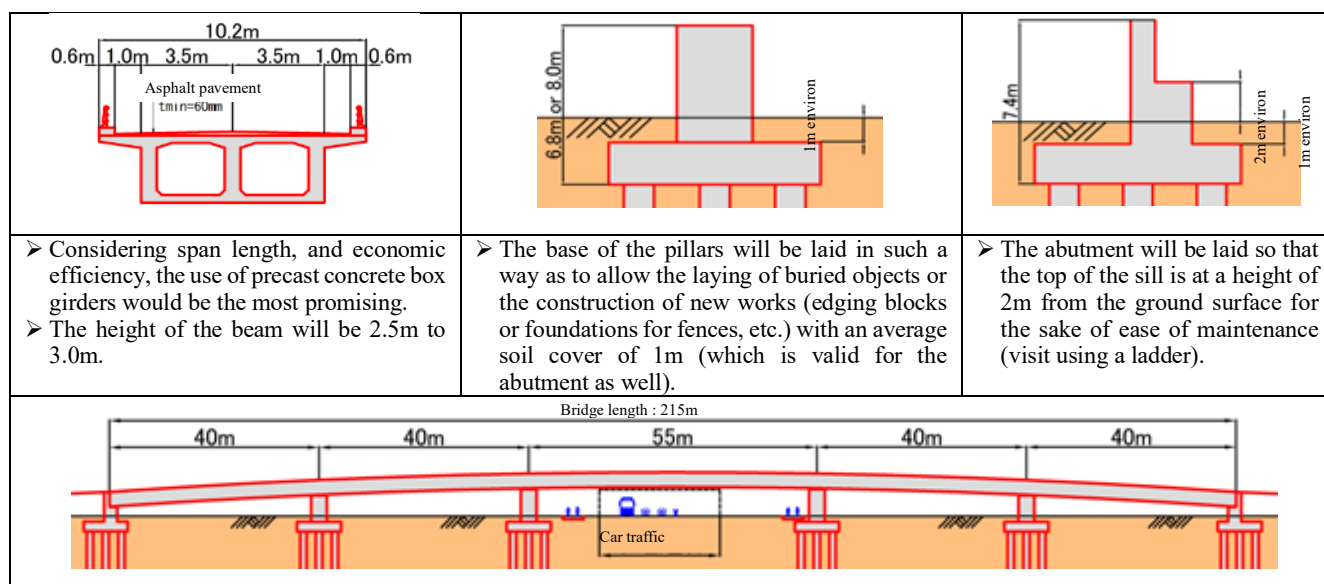


Figure 6: Deck plan (example)

Source: JICA, 2019

Table 9: Current section of the East-West highway and that after the improvement works (project)

	West Highway	East Highway
Current state		
After works		
Features	➤ The space between the constructions is larger compared to the eastern highway; as a feeder road, it is possible to establish 2 lanes for four-wheelers, and one lane for two-wheelers, in each direction. ➤ A gutter is built which acts as a dividing strip between the four-wheel and two-wheel lanes. As a result of the modification of the width of the roadway, a position adjustment is required.	➤ The space between the constructions is more restricted compared to the western highway; like the feeder road, a single four-wheeler lane and a two-wheeler lane will be installed in each direction. ➤ The difference in level between the roadway on the south side and the row of buildings requires the installation of a retaining wall (the L-shaped model shown in the drawing above)

Source: JICA, 2019

1.9.3.4. Utility road works for pedestrian safety

The measures indicated in Table 10 will be examined in order to establish a road plan offering pedestrian, among other things, the greatest safety.

Table 10: Study of security measures

Things to consider	Task	Consideration Content
Consideration for people with reduced mobility	It is to be expected that people with reduced mobility will not be able to get to the other side of the road before the change of traffic lights.	At the tip of the dividing strip that can serve as a dividing island, provide for the installation of a protective wall. The possibility of installing an optical guidance system to improve nighttime visibility should also be studied.
Considerations for local residents	- Rehabilitation of places where a difference in level will be noticeable with the rows of bordering buildings on the eastern road - Reducing environmental loads such as exhaust gases and taking privacy protection measures.	Examine the necessity of installing solid shutters at the crown of the L-shaped (retaining) wall.
Maintenance of satisfactory visibility conditions at the intersection	The presence of the pillars near the intersection hinders visibility for vehicles making left-turn maneuvers and for pedestrians.	Consider the need for keeping sufficient distance between the stop line and the pillar.
Consideration of the female gender	Appropriate measures for the protection of the female peaks taking into consideration that the runway below the aerial section is very dark at night.	Install streetlights on the runway below the aerial section.

1.9.4. Operation phase

During the operating phase, the flyover will be put into service to facilitate traffic flow.

II. METHODOLOGICAL APPROACH

The methodological approach adopted for carrying out the study is based on an analytical and systemic approach which allows the integration of environmental and social considerations in the finalization and implementation of the project. It complies with practice as well as with the requirements of the general guide for carrying out ESIA in Benin. In practical terms, the approach used was based on the following steps:

- Exchange meetings with project managers (MIT) regarding the design and working methodology that will be used to implement the project activities;
- Visits to the sites concerned in order to make a clear delimitation of the study area;
- Review of the available documentation concerning the technical information of the project, and any other document providing relevant information on all aspects of the project;
- Collection of field data throughout the project's area of influence (biophysical and socio-economic data, etc.);
- Consultation and participation of all stakeholders (SIRAT, ACVDT, MCVDD, ABE, local authorities and populations, etc.);
- Identification of risks;
- Environmental assessment of the project: identification of the impacts (positive and negative) of the project, assessment of the significance of the impacts, and proposal of mitigation and/or corrective and improvement measures;
- Development of the Environmental and Social Management Plan (ESMP) of the project;
- Drafting of the ESIA report.

1.10. Discussions with project managers

Meetings and discussions with the project managers made it possible to gather as much information as possible on the project and to know the details of the work to be carried out. These include, for example, technical options, work execution methods, equipment to be used, emergency and safety devices, materials, material borrowing sites, labor, etc. These exchange meetings will allow the Consultant to better adjust his work on the ground.

The good knowledge of the characteristics of the project is useful because it leads to the identification of factors that may a priori disturb the receiving environments and constitute a handicap or a risk for the project.

1.11. Site visits

Site visits made it possible to get to know the project's receiving environment in order to assess the environmental and socio-economic issues. To this end, the following steps were followed:

- Recognition and general visit of the entire site selected for the project and its area of influence;

- Identification of the physical characteristics of the receiving environments: slopes, nature of the ground (flooding, landslide, etc.);
- Identification and analysis of the plant and animal species that exist in the environments concerned by the project and which are threatened or not by the implementation of the project;
- Identification of existing assets, infrastructure and equipment within the project site right-of-way;
- Identification of local populations, their activities and their living conditions;
- Inventory of shoreline equipment and infrastructure and identification of sensitive natural sites or socio-economic activities likely to be disrupted.

The environmental and social impact study covers the entire area of influence of the project.

1.12. Literature review

The documents collected relating to the project, the socio-economic aspects and the environment were analyzed in order to describe the biophysical environment and the socio-economic situation of the project integration area. The study started with the existing documentation concerning the characteristics of the project. This collection of information was based on:

- the collection of documents from the promoter, in particular those concerning the work to be carried out and any other document available;
- A careful reading of the documents collected in order to identify the main characteristics of the activities, whether at the technical level (consistency with the PAG, the strategic planning documents: Master plan for urban planning, Master plan for development, etc.) environmental, social, human, etc... This exercise made it possible to better understand the project and the details of its activities, as well as the reasons which motivated the choice of the site.

The general documentation review (exploitation of previous studies carried out in the region and bibliographical review) made it possible to describe the legislative and regulatory framework, the regulations on the environmental impact study in Benin as well as the institutional framework and the vision in which this project fits. It was also used to choose the most appropriate tools to carry out the study. The data collection sources are:

- Road Infrastructure and Land Management Company (SIRAT);
- Benin Environment Agency (ABE);
- 2nd Benin Program for the Millennium Challenge Account (MCA-Benin II);
- Ministry of Industry and Trade (MIC);
- Applied Ecology Laboratory (LEA);
- Land Planning, Environment and Development Laboratory (LATED);
- Cotonou City Council and the 10th, 11th and 13th districts of Cotonou;

- National Institute of Statistics and Economic Analysis (INSAE) ;
- National Geographic Institute (IGN);
- FASHS documentation centre;
- CREDD-Benin Sar documentation centre ;
- etc.

1.13. Data collection

Data is collected through documentary research, observations and field surveys. All necessary and existing reports on the project and any additional information likely to contribute to the description of the project's receiving environment.

The approach used for the study of the receiving environment is based on the following elements: documentary research, field work, and mapping, use of the Geographic Information System (GIS) and processing of the data collected.

The documentary research made it possible to examine documents likely to provide information in order to understand the physical, biological and human characteristics of the host area in general and the project site in particular. The various documents collected and used included the monograph and the Municipal Development Plan (PDC), the Municipal Development Master Plan (SDAC) of Cotonou Municipality, as well as the RGPH 4 data collected in INSTAD documents.

1.14. Public participation

1.14.1. Analysis of the targets groups concerned

The target groups are all the people (natural or legal) affected by the project. The aim of the analysis is to identify the most appropriate sources for gathering the information and data required for this environmental impact study. The various target groups identified are presented in Table 11.

Table 11 : Target groups identified

Target groups	Criteria
Promoters (MIT),	People responsible for the project, Architect, Engineers working on the project
SIRAT	People responsible for the project, Architect, Engineers working on the project
MCVDD, DDCVDD, ABE	Responsible for environmental policy, responsible for issuing authorizations
CEB	Responsible for the construction and operation of electrical energy production facilities
SBEE	national electricity distributor
Benin Environment Agency	Environmental Studies and Assessments
Local authorities	Mayor, Head of district, Heads of locality, Heads of neighborhoods
Populations	Residents living near the project site, resource persons, road users, etc.

Source: BANCA, 2019

1.14.2. Interview with target groups

This activity focuses on the collection of data in the real world and the use of various accelerated research techniques in order to collect as much credible data as possible in record time. It is:

- The Accelerated Participatory Research Method (MARP). Here, we are initially interested in the daily realities of the person to be investigated, we then ask questions on the objectives of the research;
- the itinerary method, which consists of exploring the field in order to become acquainted with the various concerned stakeholders and to identify the target groups;
- The focus group method: this essentially aims to collect the opinions of individuals and to stimulate a dynamic group so as to arrive at a collectively validated answers to the various questions asked to the group.

1.14.3. Public consultations

Public consultation allows the perceptions, expectations and concerns of the project stakeholders to be taken into account in the ESMP development process. It is logic involving the main beneficiaries and actors in the design of the project in order to highlight the social issues and effectively contribute to the sustainability of the project.

The approach adopted is based on a participatory approach. This study was based on a process that involved grassroots actors (technical services, local authorities, leaders and members of local associations, populations). Various consultations have been carried out. This approach allowed these actors to give their point of view and to get involved in the formulation of mitigation measures.

Then surveys were carried out with local residents who will probably be negatively affected by the project. These meetings will allow the collection of information on the characteristics of the project's receiving environment. They also allow to note the points of view, opinions, concerns, recommendations and suggestions made by the stakeholders living near the project.

1.15. Environmental analysis of the project

It relate to:

- (i) identification of potential project impacts;
- (ii) analyzing and determining the magnitude of these impacts;
- (iii) the proposal of mitigation and enhancement measures;
- (iv) The development of the environmental and social management plan.

The valued elements of the environment (EVE) have been identified on the basis of selection criteria, namely: economic, vital and religious aspects. Thus, all the physical elements of the environment that are of economic importance, that is to say, that generate or are likely to provide income to the population, are important to preserve from destruction or modification of their function. All physical elements essential to the daily life of populations and ecosystems (water, air, vegetation, soil, etc.) have also been taken into account.

1.15.1. Identification of the impacts

The impact identification approach used takes into account the activities and interventions of the project and the components of the host environment. The analysis of the components of the environment (natural and human environments) on the one hand, and of the interventions and activities of the project (potential sources of impact) on the other hand, makes it possible, when they are crossed, to determine the anticipated impacts of the project. This linking, using a matrix, allow to identify the negative and positive impacts. It is a question here, of considering all relevant components of the physical, biological and socio-economic environments which are: the soil, the vegetation, the air, the water, the fauna, the human environment (population, health/quality of life, traffic/circulation, land, economy, etc.).

Project activities in these different phases determine the sources of environmental impacts. A crossing is made between these activities and the components of the environment using Leopold's matrix (1971). A summary table presents the synthesis of the crosses carried out (table 12). It is following this step that the impacts were clearly and precisely identified in order to be analyzed and evaluated.

Table 12: Leopold matrix

Project stages	Sources of impact (activities)	Environmental components potentially affected														
		Physical					Biological					human environment				
		Water		Ground			Air		Flora and fauna			Landscape				
		Runoff and infiltration	Surface water quality	Groundwater quality	Soil quality	Slope profile	Air quality	Musical ambiance	Greenhouse gas	Biodiversity	Habitats	Health and security	Socio-economic aspects	Land/housing	Visual field	Cultural Heritage
1. Preparatory	Activity 1															
	Activity 2															
	Activity 3															
	Activity 4															
2. Work phase	Activity 1															
	Activity 2															
	Activity 3															
	Activity 4															
	Activity 5															
3. Operation	Activity 1															
	Activity 2															
	Activity 3															
	Activity 4															

Source: Leopold, 1971

1.15.2. Assessing the significance of the impacts

The assessment of the significance of the impacts is carried out using the following indicators: extent, duration and intensity or degree of disturbance. The Beninese agency for the environment's (ABE) Impact Assessment Framework (1998) was used for this purpose.

✓ Duration of impact

The duration of the impact specifies its temporary dimension, ie the period of time during which the modifications undergone by the environmental components will be felt. This duration factor is grouped into three classes:

- **Momentary**, when the effect of the impact is felt at a given time and for a period of time less than a season;
- **Temporary**, when the effect of the impact is felt continuously for a period of time less than the duration of the project;
- **Permanent**, when the effect of the impact is felt for a period of time greater than or equal to the duration of the project.

✓ Extent of impact

It expresses the scope or the spatial influence of the effects generated by an intervention of the project activity on the environment. This notion refers either to a distance or to an area over which the modifications undergone by a component will be felt, or even to the proportion of a population that will be affected by these modifications.

It is **specific**, **local** or **regional** depending on whether the impacts of the project activities act only on the project site, in the district concerned, in particular in the villages bordering the site and beyond the project area in the other departments of Benin.

✓ Degree of disturbance or intensity

The degree of disturbance generated corresponds to the extent of the modifications which affect the internal dynamics and the function of the affected element. It makes it possible to define the scope of the modifications that will affect the component studied, taking into account the sensitivity in relation to the proposed development. There are four degrees: very strong, strong, medium and weak.

The disturbance is **very strong** when the impact deeply compromises the integrity of the affected element, alters its quality and cancels any possibility of its use. It is **strong** when the impact compromises the integrity of the affected element, alters its quality or significantly restricts its use. It is **medium** when the impact seems to compromise the use, quality or integrity of the element affected.

It is **weak** when the impact does not perceptibly modify the integrity, quality or use of the affected element. Accordingly, the significance of the impact can be classified into three categories:

- **Strong**, when the components of the affected environmental element are in danger of being destroyed;
- **Medium**, when they are modified without however the integrity or their existence being threatened;
- **Weak**, when only slightly affected.

These criteria above have been concretely determined on the basis of a discussion of experts drawing also on similar cases and on the specialized literature in the field of environmental analysis.

The significance of the impacts was qualified as strong, medium or weak according to a combination of the above criteria. The reference framework of the Benin Environment Agency (ABE) was used to assess the significance of the impacts (Table 13).

Table 13: Terms of Reference for Assessing the Significance of Impacts

Duration	Extent	Degree of disturbance			
		Weak	Medium	Strong	Very strong
		Significance of impact			
Momentary	Punctual	Weak	Weak	Weak	Medium
Momentary	Local	Weak	Weak	Medium	Medium
Temporary	Punctual	Weak	Weak	Medium	Strong
Temporary	Local	Weak	Weak	Medium	Strong
Momentary	Regional	Weak	Medium	Medium	Strong
Permanent	Punctual	Weak	Medium	Medium	Strong
Temporary	Regional	Weak	Medium	Strong	Strong
Permanent	Local	Weak	Medium	Strong	Strong
Permanent	Regional	Medium	Strong	Strong	Strong

Source: ABE, 1998

1.16. Development of an environmental and social management plan

The environmental and social management plan (ESMP) operationally defines all the recommended measures and the conditions for their implementation. This takes into account the significant impacts analyzed, accompanied by an implementation logical framework specifying for each of the measures, the performance indicators, the structure(s) responsible for monitoring, those that are responsible for environmental monitoring as well as the costs inherent in the implementation of the measures, according to the different phases of project execution (before, during and after the works).

The cost of the ESMP is included in the estimated project budget. Table 14 will be used for the development of the ESMP under this project.

Table 14: Matrix of the ESMP development

Activities / Measures to be implemented	Indicators	Schedule	Managers		Costs
			Surveillance	Monitoring	

Source: ABE, 2001

Implementation of the ESMP is the responsibility of the project promoter and the ABE. All the measures proposed and the accompanying solutions planned as part of the project constitute activities that are planned over time..

1.17. Assessment of the measures' cost?

The implementation of the ESMP is placed under the responsibility of the project promoter and the ABE. All of the measures proposed and the accompanying solutions planned within the framework of the project constitute activities that are planned over time.

- le nombre de sensibilisation grand-public ou de proximité à réaliser par mois ou trimestre selon le cas ;
- le nombre de participants possibles par activité/séance de sensibilisation ;
- la logistique à mobiliser par les ONG d'intermédiation sociale ;
- C'est en se fondant sur les coûts pratiqués par expérience que les coûts retenus ont été proposés.

1.18. Proposal of an environmental and social management plan

The environmental management plan operationally defines the recommended measures and the conditions of their implementation. In accordance with the legislation in force in terms of environmental management and according to the directives of the general EIA guide of the ABE, the EIA report must present an environmental and social management plan (ESMP).

The ESMP is a project implementation dashboard that identifies the managers within the project responsible for implementing the mitigation activities (Monitoring Plan) on the one hand, the managers within the public institutions responsible for control of the effective execution of the said activities on the other hand. The implementation of this plan is placed under the responsibility of the project promoter and the ABE.

All of the measures proposed and the support solutions planned under the project constitute activities that will be planned over time and accompanied by impact indicators, monitoring manager and monitoring manager.

Field measurement and observation campaigns.

Banca Engineering to succeed in this mission of environmental and social impact study called on the services of SGS Laboratory Services Ghana Limited (Industries and Environment - Environmental Services in the field) to carry out basic monitoring of ambient air, noise, vibrations and water on the Vêdoko roundabout in Cotonou, noise influence zone.

The objective of the monitoring was to obtain the ambient air quality, noise levels, and vibration levels and water quality around the catchment area of the Vêdoko roundabout before the construction of the flyover.

The scope of work as understood by SGS Laboratory Services Ghana Limited and summarized in Table 15.

Table 15: Extent of measurement work

#	Article	Study/Survey	Methodology
1	Air pollution	Ambient air quality measurement and analysis - comparison with applicable national and international regulations/standards	(1) Sampling location: 6 locations (4 locations around the Vedoko roundabout and 1 location each approximately 200 m east and west of the said roundabout. (2) Parameters: CO, NOx, SOx, PM10 and PM2.5(3) Frequency: Once
2	Water pollution	Measurement and analysis of the water quality of existing watercourses, wetlands and/or canals near the Project site. - Comparison with applicable national and international regulations/standards.	(1) Sampling location: 2 locations (1 location approximately 400 m south of the Vedoko roundabout and 1 location approximately 700 m east of the said roundabout). (2) Parameters: temperature, pH, Suspended Solids (SS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), Total Phosphorus (TP), Total Nitrogen (TN), Nitrate, Ammonia, Nitrite, Oil and grease, Escherichia coli, bacteria, mercury, cadmium, lead, chromium VI, fluoride, phenol, arsenic, selenium, copper, zinc and turbidity. (3) Frequency: once.
3	Noise and vibration	Measurement and analysis of the current level of noise and vibration. - Comparison with applicable national and international regulations/standards.	(1) Sampling location: 8 locations (5 locations around the Vêdoko roundabout, 1 location approximately 200 m southeast of it and 1 location approximately 200 m west and 600 m east of it).(2) Parameters: noise (dBA) and vibration.(3) Frequency: 2 times. - It must be measured over two days (a weekday from Monday to Friday and a weekend day such as Saturday). 12:00 p.m. to follow for example the day and night time categories of the World Health Organization (WHO) - Guidelines for Community Noise (1999). - Each session at each location should take at least 15 minutes.

Source: Work results, September 2022

1.18.1. Ambient noise measurements

SGS adopts internationally recognized practices based on ISO or APHA methods for air quality monitoring, noise monitoring and reporting. All methodologies used in this exercise met national and international requirements. Plate 1 shows the photos of the places monitored and the equipment used.

3M/TSI sound level meters were used for noise monitoring for 1 hour according to IFC HSE, 2007 and ISO 1996-2:2007 standards. The sound level meter is calibrated before and after each monitoring. It was mounted 1.5 meters above the ground and at least 3 m from any reflective surface

in the absence of rain, wind speed <5 m/s and with a vertically oriented microphone covered with a windproof foam cap.

NB: Appropriate monitored locations for ambient noise measurements have been chosen by the customer.

1.18.2. Vibrations measurements

Instantel Minimate Plus is a multi-channel vibrometer that records events and provides the site analysis, including maximum particle velocity, maximum vector sum, maximum acceleration, and maximum displacement of the event. It has a transducer and one or more microphones that can be triggered manually or automatically when trigger thresholds are exceeded. The board illustrates the measurements taken in the field.



Picture 1: Dust monitoring in the area behind Toyota



Picture 2: Furniture store noise monitoring



Picture 3: Noise monitoring in the Akossombo pharmacy area



Picture 4: Church vibration monitoring

Plate 1: Photo of surveillance areas

Shooting: Banca Engineering, September 2022

1.18.3. Particulate matter measurements (PM10 ET PM2.5)

Sampling of particles (PM10 and PM2.5) was carried out using a portable ambient air sampler called MiniVol Tactical Air Sampler. The equipment was set at a low flow rate of 5 L/min on a pre-weighed 0.8 micron filter paper. General methods for determining airborne total particulate matter from ASTM D 4096-91 (2009) have been modified and used. The sampling technique used by the MiniVol TAS is a modification of the method referenced PM10 described in the US Code of Federal Regulations (40 CFR Part 50, Appendix J). Measurements were made over a 24-hour period at each location. Gravimetric weighing of the filter was used for sample analysis. The dust concentration was calculated as follows:

$$\text{Dust Conc } (\mu\text{g}/\text{m}^3) = \frac{\text{Net dust weight (g)} \times 10^6 \mu\text{g} \times 1000\text{L}}{\text{Flow rate (L/min)} \times \text{Sampling time (min)} \times 1\text{g} \times 1\text{m}^3}$$

Net dust weight = final weight - initial weight

NB: 106 μg = 1g (since the unit of measure of the balance is the gram); 1000L=1m³ (since the flow is in L/min)

1.18.4. SO₂ and NO₂ monitoring

Nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) were sampled using passive RadielloTM tubes consisting of a blue diffusive body, support plate, vertical adapter and a chemo-adsorbent cartridge. The cartridge is made of microporous polyethylene coated with triethanolamine (TEA). Nitrogen and sulfur dioxides are chemically absorbed selectively as nitrite and sulfite or sulfate ions respectively. Nitrite is quantified by visible spectrophotometry, while sulphite and sulphate are analyzed by ion chromatography. Meanwhile, NO₂ and SO₂ can be analyzed by ion chromatography.

Sampling time

Nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) were sampled for 24 hours at each location.

Calculation

To calculate the concentration of organic matter per cubic meter of air ($\mu\text{g}/\text{m}^3$) of each sample, the following formula is used:

$$C = \frac{m}{tQ}$$

Where Q is the sampling rate and has the dimensions of a gas stream (if m is expressed in μg , t in minutes and C in $\mu\text{g}/\text{l}$, Q is expressed in l/min).

1.18.5. Carbon monoxide monitoring

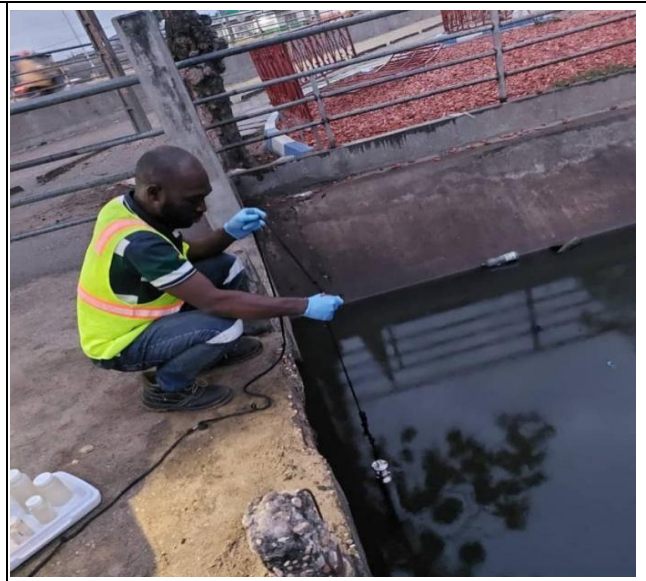
The carbon monoxide concentration was measured using a direct-reading device with electrochemical probes (TSI IAQ-CALC Air Quality Measurement) in accordance with standard UNE 100011:1991. The equipment provides a CO measurement range of 0 to 2000 ppm with a resolution of 2 ppm.

1.18.6. Effluent sampling

Water samples from the effluent points were taken by a grabbing technique into preconditioned sample bottles (each parameter preferred with bottles recommended by the laboratory) and sealed. The samples were sent to the SGS ISO 17025 accredited laboratory in Ghana for analysis.



Picture 5: Water withdrawal at the drain to the South-West of the Vêdoko roundabout



Picture 6: Water sampling at the water channel east of the Vêdoko roundabout



Photo 7: CO monitoring in the area behind Toyota



Photo 8: Dust and noise monitoring at the water channel

Plate 2: Photo of surveillance zones (CO) and water sampling
Shooting: Banca Engineering, September 2022



1.19. Materials and tools used

The materials used consists of:

- household survey sheets, local elected officials, resource persons, etc.;
- the topographic map and the images that reflect the occupation of the city (high resolution);
- floristic inventory sheets, for the collection of flora and fauna data;
- pruning shears, to take samples of plant species to be identified;
- An Instanetel Minimate Plus multi-channel vibrometer ;
- newspapers for the realization of the herbarium;
- GPS, for taking the geographical coordinates of key points;
- digital cameras, for taking pictures of the physical state of the various ecosystems visited;
- rulers to measure overflows on the right-of-way;
- topographic and geological base maps;
- High -resolution SPOT images ;
- etc.

1.20. Data processing and analysis

The quantitative and qualitative data processing and analysis were carried out using Word, Excel, Arc GIS and Map software. The analysis was consolidated with secondary data from health statistics directories, INSAE statistics, etc.

1.21. Presentation of the report

By putting together the above requirements, this ESIA report will be structured around the following main axes:

- the presentation of the context of the study, the political, legal and institutional frameworks for the execution of the project;
- the inventory of the receiving environment in the areas of intervention through the physical, biological and human components, with an opening for public consultation;
- the analysis of the variants based on the project development options, followed by the presentation of its activities and the analysis of the issues related to the said project;
- the environmental analysis which takes into account the identification of impacts (potential positive and negative), the proposal of measures (mitigation and maximization) according to each phase of the project;
- the analysis of cumulative impacts in the city of Cotonou is also taken into account in this section;
- The methods for implementing specific environmental and safety requirements (mitigation and maximization measures) are described in the risk plan and the Environmental and Social Management Plan (ESMP).

III. BASIC DATA

The initial state of the project site or of the receiving environment in general represents a reference situation which subsequently undergoes the impact of the project. It is essentially characterized by its sensitivity, which is defined in relation to the very nature of its components, but also in relation to the nature of the project. The description of the initial state of the project site aims to provide adequate knowledge of the components of the environment that risk being degraded by the project activities.

This description of the initial state of the environment is based, on the one hand, on documentary and bibliographical data, and on the other hand, on field surveys and in situ measurements.

1.22. Geographical location of the site

The study area is included in the 10th, 11th and 13th districts of the municipality of Cotonou (Atlantic Department).

The municipality of Cotonou is located between 6°21' and 6°24' North latitude and 2°22' and 2°29' East longitude. It is bordered to the north by Lake Nokoué (85 km²), to the south by the Atlantic Ocean, to the west by the communes of Abomey-Calavi, So-Ava and to the east by the Commune of Sèmè -Podji as shown in Figure 8. Cotonou is less than 100 km from Togo, about 50 km from Nigeria and nearly 800 km from the Burkinabé and Nigerien borders. It covers an area of 79 km², 35% of which are marshy areas and 65% urbanized areas on either side of the channel (Cotonou Town Hall/DST, 2005). Administratively, the city has thirteen (13) districts and one hundred and forty (140) districts.

The city of Cotonou forms an urban center stretched from east to west, bounded by the Gulf of Guinea to the south and Lake Nokoué to the north (15 km in the east-west direction and 5 km in the north-south direction). It is cut in two by a channel, the lagoon of Cotonou, dug by the French in 1855 connecting the Gulf and the lake, which divides the urban center between the east and the west connected by three bridges. It is served by the axes of the RNIE (National Inter-State Road) 1 (connecting the east and the west), the urban road, the RNIE 2 (located to the west of the RNIE 1, starting from port of Cotonou to the north passing through the city) and RNIE 3 (located to the east and passing through Porto-Novo the capital to the north).

The development of Cotonou is in fact hampered by the natural limits formed by Lake Nokoué to the north and the Atlantic Ocean to the south. Population growth is therefore now occurring in the bordering municipalities of Abomey-Calavi to the west and Sèmè-Podji and Porto-Novo to the east. This situation is an explanatory factor for the demographic saturation of Cotonou whose environmental problems (noise, air and soil pollution) and the high cost of living force people to move there day by day for neighboring municipalities, Abomey -Calavi, Ouidah, Sèmè-Podji and Porto-Novo, which have become veritable dormitory towns.

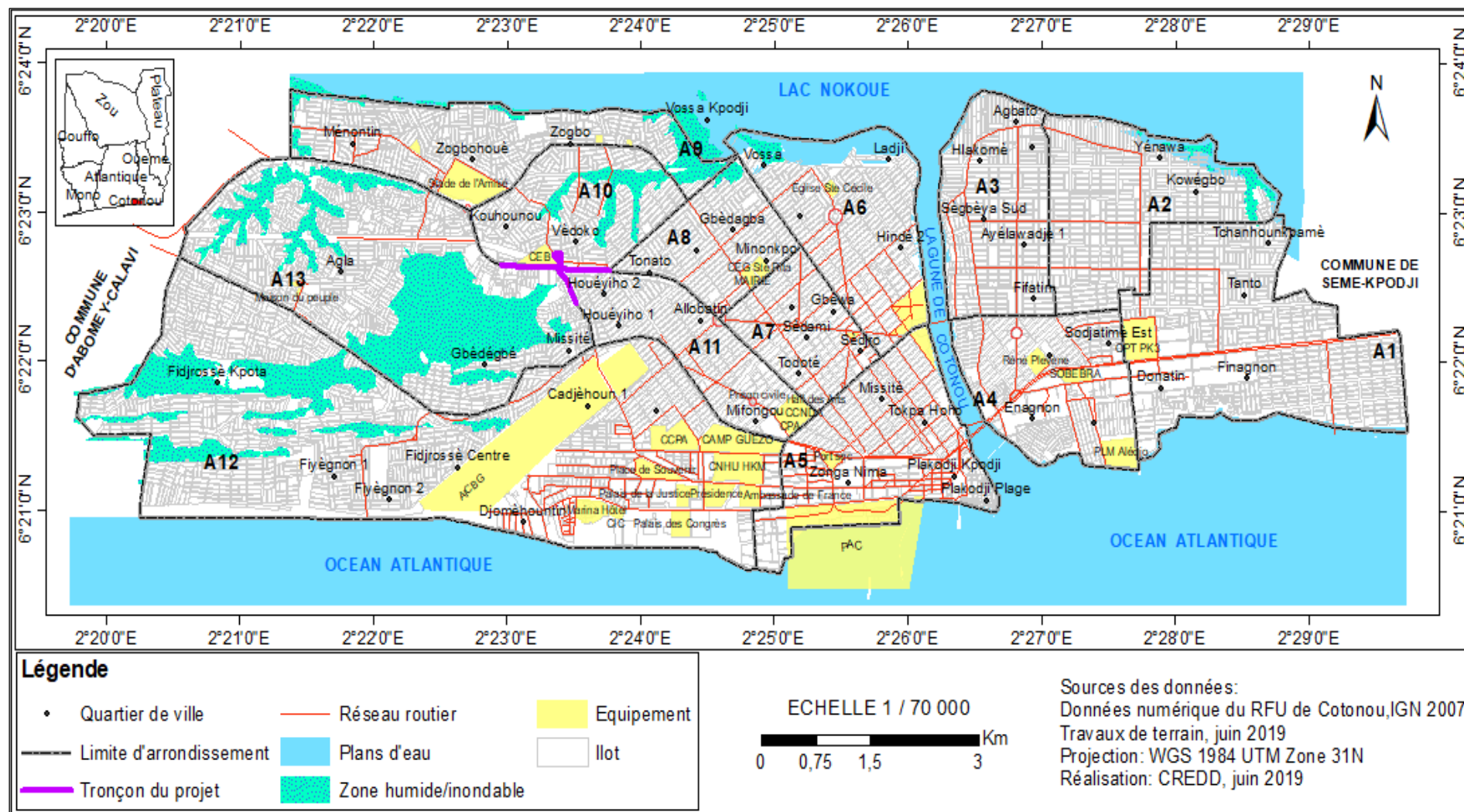


Figure 8 : Perspective of the intersection

The target intersection is a roundabout (formed by a central ring) with four roads entering it from the four cardinal points: the east-west road draws a straight line; the northern route enters it at a right angle slightly to the east of the center of the roundabout; the southern route has a radius of curvature of around 290 m and intersects with the east-west route at a bevel angle of around 40 degrees (Figure 9). They are lined with shops, housing and a market.

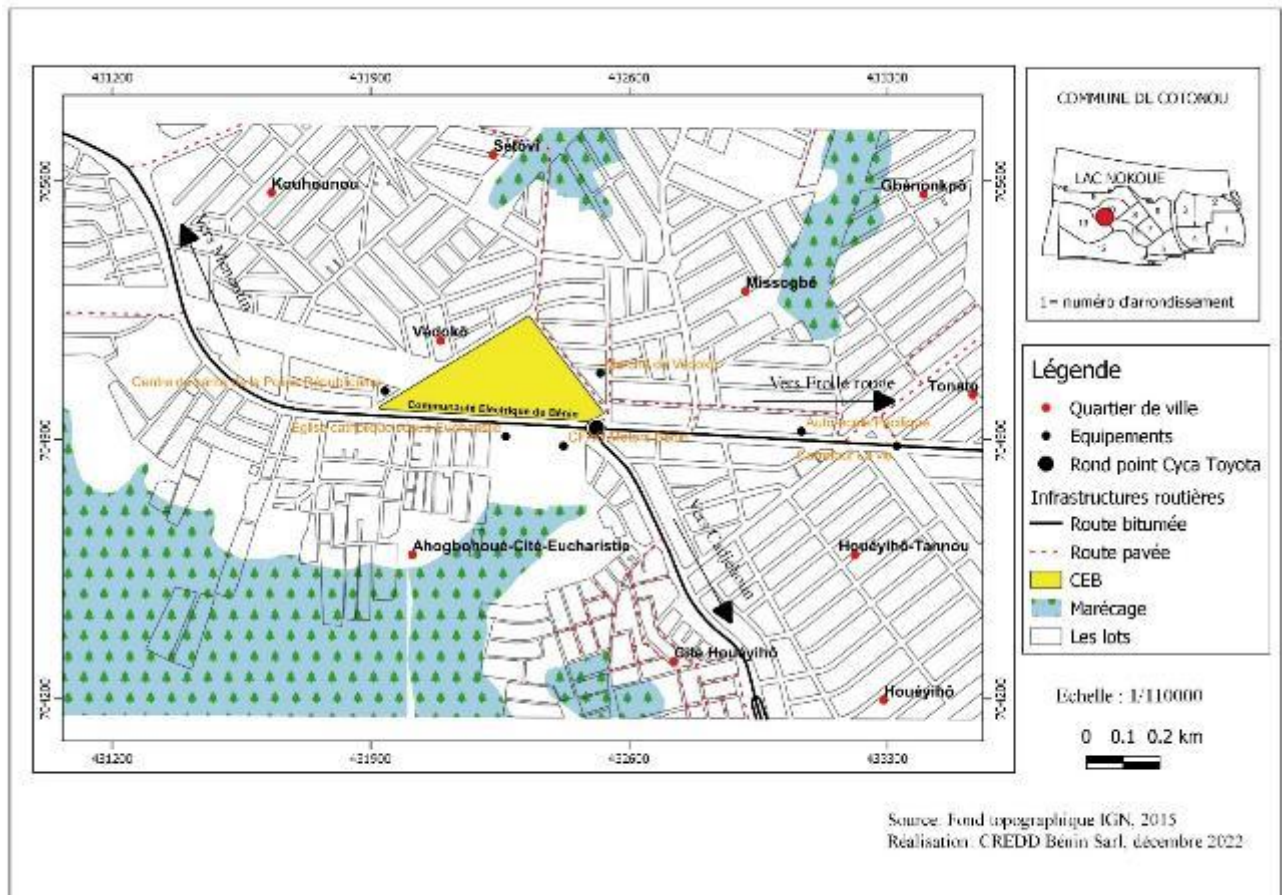


Figure 9 shows the overall view of the project footprint



Figure 10: Overall view of the project footprint

Source: Banca Engineering, September 2022

1.23. Biophysical framework of the study environment

1.23.1. Climate and air quality

1.23.1.1. Climate

On the climatic level, the coastal zone of Benin is characterized by a climatic anomaly which results in a decrease in rainfall from east to west on the coast and more pronounced temperature variations than it is in general in equatorial climates characteristics: we speak of a subequatorial climate. This type of climate is characterized by a bimodal rainfall regime with 60% of annual rainfall rates in the first rainy season and 12 to 20% in the second (Sossou-Agbo, 2013).

As shown in Figure 11, we note: a major rainy season from April to July, a minor dry season from August to mid-September, a minor rainy season from mid-September to mid-November and a major dry from December to March.

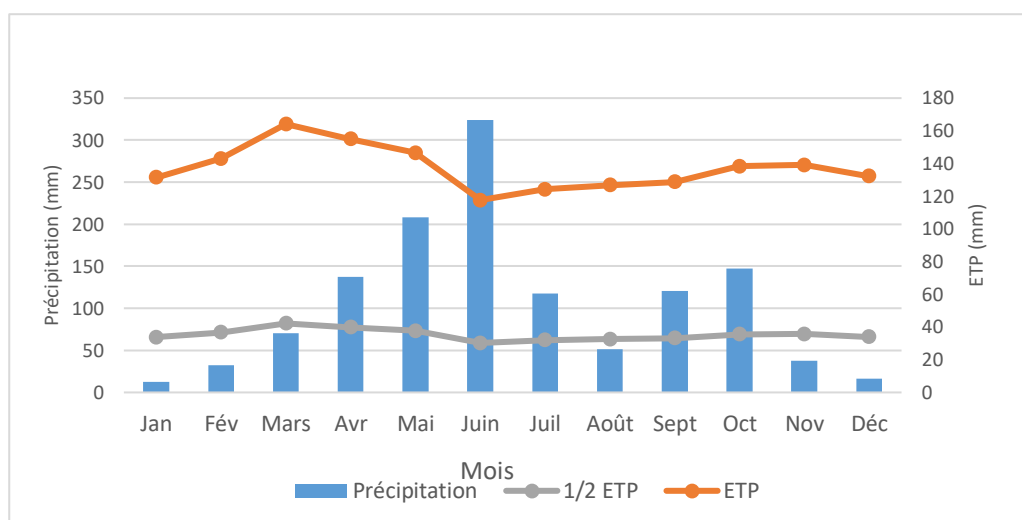


Figure 11: Climatic diagram at the Cotonou synoptic station

Source: ASECNA Statistics, 2016

According to climate projections for the year 2100, annual rainfall will remain practically unchanged, with the variations observed every five years barely exceeding 0.2%.

Table 16: Projected average annual precipitation anomalies from 2000 to 2100
South West Region (grid cell: 5°N -7,5°N et 0° - 2,5°E)

Year	1971 - 2000	2005	2010	2015	2020	2025	2050	2075	2100
Variation		-0,06	-0,36	-0,62	-0,88	-0,82	0,49	3,62	3,97
Precipitation	980	979	976	974	971	972	985	1015	1019

Source: Second National Communication on Climate Change, 2011.

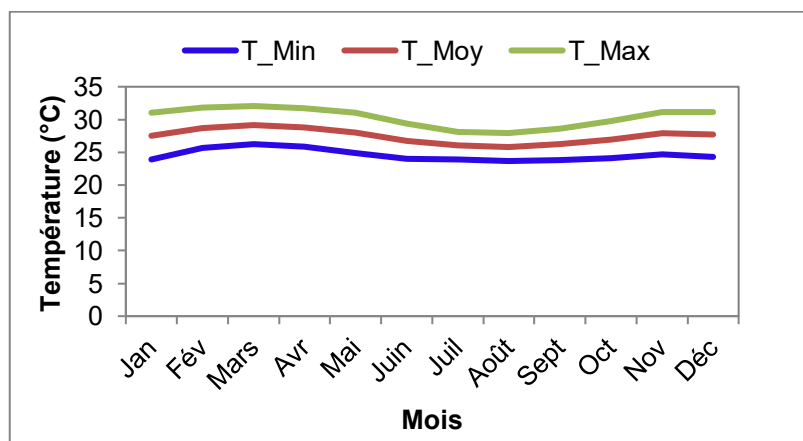


Figure 12: Average monthly temperatures recorded at the Cotonou synoptic station

Source: ASECNA Statistics, 2016

Temperatures are relatively constant and high all year round between 24°C and 31.5°C. If the months of February, March and April are the hottest, we generally notice the nights are cold (23-24°C) and sunny days (31-35°C). These coastal thermal variations are due to the duration of the insolation which gives a daily average of 6.67 hours in Cotonou. According to the results of the annual temperature projections for the year 2100, there will be a rise in temperature at the scale of

the study area. The thermal variations compared to the reference period 1971-2000 would be of the order of 2.77°C.

Compared to the air quality, air pollution is an insufficiently known phenomenon. The current air quality monitoring system is limited to measuring the concentration of pollutants in the ambient air. According to the results of studies carried out by SERHAU-SA (2006), the level of air pollution in "Big Cotonou" is high (72%) and the main sources of air pollution are motorcycle taxis (83 %), heavy-duty vehicles (7%), city taxis (3%) and septic tanks (3%). Similarly, the results of the World Bank's "Clean Air Initiative, 2006" study in the city of Cotonou revealed that:

- Sulfur dioxide pollution remains very low (less than 10 $\mu\text{g}/\text{m}^3$) due to the lack of sustained industrial activity;
- Nitrogen oxide pollution is at fairly high levels, averaging 36.5 $\mu\text{g}/\text{m}^3$ and peaking at 90 $\mu\text{g}/\text{m}^3$ in high traffic areas. The study emphasized that the growth of the car fleet should make this pollution a concern in the years to come;
- Pollution by volatile organic compounds and in particular benzene is of great concern. This pollution is largely due to motorcycles with two-stroke engines. Benzene is carcinogenic and according to the results of scientific studies carried out on this topic, it has been estimated that benzene causes an excess collective risk of approximately 164 cancers per year in Cotonou. The average pollution by benzene in Cotonou has indeed been estimated at 30 $\mu\text{g}/\text{m}^3$. It was mentioned that this value should be reviewed with new measurements over a longer period.
- The dust emitted remains the main pollution of the city. The average annual concentration of PM10 particles has been estimated at 78 $\mu\text{g}/\text{m}^3$, with daily peaks exceeding 300 $\mu\text{g}/\text{m}^3$, compared to the daily standard of the World Health Organization (WHO) which is 70 $\mu\text{g}/\text{m}^3$, and that of Benin which is 100 $\mu\text{g}/\text{m}^3$ over the year and 230 $\mu\text{g}/\text{m}^3$ per 24 hours. This pollution is responsible of many respiratory diseases.
- By applying the formulas of the World Health Organization, it is estimated that the increase in mortality in Cotonou due to dust is between 4 and 5% with an increase in medical consultations or hospitalization of approximately 1,966 people per year out of a total of 30,000 reported respiratory diseases.

The climate in the coastal zone is of the subequatorial type (of the Guinean domain) characterized by a bimodal rainfall regime with two wet seasons separated by two dry seasons, namely: a long rainy season from April to July, a short dry season from August to mid-September, a short rainy season from mid-September to November and a long dry season from December to March. The annual rainfall varies from 1,100 to 1,300 mm while the average annual temperature is around 27.5°C with an amplitude of 4°C.

1.23.1.1.1. Winds

In Benin in general and on the littoral zone in particular, several types of winds predominate: regional flows linked to pressure fields (on a global scale), and local winds (Adam and Boko, 1993). According to Oyédé and Kaki (1998), the winds which predominate on the coast by their frequency are:

- SW (64%): the monthly distribution indicates very strong frequencies in February, March, April, May, June, October and November. The average speed is 4.4 m/s, with the maximum values in July - August (5.6 and 5.4 m/s) ;
- WSW (16.07%): the highest frequencies are centered on July, August and September, with an average speed of 6 m/s. High speeds are noted between July and October (6.3 to 6.6 m/s) ;
- SSW (14.40%): the highest monthly frequencies are centered on January, March, November and December, with an average speed of 3.6 m/s.

The role of these winds is decisive in the diffusion of substances likely to constitute atmospheric pollutants: gases, odors, vapors, smoke and dust.

1.23.1.1.2. Rain events

Cotonou's rainfall regime causes traffic difficulties. It should be noted that the rains are particularly heavy in the months of May and June, causing flooding in Cotonou each year, with their consequences on the tracks and on the health of drivers. 95% of respondents in the visited localities during the investigations, affirmed that the torrential rains have been more and more regular in recent years and the frequency of floods is increasing. This makes traffic difficult.

The maximum rainfall is recorded in June (355 mm) for the long rainy season and in October (139 mm) for the short rainy season. Figure 13 shows that the rains are particularly heavy in the months of May and June.

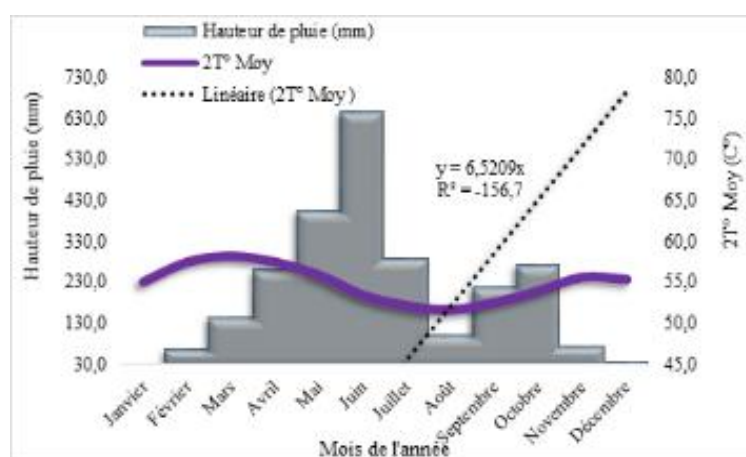


Figure 13: Ombrothermic curve of the city of Cotonou

Source: ASECNA statistics (1953 to 2016)

At low latitudes, rainfall identifies the season. In the coastal region of Benin, there are two dry seasons (December to March and August), with no or insufficient rainfall (rainfall is less than 40 mm, almost zero in December, January and February) and two rainy seasons (April to July and September to November) where it rains most often and abundantly (the monthly average exceeds

170 mm). It is therefore a bimodal regime, with two peaks of unequal importance concentrating 40 to 65% in the first rainy season and 18 to 30% in the second (Boko, 1998). The curve is bimodal, with two extremes, the first in June and the second in September-October. With inter-annual and inter-monthly variability. These are the characteristics of the southern region under the influence of the Atlantic Ocean. The average temperature is around 25°C.

1.23.1.1.3. *Relative humidity and insolation*

Southern Benin is generally characterized by high atmospheric humidity, slightly lower in December and January, due to the "harmattan". The average annual relative humidity is 82% (70% min and 94% max). Monthly averages are high between June and August and can reach 85% in June and July. They are never low but fall to values of 79% during the dry season between January and February. As for the insolation, the observation of the rhythm of insolation reveals long average monthly durations during the period going from November to March. This period corresponds to the one during which the rains are rare. Thus, the sky is less overcast, and the monthly average of hours is beyond 7 hours, that is to say an average annual accumulation of 78.5 hours.

The thermal variations on the coast are linked to the duration of the insolation and to the maritime influence. The coolest period (July-August) corresponds, at sea, to the rise of cold waters (upwellings) coming from the South and which cool the coastal region. The inter-annual average ETP evapotranspiration is 1670 mm (figure 14). It is relatively lower in the wet period than in the dry season and there is a significant rainfall deficit compared to the ETP from December to March-April.

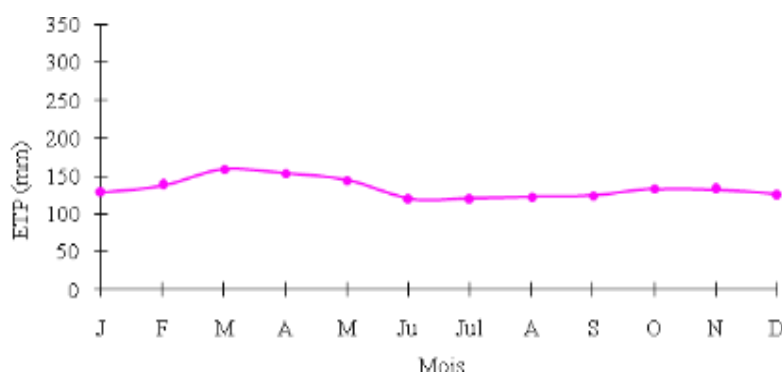


Figure 14: Variation in potential evapotranspiration (ETP)

Source: ASECNA, 2015

Apart from the climatic aspects, the city of Cotonou has a dense hydrographic network made up of lakes, lagoons, swamps and the ocean.

1.23.1.1.4. *Rainfall trends*

Observations made between 1951 and 2010 (4) show situations of deficit that alternate with situations of surplus, which results in seasonal anomalies:

- Rains concentrated in a short period disrupting human activities;
- Interrupted rains in high season;

- In the southern zone, in some years, the rain covers the period between two rainy seasons.

Temporal phenomena are observed locally as significant delays in the start of the rainy season. The temperatures are not affected differently in the climatic zones of the country, which is pointed out by certain observers (5) it is a tendency on all the country with the increase in the temperature (+1°C).

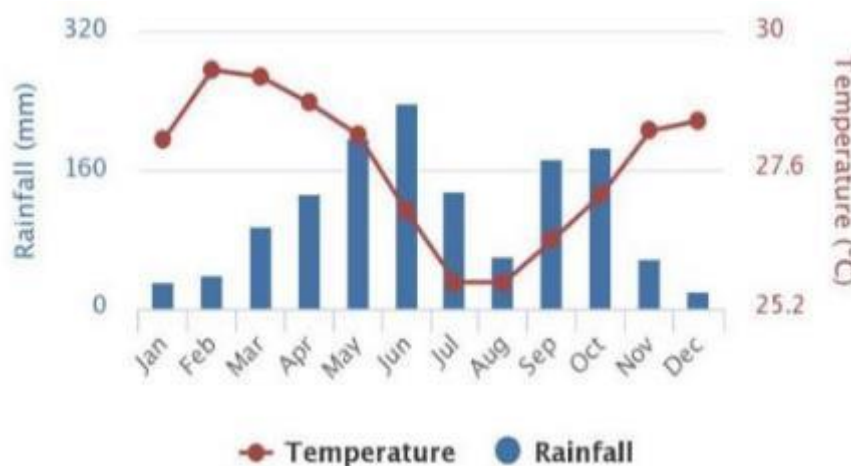


Figure 15: Average temperatures and precipitation in Cotonou for the period 1991-2015
Source: Climatic Research Unit of University of East Anglia.

1.23.1.1.5. Climate scenarios

The second national communication of the Republic of Benin on climate change published in 2011, describes the scenarios foreseen for the evolution of the climate in Benin. It is based on the IPCC scenarios published in 2007.

1.23.1.1.5.1. Precipitations

In the southern region of Benin (at latitudes below 7.5°N), we could witness practically invariable annual rainfall until the year 2100, with the variations observed every five years hardly exceeding 0.2%. North of this latitude, a slight increase would be observed, which could go up to more than 13 and 15% in 2100, respectively in the North-West and North-East.

Table 17: Projection of the annual rainfall in the coastal zone by 2100

YEARS	1971-2000	2005	2010	2015	2020	2025	2050	2075	2100
South East region (Cotonou / Porto-Novo; 5°N - 7.5°N and 2.5°E – 5°E)									
Change (%)		-0.31	-0.68	-1.02	-1.36	-1.35	0.35	2.87	3.57
Rainfall (mm)	1236	1232	1228	1223	1219	1219	1240	1271	1280
South-West region (Ouidah; 5°N-7.5°N and 0° - 2.5°E)									
Change (%)		-0.06	-0.36	-0.62	-0.88	-0.82	0.49	3.62	3.97
Rainfall (mm)	980	979	976	974	971	972	985	1015	1019

Source: MEHU second national communication of the Republic of Benin on climate change

1.23.1.1.5.2. Variability

It is on the seasonal scale that deep modifications can appear, the precipitations of the period of March – April – May, would be in reduction of 2 to 3% during the second half of the 21st century (2050-2100) in the South region.

Greater variations would be observed in the precipitation of March and April. They would result in a decrease that could reach up to 21% in April by 2100. In the Center and North, an increase would be observed up to 16% in 2100 in the North East. In this area, an upward trend in precipitation in April would characterize the first half of the 21st century; the second half would be marked by a downward trend which could lead in 2100 to values lower than those of the period 1971-2000.

The differences between rainfall in March and April would widen until the 2050s, forcing rural populations to place the beginning of agricultural activities more in April or May.

1.23.1.1.6. Temperature scenario

Temperatures are projected to rise in all regions of Benin. By 2100, at the highest the thermal increase on the national territory, compared to 1971 - 2000 would be 3.27°C at the lowest it would be 2.6°C.

Table 18: Projection of average temperatures/year in the coastal zone by 2100

YEARS	1971 - 2000	2005	2010	2015	2020	2025	2050	2075	2100
South East region (Cotonou / Porto-Novo; 5°N - 7.5°N and 2.5°E – 5°E)									
Changes (°C)		0.2	0.29	0.38	0.48	0.61	1.47	2.13	2.63
Temperature (°C)	27.3	27.5	27.59	27.68	27.78	27.91	28.77	29.43	29.93
South-West region (Ouidah; 5°N-7.5°N and 0° - 2.5°E)									
Changes (°C)		0.21	0.29	0.39	0.5	0.63	1.55	2.24	2.77
Temperature (°C)	27.4	27.61	27.69	27.79	27.9	28.03	28.95	29.64	30.17

Source: MEHU second national communication of the Republic of Benin on climate change

1.24. Biological and ecosystem aspects and their functions

1.24.1. Biological aspects

La The city of Cotonou is located in the coastal phytogeographical district (approximately 1% of the national territory) set at between latitudes 6°20' and 6°45'N. More specifically, it is located on strips of sand (exposed land) traversed by swamps.

The strong urbanization (due to the accelerated growth of the population of Cotonou) is at the origin of the disappearance of the old vegetation which occupied the exposed lands (old coastal strip comparable to the terraces of 5 to 7m in height) and a disappearance of almost the total number of valuable species in both exposed lands and marshy areas and floodplains with a host of environmental problems. The species recorded in the retention basins will be presented by basin, in volume 2.

Table 19: List of species of medicinal, cultural and other values

Plant species	medicinal	Craft/Construction/Ornamental	Edible/Pasture	Magic-religious practices
<i>Acacia auriculiformis</i>	+	+	+	+
<i>Annona senegalensis</i>	+	-	-	+
<i>Calotropis procera</i>	+	-	-	+
<i>Carica papaya</i>	+	-	+	+
<i>Cocos nucifera</i>	+	+	+	+
<i>Cyclosorus striatus</i>	-	-	-	-
<i>Cyperus difformis</i>	-	-	-	-
<i>Cyperus rotundus</i>	-	-	-	-
<i>Echinochloa pyramidalis</i>	-	+	-	-
<i>Eichhornia crassipes</i>	-	+	+	-
<i>Elaeis guineense</i>	+	+	+	+
<i>Fimbristylis littoralis</i>	+	-	+	+
<i>Flueggea virosa</i>	+	-	+	-
<i>Ipomea aquatica</i>	+	-	+	+
<i>Kyllinga erecta</i>	+	-	+	+
<i>Kyllinga quamulata</i>	+	-	+	+
<i>Leersia hexandra</i>	-	-	-	-
<i>Ludwigia decurrens</i>	-	+	-	-
<i>Mangifera indica</i>	+	+	+	+
<i>Nymphaea lotus</i>	+	+	+	+
<i>Paspalum vaginatum</i>	-	-	+	-
<i>Phoenix reclinata</i>	-	+	-	-
<i>Phragmites karka</i>	-	-	+	-
<i>Phyllanthus amarus</i>	-	+	-	-
<i>Pistia stratiotes</i>	+	-	+	+
<i>Rhynchospora corymbosa</i>	+	-	-	+
<i>Ricinus communis</i>	+	-	+	-
<i>Senna alata</i>	+	-	-	+
<i>Terminalia catappa</i>	+	+	+	+
<i>Terminalia mantaly</i>	+	+	-	+
<i>Thalia geniculata</i>	-	+	+	-
<i>Typha domingensis</i>	+	+	-	+
<i>Urena lobata</i>	-	+	-	-

LEGEND: - NOT USED, + USED SOURCE: FIELDWORK JULY 2019**SOURCE: FIELD SURVEYS, 2019**

From the analysis of table 19, it appears that the majority of the plant species inventoried in the swamps and outlets have multiple uses. This explains the ever-increasing pressure on plant resources, which undoubtedly constitutes a handicap for maintaining the balance of wildlife habitats. It should be noted that of all the listed species, none is protected by the IUCN Red List.

1.24.2. Functions of ecosystems and their valuation

1.24.2.1. Ecosystems

The marshy areas are mainly the receptacles which ensure the collection and flow of water from the basins concerned. The species present in these swamps are generally *Typha domingensis*, *Ipomea aquatica*, *Paspalum vaginatum*, *Kyllinga peruviana*, *Canavalia rosea*, *Costus spicatus*, *Thalia geniculata*, *Musa sp* and sometimes *Nymphaea lotus* which float on the water surface. There are also *Phyllanthus nodifolius*, *Pentodon pentandrus*, *Hyptis suaveolens*, and some poaceae of the genera *Eragrostis*, *Panicum* and *Dactyloctenium* which exist in dense stands.

The almost total occupation of the environment means that we are now witnessing a considerable reduction or even disappearance of wildlife. Wildlife resources are reduced to those that exist in uninhabited marshy areas. We can count: aquatic, semi-aquatic and avian fauna.

1.24.2.2. Purification and regulations functions

Marsh meadows provide:

- The function of sponge and regulator of the flow rate towards the outlets and absorption of The overflow of lakes and lagoons during floods;
- The important function of retention of coarse waste and chemical and biological purification of water before its arrival in lakes and lagoons. Marshy meadows also play a very important role in slowing down the filling of water bodies and streams (ROGGERI, 1995).

1.24.2.3. Production and conservation functions

Les Swamps in general are subject to exploitation by local and even distant populations. The products exploited are mainly plant species, in particular:

- *Typha domingensis*, much exploited for the manufacture of mattresses and mats;
- *Thalia geniculata*, a plant which leaves are marketed for the manufacture of "akassa" balls, a food consumed in southern Benin, made from corn. Some swamps are transformed into fields of *Thalia geniculata*, in view of the economic value they represent;
- Various medicinal plants are also collected in the swamps, the analysis of which is made below.

Apart from production, marshy meadows are breeding grounds for certain fish species whose fry follow the receding waters, to ensure the restocking of lakes and lagoons. In addition, the swamps are also the niches of many native and migratory Palearctic species.

In terms of conservation function, wetlands are ecosystems rich in biological diversity. Therefore, attention should be paid to the safeguarding:

- Of *Typha domingensis*. Plant much searched by the populations for the manufacture of mattresses (in the form of doormats) and mats;
- Of *Ipomea aquatica*. Food plant for animals. Its hollow and spongy stem acts as a water purifying filter;
- *Chenopodium ambosioides*, a highly sought- after multipurpose medicinal plant;
- Of *Cassia alata*. Medicinal and multipurpose plant;
- Of *Xanthosoma mafaffa*. Medicinal plant; aquatic or semi-aquatic animals such as crocodiles that live in swamps where humidity is permanent. They are found in swamps and along Lake Nokoué.

1.25. Animal population

1.25.1. Aquatic and semi-aquatic fauna

According to Houndagba *et al.* (2001 and 2003), fish are the most represented group of aquatic fauna in these marshy environments. The swamps of the AA basin are more under the influence of marine waters, which leads to the presence of a few species of fish typical of marine environments. The most abundant species in these marshy environments belong to the groups of Cichlids (Tilapias, 2 species), Osteoglossids (*Heterotis*, 1 species), Clariids (*Clarias*, 2 species) and Clarteids (*Chrysichthys*, 2 species), Laléyè *et al.* (1997 and 2000).

Crustaceans: Walker crabs (*Cardiosoma armatum*) and swimming crabs (*Callinectes latimanus*), freshwater shrimp of the genus *Macrobrachium* are observed depending on the flood period.

In the flood zone, we mainly find *Cardiosoma armatum*, hole diggers. When the plain is flooded during the flood, we also note the appearance of swimming crabs, *Callinectes latimanus*. Molluscs: In the lagoon environment, they are represented by:

- Gastropods such as: *Tympanotomus furcatus* var. *Gradula Linnaeus* and *Tympanotomus furcatus Linnaeus*, *Pachymelania aurit Müller* and *Neritina glabrata Sowerby*;
- Lamellibranchs such as: *Corbula trigona Hinds*, *Crassostrea gasar Adanson*, *Anadara senilis Linné* *Brachyodonte niger* (Cinelia), *Congeria africana Van Beneden*, *Tellina nymphallis Lamark*.

These marshy environments also contain aquatic or semi-aquatic vertebrates.

Terrestrial and semi-terrestrial fauna: found in these environments:

- Agamides, Varanids (*Varanus niloticus*), Pelomedusids, Pythonids, Elapids reptiles;
- Frogs (Amphibians, Anurans). They are abundant in swamps and floodplains. The *Rana occipitalis* and *Ptychadena* sp. species are hunted in these environments.
- Rodents and birds derive most of their subsistence from wild dumps encountered everywhere and used to backfill flooded streets, plots in swamps, etc.

1.25.2. Avian fauna and protected species

1.25.2.1. Avian fauna

Among the watercourses of West Africa is Lake Nokoué, which stands out for its particularity, especially regarding to the avian fauna.

Indeed, Lake Nokoué, as mentioned above, is the largest lake in Benin and one of the most important in Africa. It is classified as a component of the *RAMSAR site 1018* for its quality of natural and cultural richness, unparalleled in the world.

Apart from the fish fauna, many birds, fish-eating or not, exist in this lake environment. These are those belonging to the genera *Phalacrocorax*, *Ardeola*, *Egretta*, *Ceryle* etc. Among the most common species are the Crested Kingfisher and Pied Kingfisher, etc.

- **crested kingfisher (*Corythornis cristatus*)**

This species frequents reeds and dense vegetation at the edge of ponds and slow-moving rivers. Its habitat is varied and also extends to marshes, dykes, sheltered shores, estuaries, papyrus beds, mangroves, sandpits, leaching fields and tree-lined streams. Kingfishers are very sparse in rainforest areas. The crested kingfisher is endemic to sub-Saharan Africa, except for the arid areas of Somalia, Kenya, Namibia and Botswana.

The crested kingfisher lives alone or in pairs and adopts a territorial behavior. The following plate 3 indicates (*Corythornis cristatus*) on Lake Nokoué.



Plate 3: Crested Kingfisher (*Corythornis cristatus*)
 SOURCE: <http://www.oiseau.net/oiseau/martin-pecheur.huppe.html>

- **Magpie kingfisher (*Ceryle rudis*)**

The large Magpie Kingfisher (25 cm in length with a wingspan of 46 cm) feeds on fish, crustaceans, aquatic insects and small arthropods. When hunting, it can catch several preys before returning to roost. Most often, it flies hovering before dipping sharply to capture its prey. It digs horizontal galleries in the banks of rivers. They are quite narrow, but they have the advantage of protecting them from predators (such as snakes). The bird has just enough space to turn around. The following photo 9 indicates (*Ceryle rudis*) on Lake Nokoué.



Photo 9: Pied Kingfisher (*Ceryle rudis*)
 SOURCE: [HTTP://WWW.OISEAU.NET/OISEAU/MARTIN-PECHEUR.HUPPE.HTML](http://www.oiseau.net/oiseau/martin-pecheur.huppe.html)

The plate below shows other avian species, proof of the richness of the biodiversity of the ecosystems that will receive rainwater.

		
Royal tern in Lake Nokoué	Whimbrel _	Colony of Egrets on the edge of Lake Nokoué

PLATE 4: SOME BIRDS FROM LAKE NOKOUÉ

In 2017, the Wetlands International team counted 1,013 individuals and 55 species, four of which are fully protected, as they are threatened by various anthropogenic pressures.

1.25.2.2. Protected species

On Lake Nokoué and in the neighboring swamps live 4 priority protected species on the IUCN list. These are *Pelecanus rufescens*, *Anas acuta* Linnaeus and *Pandion haliaetus*. Table 20 presents the said protected species according to their ecological niche, their diet and their distribution.

The project areas are not their important habitats.

Table 20: Characteristics of the 04 protected species on Lake Nokoué (IUCN red list)

Scientific name	English name	Name in "Fon/ Toffin"	Ecological niche	Feed	Distribution
 <i>Pelecanus rufescens</i> Gmelin Family: Pelecanidae	gray pelican	Agodobe	Nests in colonies in trees, cliffs and dunes	Fishes alone or in well-organized groups and eats mostly fish	In tropical Africa, from the Sahel to southern Africa. <i>Benin</i> : Occasional, visiting Lake Nokoué (near Abomey Calavi) and even sometimes Guézin (at the mouth of the lake Ahémé towards the sea). Colonies were observed in Abomey - Calavi, Sô Ava.
 <i>Anas acuta</i> Linnaeus Family : Anatidae	pintail	"Toffin" and "Fon": Tokpakpa	Breeds in grasslands and steppes	Feeds on aquatic plants, rhizomes, sometimes grasses on the ground	Holarctic migrant. In its African winter quarters, this duck is found in the Mediterranean part, along the Nile valley to Lake Victoria, in the Sahelian strip, and occasionally further south in Benin Ganvié and Sô-Ava

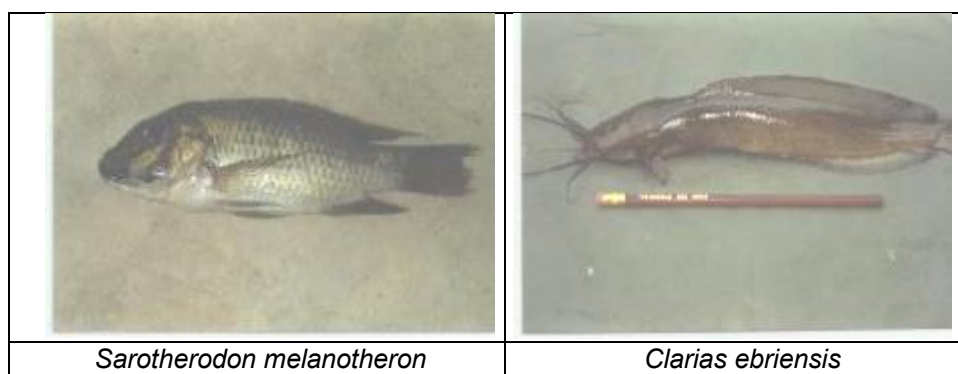
 <i>Pandion haliaetus</i> (Linnaeus) Family : Pandionidae	Osprey	Toffin : Akpobo	Nests in tall trees	Feeds almost exclusively on fish that it catches in flight, on the surface of the water. He can dive.	Worldwide, except in the arctic and antarctic. In Africa: only migratory, from the Sahel to the Cape, but nests in the Cape Verde Islands, the Canaries, near the sea Red and in some places in Algeria. <i>Benin</i> : Found in wetlands From the south and along the major rivers (Sô Ava, Nokoué and Ouémé) and the coast.
 <i>Gallinago media</i> (Latham) Family: Scolopacidae	great snipe	Toffin : Obêthoch ho	Breeds in grassy bogs, wet meadows bordered by bushes and forests	This snipe migrates from Poland and Sweden to the Yenisei River And to the tundra. Its winter quarters are tropical Africa to Mozambique.	<i>Benin</i> : Found from December to February in the marshes and swamps of the Sô River and Lake Nokoué. Threats: Very sensitive to environmental changes.

SOURCE : CEIE.SARL, 2006

1.25.3. Halieutics resources

1.25.3.1. Fishes

They are the most represented group of aquatic fauna. The known species in the study area are presented in annex 1. The most abundant (Plate 03) are Cichlids (*Sarotherodon melanotheron*, *Tilapia guineensis* and *Hemichromis fasciatus*) and Claroteids (*Chrysichthys nigrodigitatus* and *C. auratus*). During the flood many freshwater species invade the area. They are mostly Schilbeids (*Schilbe intermedius*, *Parailia pellucida* and *Pareutropius buffet*), Mormyrids (*Brienomyrus Niger*, *Hyperopisus bebe*) and Mochokids (*Synodontis schall* and *S. nigrita*). During the recession when salinity conditions are favorable, mullets (*Mugil cephalus*, *Liza falcipinnis*), Clupeidae (*Ethmalosa fimbriata*), Eleotrids (*Eleotris vittata*, *Eleotris senegalensis*, *Dormitator lebretonis*) invade the environment.



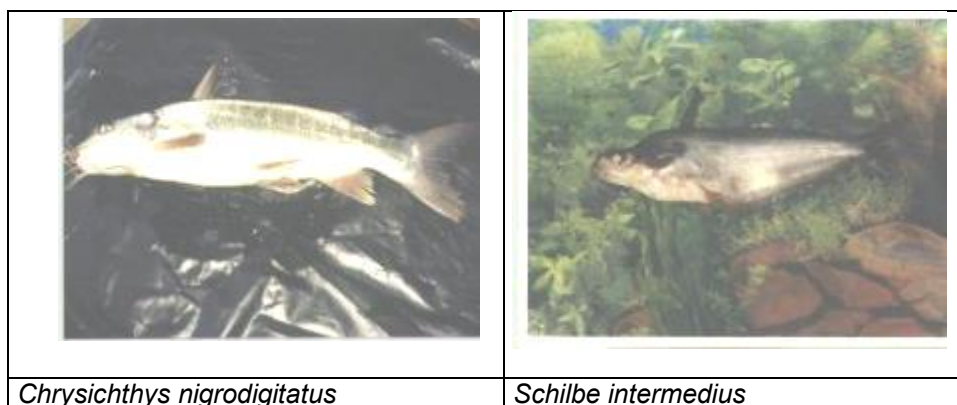


PLATE 5: SOME FISH SPECIES IN THE LAKE-NOKOUÉ-PORTO-NOVO LAGOON COMPLEX
SOURCE: CEIE.SARL, 2006

1.25.3.2. Shellfish

Those are:

- *Farfantepenaeus notialis* (formerly called *Penaeus notialis*) or pink shrimp;
- *Melicertus kerathurus* (formerly called *Penaeus kerathurus*) or tiger prawn;
- *Penaeus monodon*, the large tiger prawn;
- *Macrobrachium* or freshwater shrimp that appear in the environment during floods.



PHOTO 10 : MELICERTUS KERATHURUS
SOURCE: FIELDWORK, 2018

En Regarding crabs, there are two (02) types in the operating area:

- swimming crabs called *Callinectes latimanus* (photo 3) fished abundantly in these localities;
- The walking crabs called *Cardiosoma armatum*, diggers of holes in the floodplain. They are subject to significant hunting in these localities during the recession.



**PHOTO 11: CALLINECTES LATIMANUS IN LAKE NOKOUÉ.
FIELD WORK, 2018**

The molluscs

Dans In the lagoon environment, they are represented by:

- Gastropods such as: *Tympanotomus furcatus* var. *Gradula* Linnaeus and *Tympanotomus furcatus* Linnaeus, *Pachymelania aurit* Müller and *Neritina glabrata* Sowerby ;
- Lamellibranchs such as: *Corbula trigona* Hinds, *Crassostrea gasar* Adanson, *Anadara senilis* Linné *Brachyodonte niger* (Cinelia), *Congerica africana* Van Beneden, *Tellina nymphallis* Lamark.

1.25.4. Ramsar areas

La The Convention on Wetlands of International Importance especially as Waterfowl Habitat, adopted on February 2, 1971 in Ramsar (Iran) entered into force on December 21, 1975. Benin ratified this convention which entered into force in national level on May 24, 2000.

This convention serves as a framework for national action and international cooperation for the conservation and sustainable use of wetlands and their resources. It aims to halt the degradation and loss of wetlands by recognizing their fundamental ecological functions as well as their economic, cultural, scientific and recreational values. Stakeholders recognize that waterbirds, in their seasonal migrations, may cross borders and should therefore be considered as an international resource requiring appropriate conservation measures.

To date, 4 Ramsar Zones have been created in Benin, namely:

- The West Coast Complex (site no. 1017);
- The East Coast Complex (site no. 1018);
- Complex W of Niger (site no. 1668) also a National Park and partially a UNESCO Biosphere Reserve;
- The Wetland of the Pendjari River (site no. 1669) also National Park and UNESCO Biosphere Reserve.

Two large Ramsar zones cover southern Benin. These are Ramsar sites n°1017 (West Complex) and n°1018 (East Complex) which include the infralittoral zone up to 2 km in the ocean. On land, these two Ramsar sites entirely occupy the departments of Atlantique, Mono and Ouémé and partially the departments of Couffo, Plateau and Zou. The western limit corresponds to the border with Togo while the eastern limit is formed by the border with Nigeria. To the north, the limit of the Ramsar zones corresponds to the latitude of 7°N.

The whole covers an area of 9,083 km² (including 5,016 km² for the East Complex), or 8% of the country's area.

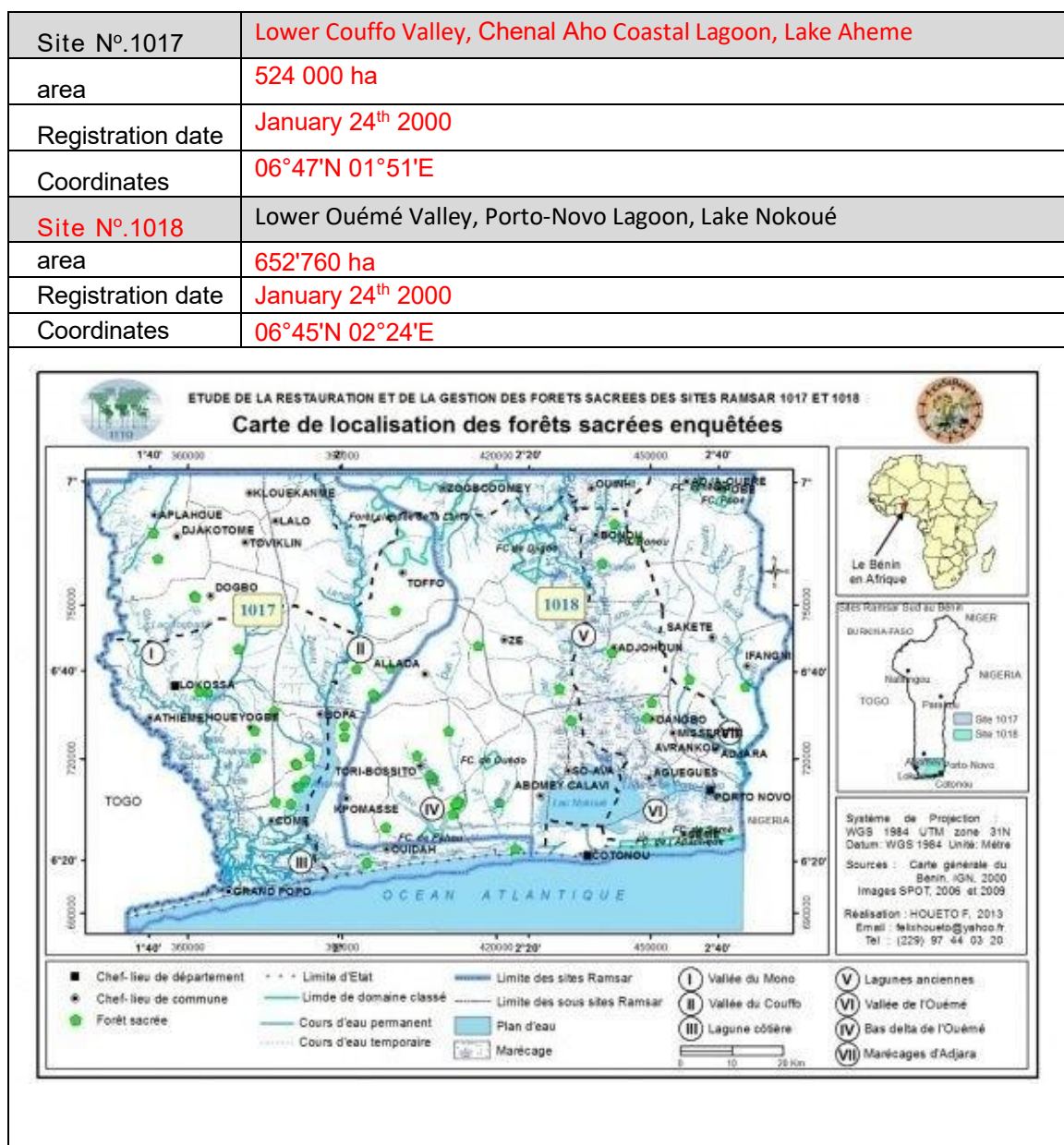


Figure 16: Map showing the RAMSAR zones of the East complex

The entire area of the city of Cotonou, target of the project, is on the Ramsar 1018 list. However, the area around the project site has already been urbanized, without valuable ecosystems, sacred forests and distributed wildlife, and the area is not an important natural habitat. Moreover,

development activities in the region are not prohibited by the laws of Benin. This project fulfills the conditions for an exceptional implementation of the project in a “protected area”.

1.26. Human frame

1.26.1. Demography of the Municipality of Cotonou

Cotonou, the only municipality in the Littoral department, is still the leading city in Benin with **679,012** inhabitants in 2013 compared to **665,100** in 2002, i.e., a slight increase, 2.09% over the period 2002-2013, after an increase of 2.17% over the decade 1992-2002 (INSAE 2015). It should be noted that the population of Cotonou has evolved significantly from **320,332** inhabitants in 1979 to 679,012 inhabitants in 2013 (INSAE, RGPH1&2), an increase of 111.97% in 33 years. This demographic growth is due to the search for more remunerative job opportunities with a view to better living conditions, to the domestic birth rate and to the attraction of foreign populations, in particular from the West African sub-region (particularly from Nigeria).

The increase in an essentially non-agricultural population offers the opportunity for commercial and craft activities of all kinds with a view to feeding, clothing, organizing mobility and caring for such a population. This situation explains why this increase in the population of Cotonou will continue for years to come, with very little chance of being reversed (figure 17).

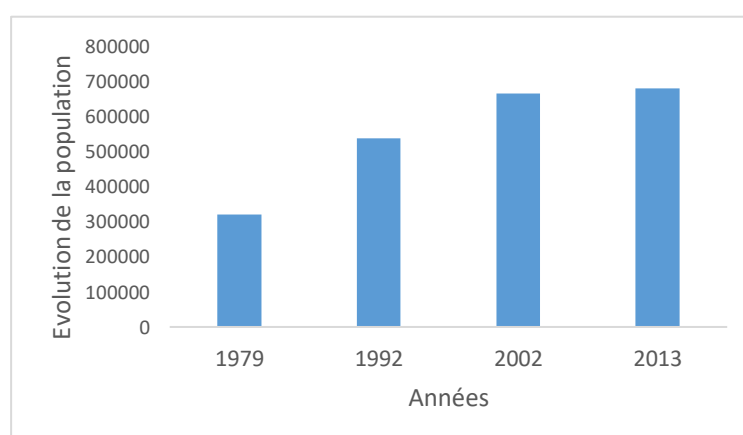


Figure 17 : Evolution of the population of the city of Cotonou from 1979 to 2012
SOURCE: INSAE (RGPH 1, 2, 3, 4)

The project area takes into account the neighborhoods in the 10th, 11th and 13th districts of Cotonou. Table 21 below shows the distribution of the population of Cotonou by district.

Table 21: Distribution of the population of Cotonou by gender and by district

Districts	Genres		Total by districts
	Male	Female	
1 st	28,131	29,831	57,962
2 nd	29,426	32,242	61,668
3 rd	33,640	36,351	69,991
4 th	17,764	18,593	36,357
5 th	9,942	10,097	20,039
6 th	35,791	39,545	75,336
7 th	12,816	14,719	27,535

8th	15,152	17,268	32,420
9th	27,506	30 185	57,691
10th	18,191	20,537	38,728
11th	17,764	17,115	34,879
12th	47,235	50,685	97,920
13th	32,514	35,972	68,486
Total of the Municipality of Cotonou	325,872	353 140	679 012

Source: INSAE, 2015

The ethnic groups listed in Cotonou are the Fon (32.9%), the Goun (15.2%). We also find the Mina and the Yoruba for respectively (5.9%) and (5.5%). In terms of religion, we note Catholicism (57.8%), Islam (14.2%). Other Christians and Celestial Christians are (4.4%) and (7.8%) respectively. Traditional religions represent 15.8%.

In the project's area of influence, the most dominant socio-cultural group remains the Fon and relatives (59.45%) followed by the Adja and relatives (24.09%) and the Yoruba (6.59%). Table 22 presents the sociolinguistic groups in the project's area of influence.

Table 22: Distribution of sociolinguistic profile of the project area of influence

Sociolinguistic group/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Adja and relatives	45	7.80	94	16.29	139	24.09
Other countries	4	0.69	3	0.52	7	1.21
Bariba and relatives	0	0.00	2	0.35	2	0.35
Betamaribé and relatives	2	0.35	0	0.00	2	0.35
Dendi and relatives	7	1.21	8	1.39	15	2.60
Fon and relatives	181	31.37	162	28.08	343	59.45
Neighboring countries	5	0.87	17	2.95	22	3.81
Fulani and relatives	1	0.17	4	0.69	5	0.87
Relatives Yoa & Lokpa	3	0.52	1	0.17	4	0.69
Yoruba and relatives	18	3.12	20	3.47	38	6.59
Total	266	46.10	311	53.90	577	100.00

Source: Results of fieldwork, November 2022

Le résultat de personnes enquêtées lors de l'étude de référence présente les religions pratiquées dans le milieu d'étude (tableau 23).

Table 23: Distribution of populations in the project area of influence by religion

Religion/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
no religion	11	1.91	16	2.77	27	4.68
Catholic	131	22.70	113	19.58	244	42.29
Celestial	15	2.60	30	5.20	45	7.80
Evangelist	83	14.38	77	13.34	160	27.73
Islam	16	2.77	49	8.49	65	11.27
Protestant Methodist	5	0.87	7	1.21	12	2.08
Jehovah's Witness	0	0.00	2	0.35	2	0.35
Voodoo	3	0.52	13	2.25	16	2.77
Apostolic	0	0.00	1	0.17	1	0.17

Buddhism	1	0.17	0	0.00	1	0.17
Pentecost	1	0.17	2	0.35	3	0.52
rebirth union	0	0.00	1	0.17	1	0.17
Total	266	46.10	311	53.90	577	100.00

Source: Results of fieldwork, November 2022

The most dominant religion is Catholicism (42.29%) and the Evangelical Church (27.73%) followed by Methodist Protestants (11.27%).

1.26.2. Land cover in the study areas

Cotonou has developed since the end of the last century from a few fishing villages. Part of simple counter; the city rapidly increased its commercial activities and developed a typical structure of colonial cities: a commercial center around the Warf and amenities, African habitat on the urban outskirts and an industrial area to the east. Cotonou development then took place not only through the extension and densification of the urban fabric, but also through the spontaneous occupation of peripheral areas. The economic capital of Benin today concentrates about 75% of industrial companies, the most important of which are the cement works, the brewery, the cotton processing plant, etc., as well as the headquarters of financial institutions (banks and insurance), the main commercial port and international airport.

Cotonou is also home to the majority of administrative infrastructure, the largest hospital and university center in Benin, large public and private schools, the most important sports and hotel complexes in Benin. The rapid expansion of the city is explained by the disappearance of rural housing in favor of modern housing.

1.26.3. Habitat

Data from the 2013 RPGH show ¹that **55.2% of Beninese men and women do not own a house**. Home ownership is lower compared to this national average and the situation is mixed. The number of female and male house owners is quite similar in the department where Cotonou is located, with 13.3% male owners and 12.9% female.

Despite the implementation of various development plans, the development of urban housing has been made from successive subdivision operations that do not respect the basic rules in terms of urbanization (occupation of the corridors of water by dwellings, housing constructions in non-built areas). There is great heterogeneity in the urban habitat in the city resulting from the shortcomings of urban planning, the inequality of income levels of the population and the historical development of the city: constructions of high and medium standing, with predominance single-storey houses surrounded by a boundary wall, mixed with traditional and precarious constructions in the same area.

¹ INSAE, Demographic and Health Survey 2011-2012, October 2013, p.303

Residential density is also heterogeneous: there are more than 200 inhabitants per hectare in some central areas developed before 1961, 100 and 150 inhab. /ha in the peri-central districts and 50 inhab./ha only for new housing estates and spontaneous housing perimeters.

In the study area, 43.1% of households do not own houses or land, 27.5% do not own land and 17.7% live in rented houses, 47.1% people rented a house in Benin (Table 24).

Table 24: Land use/land ownership

Area	With land ownership	Land title	With house and land property	Ownership of house/land	Employer's house	A relative's house	Lease	Others
Benin	2.7	27.5	3.4	43.1	0.8	3.2	17.7	1.4
Littoral	6.0	10.8	9.4	17.1	1.7	6.6	47.1	1.0
City of Cotonou	6.0	10.8	9.4	17.1	1.7	6.6	47.1	1.0
10th District	6.9	11.6	6.8	14.5	0.9	6.2	52.0	0.7
11th District	4.6	5.6	15.7	24.7	1.5	2.6	44.4	0.7
13th District	5.7	14.1	4.1	13.2	1.0	6.7	53.9	0.8

Source: Main Socio-Demographic and Economic Indicators (RGPH-4, 2013)

Main Socio-Demographic and Economic Indicators of the Littoral Department (RGPH-4, 2013)

1.26.4. Economical activities

Cotonou remains the main center of economic activities in Benin, essentially linked to trade, crafts and the provision of services, thus showing the predominance of the tertiary sector compared to the primary and secondary sector. The city is home to the largest trading centers, in particular:

- **The Dantokpa International Market**, economic center and local and sub-regional business center, visited by many traders from West and Central Africa, and supported by the free movement of people and the fluidity of traffic on the Lomé-Cotonou axis -Lagos;
- **The international airport of Cotonou and the port**, compulsory passage for import and export products both for the interior and for the landlocked countries which use the road infrastructures, or the OCBN railway.

In addition, almost all the major arteries of the city are bordered by many commercial facilities, shops, booths and stalls of manufactured, agricultural and petroleum products (gasoline, diesel, petroleum, motor oil). Commercial facilities are mostly managed by women, as in the Dantokpa market, where they represent 70% of operators, specializing in the trade of fabrics, jewelry, clothing, cosmetics and pharmaceuticals, spirits, liqueurs, tobacco, canned goods, processed or raw local food products. (Source: Update of the Cotonou Rainwater Drainage Master Plan - Feasibility Report – Vol.3: Environmental and Social Study, June 2014).

A distinction is made between **the formal activity** of traders subject to the payment of licenses and taxes, renting sites and registered in the commercial register, or even sitting in the Chamber of Commerce, from informal activities, small trades, itinerant sellers and traders, tontine, veritable savings and informal credit unions, vendors of fresh water and foodstuffs, etc.

The craft industry supported by the Center for the Promotion of Crafts (CPA) is characterized by a skilled labor force which mainly supplies foreign markets with a variety of products and services: agricultural tools, ivory and bone carvings, shoemaking products, leather and copper objects, traditional woven cotton objects, modern clothing, basketry and others, wooden and metal furniture, etc. The main craft activities related to the provision of services include car mechanics, motorcycle mechanics, bicycle mechanics, hairdressers and hairdressers, masons, painters, scrap metal workers, electricians, plumbers, electrical appliance repairmen and others.

In the project's area of influence, heads of households practice several activities that contribute to the well-being of their families (Table 25).

Table 25: Distribution of activities carried out by heads of household

Occupation/Sex	Women		Men		Total	
	Amount	%	Amount	%	Amount	%
General trade	68	11.79	88	15.25	156	27.04
Corporate employees	33	5.72	61	10.57	94	16.29
Sale of electronic and electrical consumables	106	18.37	44	7.63	150	26.00
Workshop (welding, sewing, mechanics and hairdressing)	15	2.60	25	4.33	40	6.93
Artisan (carpenter, vulcanizer, mattress maker, turner)	0	0.00	16	2.77	16	2.77
Driver	0	0.00	6	1.04	6	1.04
Head of agency and company	10	1.73	14	2.43	24	4.16
maintenance and technical	0	0.00	7	1.21	7	1.21
Sale of GSM products	6	1.04	4	0.69	10	1.73
Sale car-motorcycle	2	0.35	13	2.25	15	2.60
Residence	0	0.00	1	0.17	1	0.17
Sale of miscellaneous	25	4.33	32	5.55	57	9.88
Bread seller	1	0.17	0	0.00	1	0.17
Total	266	46.10	311	53.90	577	100.00

Source: Results of fieldwork, November 2022

The most dominant activity in the area of influence of the project is general trade (27.04%) followed by Sale of electronic and electrical consumables (26.00%) and company employees (16.29%).

1.26.5. Education

The Republic of Benin has always given pride of place to education. Few villages in Benin do not have a primary school. General education colleges and high schools cover almost the entire national territory. They are mostly owned by the state, but increasingly, private institutions are taking care, alongside the state, of education in Benin.

The efforts made over the past few years in the area of education in Benin have resulted in an improvement at all levels, particularly in terms of access and equality between boys and girls in primary school. However, girls benefit less from progress at the secondary level – with a net

enrollment rate of 37.8% for girls and 49.5% for boys in 2015 – and higher with a net rate of 8.4% for girls and 22.4% for boys.

A gender gap is also observed in literacy: 52% of women and 77% of men in urban areas are literate and 20% of women and 48% of men in rural areas. This differentiation is also observed in the city of Cotonou, where the literacy rates are the highest.² According to pro-gender organizations³, women are beginning to provide a large part of the financing of children's education and more generally of reproductive activities (children's education and health, food) thanks to the income earned from their income-generating activities. This situation, on the one hand, would result from a greater awareness of the importance of education and the facilities offered by the State on this subject.

On the other hand, it would constitute both a cause and a consequence of a tendency towards the resignation of a growing fringe of men vis-à-vis their responsibility to cover such expenses. This situation also confirms the INSAE data showing that, in general, 70% of women decide alone⁴ on the allocation of their income and priority for reproductive expenses.⁵

In the project's area of influence, the highest level of household education is secondary (40.38%). 22% of households have reached a higher level, broken down into 16.64% for the bachelor's level and 5.20% for the master's level (table 26).

Table 26: Distribution of households by level of education

Educational level/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Literate	14	2.43	9	1.56	23	3.99
None	58	10.05	21	3.64	79	13.69
Bachelor degree	41	7.11	55	9.53	96	16.64
Master	8	1.39	22	3.81	30	5.20
Primary	45	7.80	61	10.57	106	18.37
Professional	4	0.69	6	1.04	10	1.73
Secondary	96	16.64	137	23.74	233	40.38
Total	266	46.10	311	53.90	577	100.00

Source: Results of fieldwork, November 2022

1.26.6. Socio-demographic profile of PAPs

The in-depth analysis of the data collected made it possible to obtain a total population of 433 people affected by the project (PAP) plus the CFAO and 04 absent PAPs. The analysis only took into account the 433 PAPs, divided into 62.30% men and 37.70% women.

A second analysis of the PAPs indicates that men whose observed age range varies from 26 to 45 years are the most numerous (28.44%), against 15.35% for women in this age group. This implies

² EU Delegation to Benin, Benin Gender Profile 2017, May 2017, p.36

³ Representatives of AWEPP and FEFA

⁴ INSAE, Demographic and Health Survey 2011-2012, October 2013

⁵ National Institute for the Advancement of Women – Directorate for Development and Cooperation / Switzerland, Final report on the study of relations between men and women and their impact on social life in Benin, September 2013

that the PAPs are mostly young and contribute to the socio-economic development of the city of Cotonou. Table 27 presents the group of PAPs according to the male-female ratio.

Table 27: Distribution of PAPs by age group

Tranche d'âge/Sexe	Femme		Homme		Total	
	Effectif	%	Effectif	%	Effectif	%
Moins 18 ans	1	0,23	1	0,23	2	0,45
18 à 25 ans	29	6,55	39	8,80	68	15,35
26 à 35 ans	47	10,61	92	20,77	139	31,38
36 à 45 ans	40	9,03	83	18,74	123	27,77
46 à 55 ans	28	6,32	43	9,71	71	16,03
56 à 65 ans	17	3,84	12	2,71	29	6,55
66 à 75 ans	2	0,45	3	0,68	5	1,13
Plus de 75 ans	3	0,68	3	0,68	6	1,35
Total	167	37,70	276	62,30	443	100,00

Source: Results of fieldwork, November 2022

The PAPs are distributed in the three (03) districts of Cotonou distributed in the 10th District (41,08 %), 11th District (30,47 %) and 13th District (28,44 %), table 28.

Table 28: Distribution of PAPs by District

District/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
10th District -	60	13.54	122	27.54	182	41.08
11th District -	59	13.32	76	17.16	135	30.47
13th District -	48	10.84	78	17.61	126	28.44
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

These PAPs are distributed in the Ahogbohoulè (28, 22 %), Houeyiho (17, 38%) and Vêdoko (54, 40 %) districts. Table 29 shows the distribution of PAPs in the neighborhoods covered by the project.

Table 29: Distribution of PAPs by city district

City District/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Ahogbohoulè	48	10.84	77	17.38	125	28.22
Houeyiho	32	7.22	45	10.16	77	17.38
Vedoko	87	19.64	154	34.76	241	54.40
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

Among the 443 PAPs, 37.70% are women, widows represent 4.29 %, single women (7.90 %) and married women (23.48%) On the men's side, among the 62.30%, 48.76% are married against 13.09% single. Table 30 shows the distribution of PAPs by marital status.

Table 30: Distribution of PAPs by marital status

Marital Status/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Single	35	7.90	58	13.09	93	20.99
Divorced/Separated	9	2.03	2	0.45	11	2.48
Married	104	23.48	216	48.76	320	72.23

Widowed	19	4.29	0	0;00	19	4.29
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

On the sociolinguistic level, nine (9) groups were recorded including a group from neighboring countries and other countries. The most dominant sociolinguistic groups are the “Fon and relatives” (58.24%) followed by the adja and relatives (25.73%). Table 31 below shows the distribution of PAPs by sociolinguistic group.

Table 31 : PAPs by sociolinguistic group

Sociolinguistic group/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Adja and relatives	33	7.45	81	18.28	114	25.73
Other countries	1	0.23	3	0.68	4	0.90
Bariba and relatives	0	0.00	4	0.90	4	0.90
Dendi and relatives	4	0.90	7	1.58	11	2.48
Fon and relatives	106	23.93	152	34.31	258	58.24
Neighboring countries	6	1.35	14	3.16	20	4.51
Fulani and relatives	0	0.00	2	0.45	2	0.45
Yoa Relative & Lokpa	2	0.45	0	0.00	2	0.45
Yoruba and relatives	15	3.39	13	2.93	28	6.32
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

The majority of PAPs are of the Catholic religious faith (40.41 %). Evangelicals represent 28.44 % and Muslims 10.39 %. Table 32 shows the distribution of PAPs by religion.

Table 32: Distribution of PAPs by Religion within the scope of works

Religion/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
no religion	6	1.35	19	4.29	25	5.64
Catholic	80	18.06	99	22.35	179	40.41
Celestial	9	2.03	24	5.42	33	7.45
Evangelist	52	11.74	74	16.70	126	28.44
Islam	12	2.71	34	7.67	46	10.38
Protestant Methodist	5	1.13	5	1.13	10	2.26
Jehovah's Witness	0	0.00	3	0.68	3	0.68
Voodoo	1	0.23	14	3.16	15	3.39
Apostolic	0	0.00	1	0.23	1	0.23
Buddhism	1	0.23	0	0.00	1	0.23
Gbaname	0	0.00	1	0.23	1	0.23
Pentecost	1	0.23	2	0.45	3	0.68
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

Regarding the level of education, a rate of 9.71% of illiterates is recorded, of which 6.09% is observed in the rank of women with 3.61%. Among 62.30% of men, 18.06% reached the next level. Table 33 presents the distribution of PAPs by level of education.

Table 33: Distribution of PAPs by level of education in the works area

Educational level/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%

Literate	3	0.68	8	1.81	11	2.48
None	27	6.09	16	3.61	43	9.71
Bachelor degree	36	8.13	49	11.06	85	19.19
Master	8	1.81	18	4.06	26	5.87
Primary	17	3.84	62	14.00	79	17.83
Professional	1	0.23	11	2.48	12	2.71
Secondary	75	16.93	112	25.28	187	42.21
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

1.27. Restricted Environmental Quality

The environmental framework of the study area was analyzed on the basis of our observations, analyzes and taking into account the information obtained on the commune of Cotonou and especially on the 10th, 11th and 13th districts:

In the Municipality of Cotonou, the management of the environment and the respect of the rules of Hygiene by the populations is marked by a lack of sanitation works in the city (primary and secondary collectors) and a waste management system inefficient household solid (PDM 2016-2020). But it must be said that with the various sanitation works undertaken by the State, the situation will improve. The management of household solid waste has seen a lot of improvement in recent years, however there are still some anomalies. Garbage removal structures certainly exist, but we note that the lowlands continue to receive waste. Indeed, some carters come and dump garbage collected from households in the swamps.

1.27.1. Waste management

Composed of Ste Rita, Missèkplé, Vèdoko, Yénawa and Kouhounou districts, the tenth district borders the ninth, with which it experiences a very similar situation in terms of flooding and management of the living environment. While flooding and the risk of reptile attacks are mentioned as the main problems, the incivility of the populations in the occupation of the water flow paths, the congestion of the vegetation and the wild dumps are difficulties to which populations are confronted. As in the Communes of Grand-Nokoué, waste management in the three (03) Study Districts is done by the Waste Management and Urban Hygiene Company (SGDS). The collection is done through the Small and Medium Enterprises (SME) on its account. It is free of charge and entirely financed by the Beninese State.

There are no public latrines but the majority of houses (77%) have private latrines. However, in none of these houses there is a structure for collecting waste water which is discharged into the yard, into the streets or into the collectors. The access roads deserve to benefit from more regular maintenance and an improvement in their quality. Asphaltting and/or paving would improve the situation, according to the populations.

The thirteenth district could be considered the marshiest of the territorial collectivities of Cotonou. There is the Agla district, renowned for its large slums, and the Gbèdégbé district. This district has

drawn the attention of many previous works. Despite this, the floods continue to be considered as the nightmare of the populations there. All of the people questioned rank this scourge as the first in their respective neighborhoods, as if nothing had been done about it. Such unanimity has not been reached on any other concern.

1.27.2. Air quality and other nuisances

The main mode of transport for the population is the “Zémidjan”. This mode of transport is not without impact on the health of populations for two reasons. On the one hand, these drivers use adulterated gasoline and, moreover, the gasoline-motor oil mixture they use exceeds the recommended proportions. On the other hand, these machines are often purchased second -hand with old and poorly tuned engines.

The combination of all these parameters leads to the release of smoke made up of toxic gases such as carbon monoxide (CO), carbon dioxide (CO₂), volatile organic compounds (VOC), non-methane volatile organic compounds (NMVOC), lead (Pb), nitrogen oxide (NO), methane (CH₄) etc. all these gases released have effects on the health of populations. As ailments generated, mention may be made of acute respiratory infections (ARI), eye diseases, allergy/sneezing, asthma. Many studies have shown the link between an unhealthy environment and the prevalence of certain diseases. The use of dirty water, the non-existence of an appropriate wastewater treatment system, poor management of domestic and biomedical waste, atmospheric pollution, are factors that compromise the environmental balance. However, it is good to see that the population has a fairly precise perception of the causal relationships between environment and health.

1.27.2.1. Summary of measurement results related to air quality

Field measurements were carried out from September 8 to 13, 2022 for air quality, water and noise levels) and from October 1 to 4, 2022 (for vibration).

1.27.2.1.1. Air quality results

Table 34 presents the results of the measurements PM2.5 & PM10.

Table 34: PM2.5 & PM10 measurement results

Sample location	Conc. PM2.5 (µg/m3)	Conc. PM10 (µg/m3)
Gas station	17.4	39.7
Furniture store	160.4	227.1
water channel	59.0	110.4
Church	21.5	60.4
Behind Toyota	18.8	22.9
Akossombo pharmacy area	49.3	74.3
IFC guideline for PM2.5 (24 hours)	25µg/m3	50µg/m3
Fonts in Red indicates exceeding IFC guidelines		

Source: Banca Engeneering, November 2022

Table 34 shows the maximum daily concentrations measured during the monitoring periods, in comparison with the IFC air quality guidelines.

- During the monitoring period in: the vicinity of the Eucharistie church, CFAO Motors and the AKOSSOMBO pharmacy, it rained, which may have resulted in relatively lower dust concentrations compared to the three remaining locations.
- The furniture store and the water channel are near the busy road, which leads to heavy dust.
- There was a 50% exceedance of the IFC PM2.5 concentration guideline at all six monitoring locations. 66.67% of monitoring sites exceeded IFC guidelines for PM10 concentration.

1.27.2.1.2. NO₂, SO₂ and CO monitoring results

Nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) were sampled using passive Radiello™ tubes consisting of a blue diffusive body, support plate, vertical adapter and a chemo-adsorbent cartridge. The cartridge is made of microporous polyethylene coated with triethanolamine (TEA). Nitrogen and sulfur dioxides are chemically adsorbed selectively as nitrite and sulfite or sulfate ions respectively. Nitrite is quantified by visible spectrophotometry, while sulphite and sulphate are analyzed by ion chromatography. Meanwhile, NO₂ and SO₂ can be analyzed by ion chromatography. Table 35 presents the results obtained.

Table 35: Results of SO₂, NO₂ and CO measurements

Sample ID	Sample location	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)	CO (µg/m ³)
BRO1	Gas station	10.1	3.5	0.3
BRO2	Furniture store	27.2	3.0	6.4
BRO3	water channel	21.9	2.7	0.0
BRO4	Church	6.7	2.8	9.3
BRO5	Behind Toyota	< 2.6	4.3	0.0
BRO6	Akossombo pharmacy area	16.6	4.9	1.6
IFC Directive		200	20	seven
<i>Fonts in Red indicate exceeding IFC guidelines</i>				

Source: Banca Engineering, November 2022

- The ambient CO concentration at the church, 9.3 µg/m³, exceeded the IFC guideline of 7 µg/m³.
- This is due to the fact that there was heavy traffic on the stretch of road at the time of the surveillance.
- The remaining parameters complied with the respective IFC guidelines for the eight sites.

1.27.3. Floristic inventory

To carry out a floristic inventory, a minimum of two (2) readings of 30 m x 30 m, i.e., 900 m² per hectare, are required. This site visited being a lowland and during this rainy period, there is a significant presence of water which did not facilitate access, so the readings could not be carried out inside the site. However, the entire site has been covered along its length and width in order to carry out the inventory. The plant species identified during the observations are as follows: the area is full of enough lianas and other species (see plates 4 and 5) of lowland among others, we have the details recorded in table 36.

Table 36: Summary of plant species

Number order	Common names	Scientific names
1	Papaya	<i>carica papaya</i>
2	Palm	<i>Elaeis guineensis</i>
3	duck fern	<i>Acrostichum aureum</i>
4	Reed Reel, Cattail or Typha	<i>Typha domingensis</i>
5	small white tamarind	<i>Phllanthus amarus</i>
6	christmas bush	<i>Alchormia cordifolia</i>
7	Poc-poc creeper, fetid passionflower	<i>Passiflora foetida</i>
8	bitter melon	<i>Momordica charantia</i>
9	Potato in Durand	<i>Ipomola pes-caprea</i>
10	<i>panicum pyramid</i>	<i>Echinochloa pyramidalis</i>
11	cookie grass	<i>Paspalum vaginatum</i>
12	Water bindweed or morning glory	<i>Ipomola aquatica</i>
13	creeping primrose	<i>Ludwigia repens</i>
14	Mexican primrose	<i>Ludwigia octovalvis</i>

Source: Field survey, August 2019

Regarding animal species, observations could not be made, however, some reptiles and butterflies that jumped from flower to flower were seen.

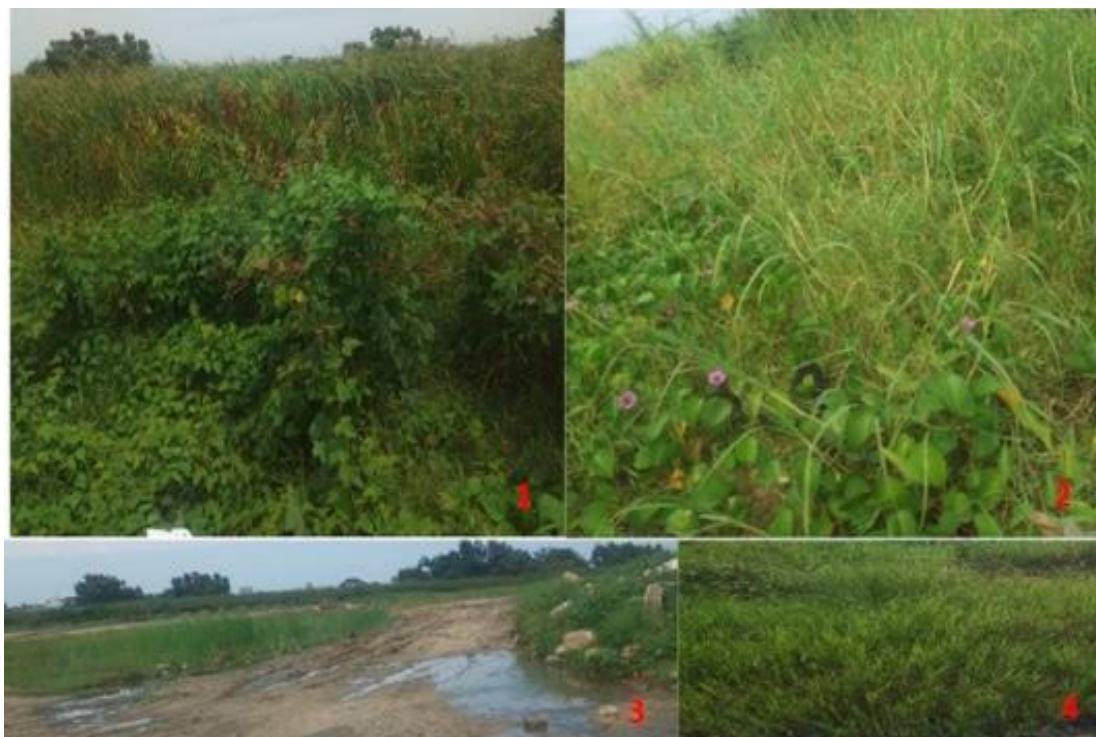


Plate 6 : Images of some species encountered on the base camp site of the vèdoko flyover: 1- *Senna occidentalis*, *Passiflora foetida* and *Echinochloa pyramidalis*; 2- *Ipomoea pes-caprae* broad-leaved flowers; 3- Young *Typha domingensis*; 4- *Paspalum vaginatum*



Plate 7 : Images of some species encountered on the base camp site of the vêdoko flyover: 5- *Ipomoea aquatica*; 6- a set of plants including *Acrostichum aureum*, *Ludwigia octovalvis* and *Ipomoea* without flowers; 7- *Typha domingensis*; 8- *Momordica charantia*

These floristic data were supplemented by data from affected trees in the project footprint (table).

Table 37: Affected plants with economic value

Types of goods	Assets affected	Feet	Features	Number	%
Plants of economic value affected	Neem	Feet	Young	3	6.38
	Oil palm tree	Feet	Adult	7	14.89
	Oil palm tree	Feet	Young	6	12.77
	Ficus umbelata	Feet	Young	3	6.38
	Mango	Feet	Young	2	4.26
	Mango	Feet	Adult	4	8.51
	kola tree	Feet	Adult	22	46.81
Total				47	100

Source: Results of fieldwork, November 2022

In addition to these plants, there are 22 alignment trees of the *Khaya senegalensis* type located on the central reservation (Plate 8).



Photo 12: *Terminalia catappa* (colatree) affected (south side) of the crossroads



Photo 13: *Khaya senegalensis* (Cailcedrat) affected (central reservation) of the crossroads (east side)



Photo 14: *Khaya senegalensis* (Cailcedrat) affected (central reservation) of the crossroads (east side)

Picture 15: *Terminalia catappa* (colatree) affected (CEB fence to market)

Plate 8: Plants of economic value and roadside trees affected
Shooting: Banca Engineering, December 2022

1.27.4. Ambient noise

The field measurements were carried out from September 8 to 13, 2022 (for noise levels) and from October 1 to 4, 2022 (for vibrations).

1.27.4.1. Results of the ambient noise measurement

Table 38 presents the results of ambient noise measured during the week.

Table 38: Results of the noise measurement during the week

Location	Date	5 a.m. - 7 a.m.	8 a.m. - 10 a.m.	2 p.m. - 4 p.m.	10:00 p.m. - 12:00 a.m.	IFC Directive
Gas station	9 Sep 22	64.4	75.0	70.0	69.1	70
Hairdresser		65.3	57.5	59.0	54.5	70
Furniture store		86.9	84.9	85.0	86.6	70
water channel		70.7	75.1	75.1	72.8	70
Akossombo	12 Sep 22					
Pharmaceutical Zone		60.8	72.0	76.5	73.6	70
Church		67.9	71.8	72.2	70.2	70
Behind Toyota		54.0	63.9	63.3	60.3	70
Path of the Consul General		69.9	71.5	78.5	76.1	70
Fonts in RED indicate exceeding the IFC guideline of 70dB(A)						

Source: Banca Engineering, November 2022

- From Table 38, weekday noise results for the eight monitoring locations, traffic situations varied at different times of the day.
- Traffic levels were generally lowest between 5am and 7am as it was the early hours of the day. The traffic situation increased significantly between 8 a.m. and 10 a.m. as many people were moving on the road. The traffic situation reached its peak between 2 p.m. and 4 p.m., as many more people were moving on the roads. Between 10:00 p.m. and midnight, traffic levels saw a drop, although higher than during the early hours of the day.

- The furniture store had the highest noise levels as the location was closest to the Vêdoko roundabout; this is followed by the water channel on the same stretch of road, east of the Vedoko roundabout. The General Consul Lane and the Akossombo Pharmacy area placed third and fourth respectively. The General Consul Lane had welders close to the lookout location and vehicles traffic joining the Vêdoko roundabout. The Akossombo pharmacy area was about 10 meters from the Vêdoko market and connected to the Vedoko roundabout.
- Behind Toyota and the babershop were within the communities and away from the road, so recorded lower noise levels. The barber shop was the location with the least noise.

Table 39 presents the result of the noise level at the weekend.

Table 39: Results of the weekend noise measurement

Location		5 a.m. - 7 a.m.	8 a.m. - 10 a.m.	2 p.m. - 4 p.m.	10:00 p.m. - 12:00 a.m.	IFC Directive
Gas station	10-Sep-22	73.4	71.5	77.8	66.5	70
Barbershop		56.2	57.7	72.4	57.9	70
Furniture store		95.1	95.2	93.9	94.8	70
water channel		68.9	74.4	74.7	73.3	70
Akossombo Pharmaceutical Zone	11 Sep 22	66.3	74.4	74.5	73.0	70
Church		68.5	75.0	75.2	70.1	70
Behind Toyota		57.9	57.5	77.6	75.1	70
Path of the General Consul		71.0	71.5	72.6	67.0	70
Fonts in RED indicate exceeding the IFC guideline of 70dB(A)						

Source: Banca Engineering, November 2022

- Comme Similar to weekday noise levels, Furniture Store had the highest noise levels exceeding IFC guidelines and the Barbershop was the area with the least observed noise levels.

1.27.4.2. Results of ambiet vibration measurement

Comme Like the other measurements, ambient vibration was measured at the same locations as the other parameters (Table 40).

Table 40: Weekend vibration measurement results

Location		5 a.m. - 7 a.m.	8 a.m. - 10 a.m.	2 p.m. - 4 p.m.	10:00 p.m. - 12:00 a.m.
Gas station	Octob er 1, 22	0.3	0.4	0.4	0.4
barbershop		0.5	0.4	0.4	0.3
Furniture store		0.5	0.5	0.5	0.5
water channel		0.4	0.4	0.4	0.5
Akossombo Pharmaceutical Zone	Octob er 2, 22	10.9	0.5	0.6	0.4
Church		0.5	0.8	0.8	0.9
Behind Toyota		1.1	0.3	0.8	0.3
Path of the Consul General		0.3	0.4	0.4	0.4
In the absence of IFC guidelines, the Ontario criterion, 12.5 mm/s, is used					

Source: Banca Engineering, Novembre 2022

- Over the weekend there was generally an increase in vibration levels from 5-7 a.m. to 8-10 a.m. with peak vibration levels between 2-4 p.m. This reduces during the hours from 10:00 p.m. to midnight.
- Since there are no IFC guidelines for vibration levels, the Ontario criteria were used for comparison.
- All monitoring locations had vibration levels below the Ontario criteria (Table 41).

Table 41: Weekday vibration measurement results

Location		5 a.m. - 7 a.m.	8 a.m. - 10 a.m.	2 p.m. - 4 p.m.	10:00 p.m. - 12:00 a.m.
Akossombo Pharmaceutical Zone	October 3, 22	0.4	0.4	0.5	0.5
Church		0.5	1.0	0.7	0.5
Behind Toyota		0.3	0.4	0.4	1.0
Path of the Consul General		0.4	0.4	0.4	0.4
Gas station	October 4, 22	0.3	0.5	0.5	0.3
Barbershop		0.3	0.3	0.4	0.3
Furniture store		0.5	0.5	0.6	0.5
water channel		0.4	0.5	0.5	0.4

In the absence of IFC guidelines, the Ontario criterion, 12.5 mm/s, is used

Source: Banca Engineering, Novembre 2022

- When weekday vibration levels are compared to the Ontario criterion, 12.5 mm/s, all eight monitoring locations were below the criteria.
- Weekday vibration levels increased from 5-7 a.m. to 8-10 a.m. and peaked from 2-4 p.m. This is consistent with previous observations of the noise data.
- After the peak traffic hours, 2 p.m.-4 p.m., the vibration levels decreased during the period 10 p.m.-12 a.m.

1.27.5. Water quality

Field measurements were carried out from September 8 to 13, 2022 for water quality.

1.27.5.1. Effluent quality results

Le Table 42 presents the results of the effluents analyzed in the water channel to the east and the water drained to the west.

Table 42: Effluent Quality Results

Settings	BW01 (water channel east of Vedoko R'dt)	BW02 (Drain-West of Vedoko R'dt)	IFC Directive
pH	7.1	7	6-9
Total suspended solids (mg/L)	35	33	50mg/L
Total Dissolved Solids (mg/L)	726	446	None
Dissolved oxygen (mg/L)	2.2	4.6	None
BOD (mg/L)	7	6	30mg/L
COD (mg/L)	47	42	125mg/L
Turbidity (NTU)	26	24	None
Total phosphorus (mg/L)	<0.03	0.14	2mg/L

Total nitrogen (mg/L)	8.5	6.5	10mg/L
Nitrates (mg/L)	31.2	26	None
Ammonia (mg/L)	<0.02	<0.02	None
Nitrite (mg/L)	6.29	<0.05	None
Oil and grease (mg/L)	<5	<5	10mg/L
Mercury (mg/L)	<0.0001	<0.0001	None
Cadmium (mg/L)	<0.0001	<0.0001	None
Lead (mg/L)	0.0026	0.0015	None
Chromium VI (mg/L)	<0.004	<0.004	None
Fluoride (mg/L)	0.22	0.15	None
Phenol (mg/L)	<0.1	<0.1	None
Arsenic (mg/L)	<0.0005	<0.0005	None
Selenium (mg/L)	<0.01	<0.01	None
Copper (mg/L)	0.005	0.003	None
Zinc (mg/L)	0.021	0.016	None
<i>E. coli</i> (MPN/100ml)	>2419.6	>2419.6	400MPN/100ml*
Faecal coliform bacteria (MPN/100ml)	>2419.6	>2419.6	400MPN/100ml*

Source: Banca Engineering, November 2022

The two samples of effluent were heavily contaminated with faecal matter following the mixture of rainwater and lowlands which serve as a dumping ground and places of comfort for the zémidjan-men in the city of Cotonou.

1.27.6. Health

The national health system is modeled on the administrative division and is defined through a pyramidal structure at three levels:

- The central or national level;
- The intermediate or departmental level;
- The peripheral level.

At the central level, the system is managed by the Ministry of Health, which is responsible for implementing the health policy defined by the Government. To do this, he initiates the health action, plans its implementation, coordinates and controls the execution of the defined tasks. As infrastructure at the central level, Benin has the National Hospital and University Center (CNHU) and the Mother and Child Hospital Lagune (HOMEL).

At the intermediate level, the relay is provided by the Departmental Health Directorates whose actions are in line with the strategy adopted at the central level. There are five Departmental Hospital Centers (CHD) located in the departments of Ouémé, Borgou, Atacora, Zou and Mono.

At the peripheral level, we find the health zones which constitute the most decentralized operational entities of the Beninese health system. The health zone is made up of a network of first aid services: Village Health Unit (UVS), Maternities and dispensaries alone, Health Center (CS) and private health

facilities, all supported by a first referral hospital (Hospital area), public or private, and intended to serve an area with between 100,000 and 200,000 inhabitants. It should be noted that the Republican Police Health Center is the closest health facility to the project site.

1.27.6.1. *Epidomological profil of water*

Over the past four years (2014 – 2017), malaria, diarrheal diseases, anemia and cholera have been the main waterborne pathologies (Figure 18) recorded in the city of Cotonou.

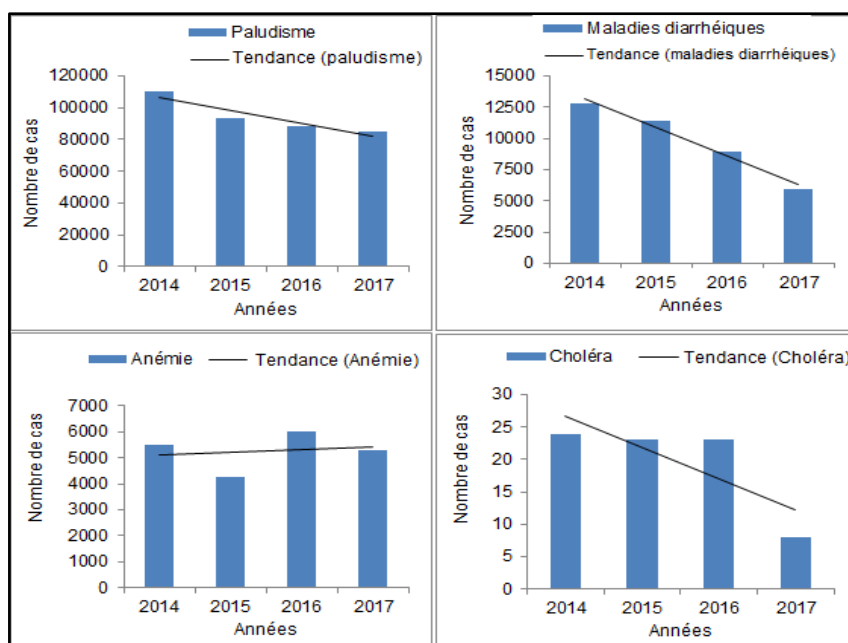


Figure 18: Interannual evolution of cases of malaria, diarrheal diseases, Anémie and cholera in the PAP sectors from 2014 to 2017
DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

Examination of Figure 18 shows that malaria was the most prevalent illness, followed by diarrhea, anemia and cholera. At the level of all affections, the number of consultations evolves up and down from one year to another. Globally, malaria shows a downward trend. The number of recorded cases increased from 110,603 in 2004 to 84,631 cases in 2017. The year 2017 recorded the lowest number of malaria cases (84,631 cases).

Regarding diarrheal diseases, they are also experiencing a downward trend. The number of consultations increased from 12,788 in 2014 to 5,909 cases in 2017 with a sharp drop between 2015 and 2017. As for anemia, it shows an upward trend with a peak observed in 2016. Cholera is experiencing a tendency to the decrease, going from 24 cases in 2014 to 8 cases in 2017. The variation of the epidemiological indices as presented does not allow to have the annual variations by study district.

In the area of influence of the project, the most common diseases from which households suffer are, among others, malaria (91.68%) broken down into 50.61% for men and 41.07% for women. Colds represent 33.97% and diarrhea (23.40%) of common illnesses recorded in households. Table 43 shows the distribution of PAPs by type of common disease by sex.

Table 43: Distribution of PAPs by type of common diseases by sex

Common Household Illnesses/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Diarrhea	49	8.49	86	14.90	135	23.40
Common cold	87	15.08	109	18.89	196	33.97
Dengue fever	5	0.87	5	0.87	10	1.73
Malaria	237	41.07	292	50.61	529	91.68
Yellow fever	1	0.17	1	0.17	2	0.35
Meningitis	1	0.17	0	0.00	1	0.17

Source: Results of fieldwork, November 2022

1.27.6.2. Inter-monthly rate of disease cases in the sector

In this section, it is question of seeing whether between 2014 and 2017, the rhythm of the four main conditions coincides with the climatic rhythm. Figure 19 highlights the rhythm of the number of cases of the main conditions according to the month.

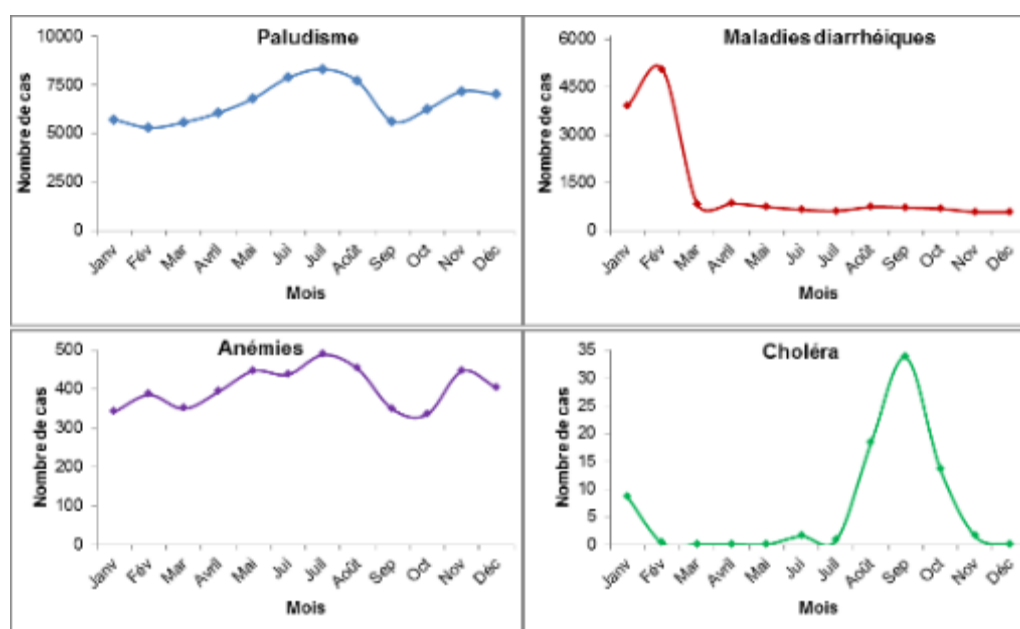


Figure 19: Monthly averages of cases of malaria, diarrheal diseases, of anemia and cholera in the PAP sectors from 2014 to 2017

DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

Figure 19 presents the inter-annual monthly averages of malaria, diarrhea diseases, anemia and cholera in the study area over four consecutive years (2014-2017). On analysis, we observe a seasonal nature of malaria, anemia and cholera. Indeed, there is a seasonal distribution of malaria in the PAPVIC sector with peaks during the rainy season (July for the long rainy season and November for the short rainy season). These peaks correspond to the end of the rainy seasons when Anopheles mosquitoes are most numerous in the adult phase. As far as diarrhea is concerned, two main phases are observed: the high phase which extends from December to April and which corresponds to the long dry season, and the low phase which occurs from May and which covers all the rest of the year.

The rate of anemia is tri-modal with the maximum in July and secondary peaks in May and November, the same trend is observed as for malaria. Cholera, on the other hand, experiences an increase in the number of cases from July to September, a period coinciding with a decrease in temperature. However, consultations remain considerable throughout the year for cases of malaria and diarrhea diseases. During the long rainy season, populations that do not have easy access to SONEB water use water from wells with high microbial and bacterial concentrations.

1.27.6.3. *Evolution of the number of cases of affections by district and by age group*

According to data from the Ministry of Health, the epidemiological picture in each district is not fundamentally different from the pictures observed in the entire sector. The analysis of these data for the years 2014 to 2017 gives the results presented in the following figures by district.

▪ **Malaria**

Malaria is the leading cause of morbidity in the districts (Figure 20).

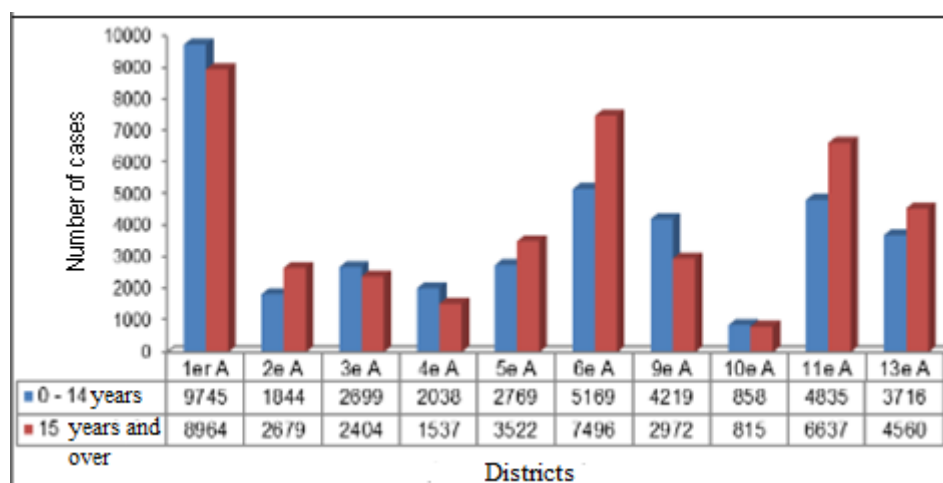


Figure 20: Distribution of the number of malaria cases by age group and by district in the study area from 2014 to 2017

DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

Over the past four years (2014 to 2017), an average of 79,500 cases of malaria have been recorded per year. Children under 15 are the least affected (47.67% against 52.33% for those aged 15 and over). The 1st, 6th, 11th and 13th districts have the highest numbers of cases. These boroughs stand out from the others, from an environmental point of view. These are the most flooded districts in the rainy season where hygiene and sanitation problems arise acutely. They then present conditions conducive to the transmission of the disease, but also because of the proximity of houses to certain permanent breeding sites.

The 10th districts has the lowest number of cases. It records 858 cases for those under 15 and 815 cases for those 15 and over. However, in view of the data from the Ministry of Health, the number of new cases of malaria is considered low. This is explained by the Government's programs in relation to the fight against malaria and also the impact of the use of several means of mosquito control by the populations.

▪ **Diarrhea diseases**

They come in second place at the rank of 15). These are pathologies transmitted through infested food or contaminated water.



Figure 21: Distribution of the number of cases of diarrhea diseases by age group and by district in the studied area from 2014 to 2017

DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

Figure 21 presents the number of cases of diarrheal diseases by district and in the two age groups. Analysis of the figure shows that the 11th, 1st and 9th districts are clearly denoted from the other districts by the high number of cases of diarrhea diseases. People aged of 15 and over are the most affected (1,245 cases against 1,001 for those under 15 in the 11th districts). The same trend is observed in the other boroughs.

The level of sanitation, the poor water storage and food preservation conditions already mentioned, can therefore be the cause of these pathologies. The WHO considers that the high prevalence of diarrhea diseases is the sign of major underlying problems of poor hygiene, the conservation of drinking water, the safety of the food consumed, but also poor preparation of these foods.

▪ anemia

It represents the third cause of consultation in health facilities in Cotonou. Figure 22 shows the number of anemia cases from 2014 to 2017 according to age groups and by district. Analysis of the figure shows that the populations of the 1st district are more affected than those of the other districts.

The 1st district recorded 2,234 cases of anemia out of a total of 4,832 new cases in the ten districts. It mainly affects children.

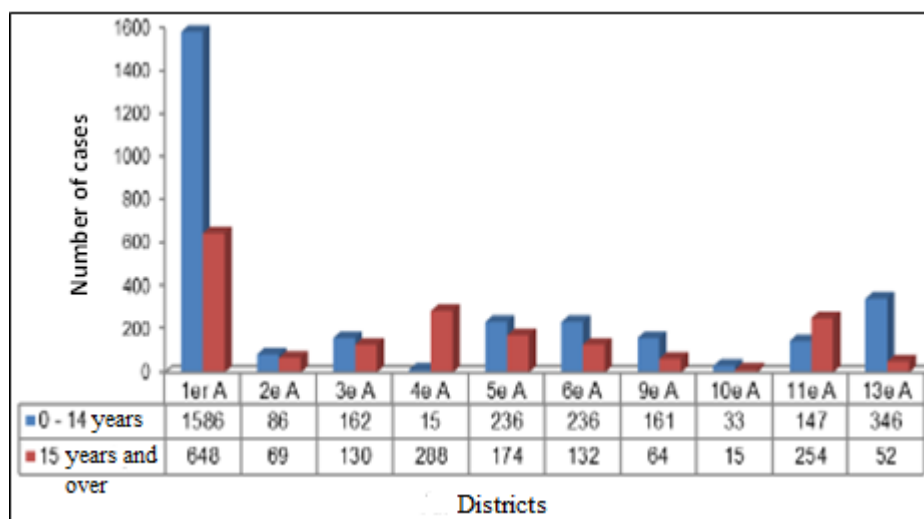


Figure 22: Distribution of the number of anemia cases by age group and by district in the study area from 2014 to 2017

DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

▪ CHOLERA

Cholera is one of the rare cases of waterborne disease recorded in consultations (Figure 23).

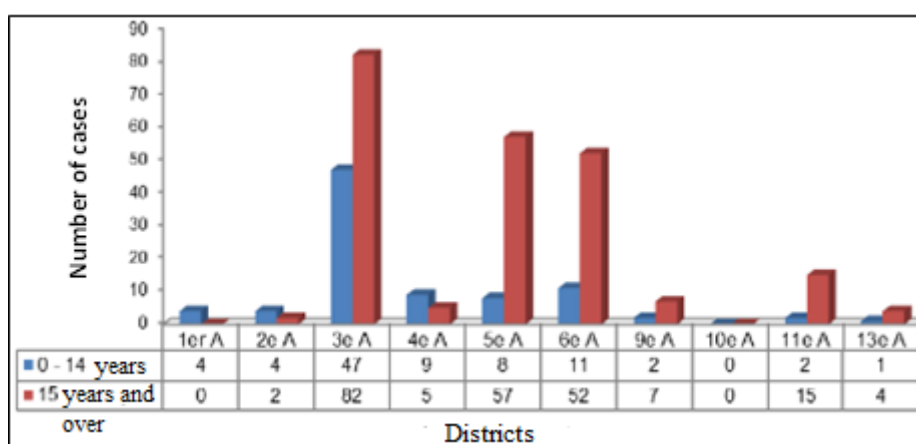


Figure 23: Distribution of the number of cholera cases by age group and by district in the study area from 2014 to 2017

DATA SOURCE: MINISTRY OF HEALTH - DHIS2, 2018

The analysis of Figure 23 shows that the 3rd, 5th and 6th districts recorded respectively namely 82, 52 and 57 cases of cholera on average during the last four years (2014 to 2017).

Indeed, these cases of cholera always arrive in the districts of the city of Cotonou, combining several risk factors: population density, promiscuity, deterioration of hygiene conditions, problems of sanitation and access to drinkable water. An eradication of this pathology requires actions of the central State through the respect, protection and satisfaction of people's right to safe drinking water and sanitation as a fundamental human right.

1.27.7. Transport infrastructures

Cotonou's road network is the densest in Benin. There are three categories of roads:

- National Interstate Roads (RNIE), often paved with bitumen;
- National roads, paved or tarred;
- Secondary roads that connect national or Inter-State roads to residential areas or economic activities, most often covered with laterite, cobblestone and bitumen.

Furthermore, in terms of opening up the city, Cotonou has a mixed road network made up of a few good quality paved roads and a majority of unpaved streets that are more or less passable depending on the quantity of rain. Despite its importance in the economic and social fabric, it is subject to many sanitation problems and its road network is still poor. The rail network includes two coastal lines, from Cotonou to Porto-Novo in the East, and from Cotonou to Ouidah in the West, and a South-North Cotonou – Parakou line, which also serves the Port of Cotonou. This network is currently being rehabilitated.

To seek treatment for these pathologies, household members in the project's area of influence resort to various types of care (Table 44).

Table 44: Distribution of households by healthcare system

Common Household Illnesses/Gender	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Self-medication	41	7.11	28	4.85	69	11.96
Pharmacy consultation	36	6.24	33	5.72	69	11.96
Traditional care	11	1.91	59	10.23	70	12.13
Medical clinic	18	3.12	27	4.68	45	7.80
Private doctor	0	0.00	2	0.35	2	0.35
Private hospitals	117	20.28	131	22.70	248	42.98
Public hospitals	165	28.60	201	34.84	366	63.43

Source: Results of fieldwork, November 2022

From the analysis of Table 44, 63.43% of households in the three (03) districts covered by the project use public hospitals for treatment, compared to 42.98% who go to private hospitals.

1.27.8. Access to energy and quality of distribution

En In 1968, Dahomey and Togo created a common structure for the production and transmission of electrical energy: the Electric Community of Benin (CEB). On March 1, 2004, following an institutional reform of the energy and water sectors, the government of Benin created the Benin Electric Power Company (SBEE), by way of decree No. 2004-098.

The CEB assumes the task of sole supplier of two electricity distribution companies: the Beninese Electric Energy Company (SBEE) in Benin and the Electric Energy Company of Togo (CEET) in

Togo. For its part, the SBEE, a commercial and industrial company whose mission is the purchase, production and distribution of electrical energy throughout the national territory.

The energy distributed in Benin comes from several sources, namely: hydroelectric energy supplied by the Electric Community of Benin (CEB). This energy produced from the Akossombo dams in Ghana, Taabo and Kossou in Ivory Coast and Nangbéto in Togo is imported; thermal energy from SBEE's thermal power stations and energy produced by CEET.

At the country level, according to the results of the RPGH 2013, the main source of domestic lighting remains oil (45.4%), followed by electricity supplied by the SBEE (34.6%) and other sources not detailed (16.1%). For cooking energy, wood (including palm) remains the main fuel (56.1%) used by households, followed by charcoal (28.1%), these two sources representing 94.8 % of consumption. Electricity is still poorly used (0.2%) as cooking energy, the highest rate of use of electricity as a means of cooking is recorded in Ouémé (0.4%).

In terms of electrical connection, households ⁶headed by women are relatively more numerous (37.2%) than those headed by men (34.1%). A non-negligible part of these households (12-13%) are indirectly connected to the network via “cobwebs”.

In the project area of influence, 92.03% of households have electricity. Households headed by women not covered by electricity are 4.51% against 3.47% for households headed by men (Figure 24).

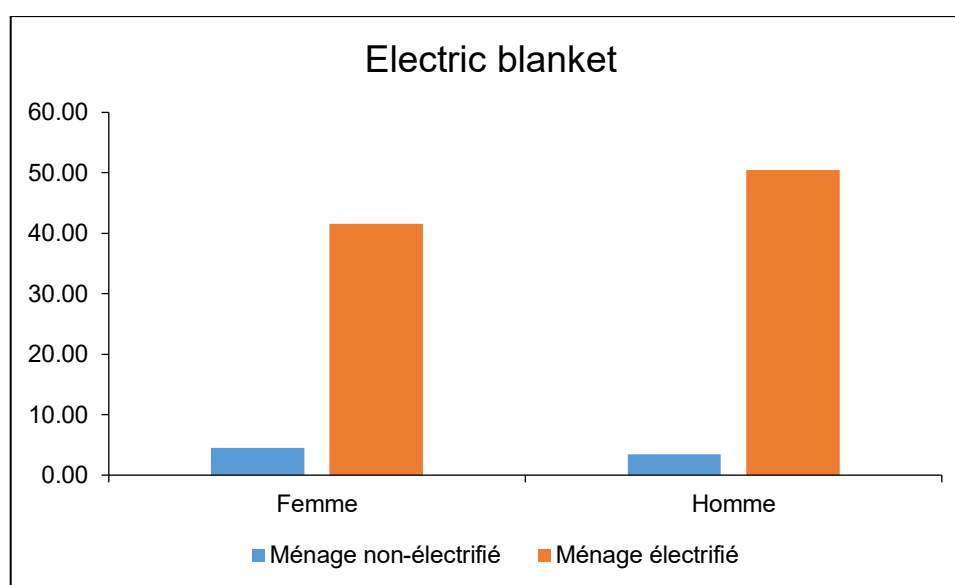


Figure 24 : Headcount of households connected to the electricity grid

Source: Results of fieldwork, November 2022

97.74% of households with electricity are connected to the electrical connection of the Beninese Electricity Company (SBEE).

⁶ INSAE, Survey on electricity consumption in Benin: household report, UCF, February 2016, p.37 and p.39

33.71% of households headed by women are connected to the SBEE and have a meter on their plot, compared to 39.74% of households headed by men.

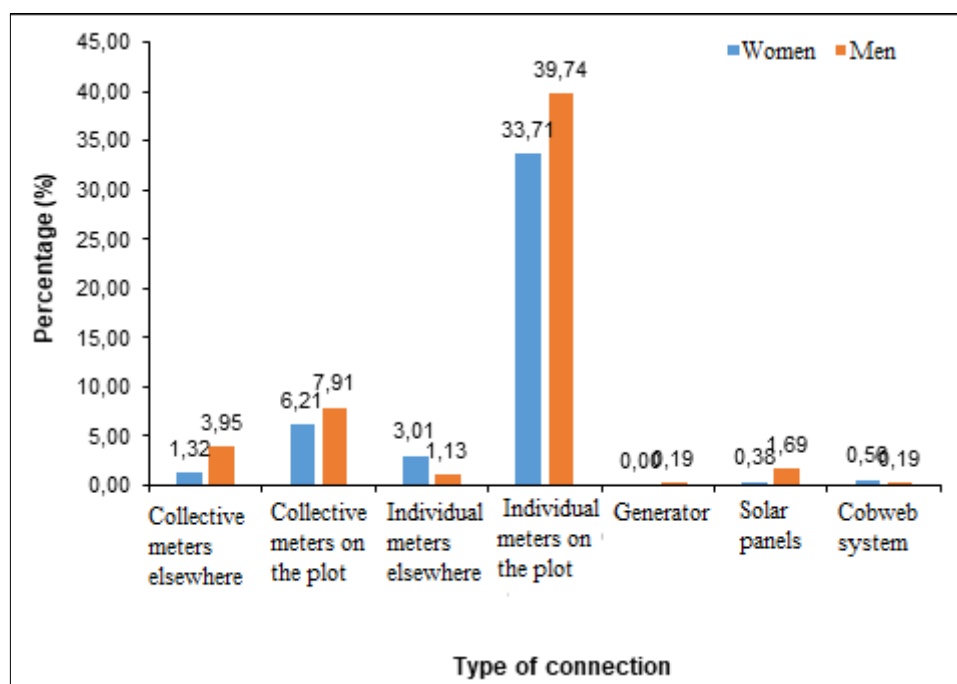


Figure 25: Type of household electrical connection

Source: Results of fieldwork, November 2022

1.27.9. Heritage and tourist sites

1.27.9.1. Historical and cultural heritage

The heritage today embodies the common heritage of a community, whether it be monuments, museums, and archives, regional parks, and archaeological sites, but also industrial wastelands, places of local memory or more universal, of all the reflections of near or distant history, this notion goes beyond the simple image of the “historical monument”.

Interest has largely focused in recent years on new areas, such as industrial, rural and ethnological heritage, which concern both traditions, lifestyles and popular arts. Recently, a particular effort has been made on the conceptualization and designation of a complementary dimension of heritage: Intangible heritage, which already includes acts of creation and representation (performing arts, rites, festive events, and visual arts), transmission processes (social practices, traditional knowledge and know-how, beliefs and practices relating to nature) as well as the non-sustainable content of creativity (Space 2020, 2013).

In Law No. 2021-09 of October 22, 2021 on the protection of the cultural heritage in the Republic of Benin. The heritage has been defined in Articles 2, 3 and 4. According to Article 2 the cultural heritage of the nation consists of property which, whether religious or secular, is designated by the State as being of importance for the nation, archeology, prehistory, history, literature, art, anthropology, anthology or science.

In Article 3 it is specified that sites and monuments, movable and immovable property from the colonial era such as school and health infrastructure, transport infrastructure, accommodation and residence of colonial administration officials, churches, mosques, shrines, temples and other places of worship, cultural, denominational or traditional buildings as well as places of pilgrimage, types of returning architecture, habitats of traditional architecture, isolated or grouped endangered and any other type of construction whose preservation and conservation is of historical, artistic, scientific or picturesque interest.

Article 4 defines the natural heritage of a cultural nature of the Nation as the natural monuments constituted by the formations or groups of physical and biological formations having an exceptional universal value from the aesthetic or scientific point of view - the geological and biological formations, delimited areas or zones constituting the habitat of endangered animal and plant species which are of exceptional value from the point of view of science or conservation – delimited natural sites or zones of universal value from the point of view of science, conservation or natural beauty”. Heritage is a richness inseparable from the territory where it was born or evolved. It is always linked to social and community organizations within a defined space. It is passed down from generation to generation. It is therefore understandable that the manifestations of heritage vary according to territories, populations, lifestyles and resources.

1.27.9.2. Cotonou's architectural and built heritage

Unlike Ouidah or Porto-Novo, the history of Cotonou is relatively recent. This probably explains the lack of visibility of the city's architectural heritage, and even when it is identified, it seems to be drowned in the flood of “modern constructions” resulting from the prodigious development of recent decades. The checkerboard plan, drawn by the colonial administrators, which shaped the city of Cotonou, like all the other French colonial cities, is based on the direction of the winds: South-West / North-East and responds to a hygienist concern: ventilation, circulation and sanitation.

The colonial city comprised two distinct zones: the European sector, administrative and commercial, and the African part welcoming all the socio-cultural groups of the country. The installation of new commercial immigrants allows the birth of districts like Gbégamey, Sikècodji, Jericho, Missèbo, Guinkomè, Scoa Gbéto, Zongo, Jonquet, Placodji, Ganhi which sheltered buildings and buildings of the colonial type. In these districts, there are still R+1 type buildings with a shop on the ground floor and accommodation on the first floor, a loggia with a balustrade in fretted bricks and a spiral staircase on the facade. This heritage has been invaded and destroyed by imposing and modern buildings, very geometric with rooms not lit by day. The only vestiges of this rich heritage that have survived are: the building of the Chamber of Commerce and Industry of Benin, the Warf, the lighthouse which has been modernized and some administrative buildings in Placodji.

1.27.9.3. *Green heritage and symbolic place*

The notion of green space is evoked today with particular reference to the Western model (the Luxembourg Gardens in Paris; Central Park in New York). Such spaces are not the legion in the city of Cotonou. It is in fact a notion completely foreign to African realities. The frequentation of these spaces is very appreciated by the population: place Québec, the Crafts Promotion Center, the bicentennial place, etc.

As for squares and wooded thoroughfares, they are beginning to appear in the city (Sica Toyota crossroads – Place de l'étoile rouge; cobbled street, Sobébra crossroads). However, these initiatives are still quite isolated.

1.27.9.4. *Tourist sites and landscape heritage*

Benin has 125 km of coastline. In general, the coastal zone has three geomorphological complexes which have a direct or indirect impact on the development of tourism in the area. Of these, the coastal fringe between the bar land plateaux and the sea is currently the portion where tourist facilities are found in Benin's coastal fringe. Benin has 125 km of coastline.

Along around 60 km of coastline from Ekpè to Ouidah, there are 54 unclassified accommodation facilities: hotels, hostels, motels, guesthouses and relay stations. There are 20 hotels in Cotonou alone, ranging from 2 to 4 stars. This coastal fringe is densely and anarchically occupied (without authorisation from the tourism administration) by tourist infrastructures that do not always comply with the relevant regulations (the 100 steps of the King and the 100 or 200 metres of the Customs Officer's Way).

The available land is becoming increasingly scarce, land speculation is on the rise year on year, and the increasing density of human occupation is leading to all kinds of environmental problems. Tourism is measured in terms of accommodation capacity and tourist transport. Cotonou's tourist attractions include coconut beaches with fine sand, rivers teeming with fish, folklore and the performing arts, and a healthy, pleasant climate...

IV. POLITICAL, LEGAL AND INSTITUTIONAL FRAMEWORK OF THE CES.

1.28. Project and ESIA policy framework

The National Conference of Living Forces in February 1990 enabled Benin to enter into a dynamic of social change for the well-being of the population. This has resulted in political and institutional stability of its democracy for more than two decades. It therefore encouraged the various Governments to lift the country out of poverty and put it in a phase of economic emergence, through accelerated growth and sustainable human development.

4.1.1. Government action program

Le 2016-2021 Government Action Program or "Benin Revealed" undertakes bold actions and reforms to "relaunch" the economic and social development of Benin in a sustainable manner. The PAG is also based on reflections on the 2030 Agenda for Sustainable Development (the Sustainable Development Goals) as well as the conclusions and recommendations of the Paris agreement on climate change (COP21).

Benin through the PAG 2016-2021 (PAG) has designed major projects to improve the living environment of the population, including urban development projects considered as a lever for the economic development of a country. It includes several priority projects that aim to significantly improve the urban environment and the mobility of people and goods in the economic capital. It is based on three pillars, namely:

- the consolidation of democracy, the rule of law and good governance;
- the structural transformation of the economy;
- the improvement of the living conditions of the populations

Indeed, the PAG has identified 45 flagship projects to boost growth and improve the living conditions of the populations. Many road infrastructure projects have been initiated and are in progress. This flyover construction project at Vêdoko therefore falls within the framework of the PAG with regard to the infrastructure sector.

4.1.2. National Development Plan 2018-2025

Le The National Development Plan (NDP) 2018-2025, adopted on 24 October 2018, is part of the drive to renew Benin's planning system by integrating the main challenges and issues of the SDGs and the African Union's Agenda 2063. It aims to set out the strategic benchmarks for development action for the eight (08) years leading up to 2025, the deadline set for achieving the vision and making it a reality. The NDP 2018-2025 is structured around the following themes:

- (i) Human capital and the well-being of the population;
- (ii) Economic productivity and competitiveness;
- (iii) Environment, climate change and territorial development.

– (iv) Governance

So, looking forward to a beacon Benin that is well governed, united and peaceful, with a prosperous and competitive economy, cultural influence and social well-being, the NDP's overall objective is: "to achieve sustained, inclusive and sustainable growth of at least 10% by 2025, based on the development of the agro-industry, services and tourism within a framework of more effective national and local governance, with a focus on the development of human capital and infrastructure". Achieving this objective by 2025 will require the following major changes:

- Healthy, skilled and competitive human capital;
- A competitive and diversified economy based on agro-industry and services
- A mastery of land management and urban development, and adaptation to climate change;
- Effective national and local governance strengthened by a sustained development administration.

The project to build a flyover at Vêdoko is part of the national development plan.

4.1.3. Transport Sector Strategy 2014 – 2018

In accordance with the requirements of the Sectoral Approach agreed with its Technical and Financial Partners, the Government of Benin manages the transport sector according to periodic strategies. It has therefore adopted a sectoral transport strategy for the period 2014 - 2018, which includes, among other things, actions identified for the various sub-sectors: road infrastructure, land transport, air transport, rail transport, maritime transport and river and lake transport. The vision for the development of the transport sector is to transform Benin from a transit country into a logistics and export services platform, by equipping it with an integrated system of high-performance transport infrastructures and services.

The transport sector strategy is currently being updated.

The Vêdoko flyover construction project is part of the implementation of the sectoral transport plan.

4.1.4. The Environmental Action Plan (EAP)

Aware of the importance of environmental management to sustainable development and poverty reduction, Benin's public authorities adopted an Environmental Action Plan (PAE) in January 1992, which forms the basis of the country's environmental policy. The PAE was revised in 2007 and is broken down into 7 programs:

- i. Education, training, awareness and communication;
- ii. The Land Research and Action program;
- iii. Biodiversity management program;
- iv. The Water Resources Management program;
- v. Improving the rural environment program;
- vi. Urban environment improvement program;
- vii. The Institutional and Legislative Framework and Environmental Information System program;

The Vêdoko flyover project is an integrated project that takes into account most of the programs in the environmental action plan.

4.1.5. Benin policies regarding climate change

The main climate change policy reference documents are as follows:

- Initial communication on climate change in 2001;
- Implementation Strategy Paper for the United Nations Framework Convention on Climate Change (UNFCCC) in 2003;
- National Adaptation Program of Action (NAPA) in 2008;
- Second National Communication on Climate Change in 2011;
- Intended Nationally Determined Contributions (INDCs) in the context of the 21st Conference of the Parties (COP 21), in 2015.

These documents show that Benin, as part of its policy to adapt to climate change, has opted for Integrated Water Resources Management (IWRM) through the implementation of the National Integrated Water Resources Management Plan (PANGIRE), the general objective of which is to "optimise the economic and social well-being of the population".

To mitigate the effects of climate change, it is planned to avoid traffic conflicts during construction work in order to reduce GHG emissions, and to reforest. The activities will be implemented in accordance with Benin's framework law on the environment.

4.1.6. Spatial agenda (SNAT 2013)

Benin's Spatial Agenda, also known as the National Spatial Planning Scheme (SNAT), is a framework document that reflects Benin's vision of the national territory and its development over a period of fifteen (15) years. It proposes broad national guidelines for balanced and sustainable planning and development. Its vision is defined as follows: "The Benin of 2025 is a well-governed and well-developed country, open to Africa and the world, respectful of the environment and with human capital and infrastructure at the service of a competitive and inclusive economy, in order to ensure the well-being and quality of life of people throughout the national territory.

Benin's vision also favours (i) improved and equitable access for the population to public facilities and services; (ii) development that respects the environment; and (iii) development based on a territorial approach.

The implementation of the project from the design phase through to the construction of the infrastructure and operation of the logistics park will not obstruct the spatial agenda.

4.1.7. Benin's National Hygiene and Sanitation Policy

With the advent of decentralisation, which has given local authorities responsibility for hygiene and sanitation issues since 2003, the National Hygiene and Sanitation Policy was drawn up and approved in 2013, in line with all the new provisions and with Benin's commitments under international agreements and conventions relating to hygiene and sanitation. This National Hygiene and Sanitation Policy reflects, among other things, the desire for greater coherence in the actions of the various players in the hygiene and sanitation sector.

Strategic guidelines adapted to the realities of Benin have been proposed in order to encourage the commitment and participation of all stakeholders in an irreversible move towards a healthy living environment for sustainable development. The scope of the PNHA covers the following areas:

- Solid household waste and plastic waste;
- Biomedical waste;
- Wastewater, excreta and faecal sludge;
- Rainwater;
- Industrial waste;
- Hygiene education and training.

The general objective of the NHSP is to improve the organisational and material conditions of sanitation in Benin. Its specific objectives are:

- Improve access (physical and conditions of access) to sanitation infrastructure and equipment,
- Improve people's hygiene and sanitation practices,
- Improve the organisation and institutional coordination of sanitation in Benin.

The construction work and the operation of the flyover will produce solid and liquid waste that could affect the clean environment. During the works, measures will therefore have to be taken to minimise any pollution that could harm the health and safety of the surrounding population. In implementing this project, the waste generated will have to be managed in a sound manner.

The project to build and operate the flyover is an integrated project that takes into account most of the programs in the environmental action plan..

4.2 Legal framework

The practice of environmental assessment has become a legal requirement in Benin, which applies to both private developers and the public sector. This study has therefore been carried out in accordance with current Beninese legislation, both in terms of environmental protection and that governing other areas related to the nature of the project (urban development, infrastructure, land tenure, safety, etc.), in order to respond strictly to the need for socio-economic development combined with environmental protection.

The legal framework has been defined in accordance with: i) international and national environmental requirements, and ii) requirements for urban development and infrastructure projects. The legislative and regulatory provisions that make up the legal framework are of three types:

- international texts including, on the one hand, the Agreements, Conventions and Treaties to which Benin has acceded and which have been ratified and signed by Benin and whose contents relate to the environment and the living conditions of the population;
- National texts, including the Constitution of the Republic of Benin, Beninese laws in force concerning the environment, and related to infrastructure projects and living conditions of the population, regulatory texts in force in Benin and related to the environment and living conditions (decrees, orders, circulars).
- Bank directives and standards.

1.28.1. International conventions relevant to the project

As part of the international community's efforts to protect the environment, Benin has ratified a number of international conventions that can have an impact on every component of the environment. The conventions ratified by Benin that are relevant to this project are shown in Table 45.

Table 45: Conventions ratified by Benin and relevant to the project

No	AGREEMENTS/AGREEMENTS	RATIFICATION/ Signature
1.	Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)	December 2004
2.	Kyoto Protocol	February 25 , 2002
3.	Convention on the worst forms of child labor	December 6, 2001
4.	Convention on Tripartite Consultation on International Labor Standards	June 11, 2001
5.	Minimum Age Convention (minimum age specified: 14 years)	June 11, 2001
6.	Convention on labor inspection	June 11, 2001
7.	Stockholm Convention on Persistent Organic Pollutants	May 23, 2001
8.	Convention on Wetlands and Waterfowl Habitat - Ramsar Convention	January 20, 2000
9.	Convention on Cooperation for the Protection and Development of the Marine Environment and Coastal Zones of Africa	January 16, 1997
10.	Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal	December 4, 1997
11.	Bamako Convention on the prohibition of the import of hazardous wastes into Africa and on the control of transboundary movements and management of hazardous wastes produced in Africa	July 17, 1997
12.	United Nations Framework Convention on Climate Change	June 30, 1994
13.	United Nations Framework Convention on Desertification	June 30, 1994
14.	Convention on Biological Diversity	June 30, 1994
15.	Convention on the Conservation of Migratory Species of Fauna	April 1, 1986
16.	Convention on Civil Liability for Oil Pollution Damage	January 30, 1986
17.	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	May 28, 1984

No	AGREEMENTS/AGREEMENTS	RATIFICATION/ Signature
18.	Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol on Substances that Deplete the Ozone Layer	July 1, 1993
19.	International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	November 1973 amended by the 1978 Protocol
20.	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	September 11, 1998
21.	Abidjan Convention for cooperation in the protection and enhancement of the marine and coastal environment in the region of West and Central Africa.	October 16, 1997
22.	Convention on Access to Information, Public Participation in Decision-making and Access to Environmental Justice	December 22, 1998 in Aarhus (Denmark)
23.	Convention on Environmental Impact Assessment in a Transboundary Context	September 03, 1991 in Espoo Finland
24.	Convention on the Protection of the World Cultural and Natural Heritage	September 14, 1982
25.	Phytosanitary Convention for Africa	April 1, 1974
26.	Convention on the right to organize and collective bargaining	May 16, 1968
27.	Agreement on equal pay	May 16, 1968
28.	Convention on the Abolition of Forced Labor	May 22, 1961
29.	Convention on Discrimination (Employment and Occupation)	May 22, 1961
30.	Forced Labor Convention	December 12, 1960
31.	Convention on Freedom of Association and Protection of Trade Union Rights	December 12, 1960
32.	Night Work (Women) Convention	December 12, 1960
33.	Minimum Age (Industry) Convention	December 12, 1960
34.	Convention on night work of children (industry)	December 12, 1960
35.	Convention on the right of association	December 12, 1960

Source: CREDD, 2018

1.28.2. Legislative and regulatory framework relating to the project

The implementation of this construction project of the Vêdoko flyover must be done according to the legislation which frames and regulates the protection of the environment in Benin. To this end, the promoter will ensure that all its activities comply with the texts (laws and regulations) in force in Benin. The main legislative elements that guarantee the protection of the environment and require its systematic consideration in human actions are:

✓ The Constitution of the Republic of Benin

Law No. 90-32 of December 11, 1990 on the Constitution of the Republic of Benin, amended by Law No. 2019-40 of November 7, 2019 enacts certain principles relating to the environment and the living conditions of citizens. These principles can be found in the following articles:

- Art.8: The State guarantees these citizens equal access to health, education, culture, information, vocational training and employment;

- Art.22: Everyone has the right to property. No one may be deprived of his property except for reasons of public utility and against just and prior compensation;
 - Art.27: Everyone has the right to a healthy, satisfying and sustainable environment and has the duty to defend it. The State sees to the protection of the environment;
 - Art.74: There is high treason when the President of the Republic has violated his oath, is recognized as the author, co-author or accomplice of serious and characterized violations of human rights, of the transfer of part of the national territory or an act detrimental to the maintenance of a healthy, satisfactory, sustainable and development-friendly environment;
- Art.98: Are of the field of the law the rules concerning: the protection of the environment and the conservation of the natural resources

The development and implementation of the project to build and operate the Vêdoko flyover must systematically comply with the provisions of Articles 22, 27 and 98 of the Constitution of Benin.

✓ **Framework Law No. 98-030 of February 12, 1999 on the Environment**

The main principles for taking the environment into account in policies, plans, programs and development activities are defined by law no. 98-030 of 12 February 1999 relating to the framework law on the environment. These principles are:

- Art 3-c "the protection and enhancement of the environment must be an integral part of the economic and social development plan and the strategy for its implementation. This principle requires that environmental issues be taken into account in the implementation of development activities";
- Art. 3-d: "the different social groups must intervene at all levels in the formulation and execution of national policy on the environment; this principle is essential in the fight against poverty and promotes the development of the country";
- Art 3-f. "any act prejudicial to the protection of the environment engages the direct or indirect responsibility of its author who must ensure compensation".

These three principles refer respectively to (i) the consideration of environmental concerns during the implementation of projects through environmental assessment tools, (ii) public participation during the environmental assessment process and (iii) the Polluter-Pays principle *"aimed at covering the costs/costs resulting from measures to prevent, reduce and combat pollution by the polluter"*. *This is a principle stemming from the ethics of responsibility, which consists in making each economic actor take into account the negative externalities of his activity.*

Taking account of the framework law on the environment, environmental concerns are one of the cornerstones of the Vêdoko flyover construction project.

✓ **Law No. 2016-06 of May 26, 2016 on the framework law on land use planning in the Republic of Benin**

Article 40 of Law No. 2016-06 on the framework law on land use planning in the Republic of Benin specifies that a Spatial Coherence Certificate (CCS) is instituted, issued by the authority in charge of spatial planning following a study of spatial coherence carried out for all projects of national and regional scope. The terms of preparation and delivery as well as the content of the Spatial Coherence Certificate are specified by the application texts.

✓ **Law No. 2017-15 amending and supplementing Law 2013-01 of August 14, 2013 on the Land and State Code**

Law 2017-15 amending and supplementing Law 2013-01 of August 14, 2013 on the Land and State Code (CFD) in the Republic of Benin was passed to update the domain and land sector in Benin. The land code defines the right to property as “a fundamental right which no one can be deprived of unless it is for public utility and against fair and prior compensation”. It also defines the methods of acquisition and transfer of real estate (Articles 8 and 9).

The code also defines the public domain and its legal regime. The State and the local authorities are the guarantors of their respective public domain and private domain and easements are established for the benefit of the public domain of the State and the local authorities (Title V of the code, articles 260 - 283). The real estate public domain of the State and local authorities is made up of all the land and real estate classified or delimited, assigned or not to the use of the public. It includes the natural public domain and the artificial public domain.

The artificial public domain includes developments and works of any kind carried out for the purpose of general interest or public utility as well as the land that supports them. They may be determined by law or be the subject of a classification or incorporation procedure. In general, all real estate not subject to ownership.

The Land Code also specifies that "The infringement of the right of ownership may consist of an expropriation for public utility, a limitation of the right of ownership for the purpose of urban or rural development and the enactment of servitude of public utility. If it fails, the State, the Communes or local authorities have the right to exercise the infringements of any property right...", it being up to these authorities to comply with the legal regime of expropriation (articles 210-258) or the provisions of articles 260-264 in the event of limitation of the right of ownership for the purpose of urban or rural development and in the enactment of easements of public utility (article 259).

✓ **Law No. 87-015 of September 21, 1987 on the Code of Public Hygiene**

The Law on the Public Hygiene Code aims to promote the physical, mental and social health of every citizen. It generally deals with hygiene and sanitation in the living environment. This law applies to this wholesale market and large slaughterhouse project. It also deals with the protection and hygiene

of foodstuffs in Chapter III (Articles 36 to 45). For better application of the provisions of the Public Hygiene Code, Decree No. 97-616 of December 18, 1997 implementing Law No. 87-015 of September 21, 1987 on the Public Hygiene Code, has been adopted.

It establishes the Sanitary Police whose agents are responsible, among other things, for researching and noting breaches of hygiene legislation.

- ✓ **Law 2017-39 of December 26, 2017 prohibiting the production, import, export, marketing, possession, distribution and use of non-biodegradable plastic bags in the Republic of Benin.**

The promoter must take into account the provisions of this law during his activities. Indeed, article 18 stipulates: "Any natural or legal person who produces, imports, exports, markets, distributes or holds in stock non-biodegradable sachets has a period of six (06) months to comply with the provisions of this law. In any case, no imports are authorized during the transitional period. After this period, any non-biodegradable bag in circulation in contravention of the provisions of this law is seized and destroyed in accordance with the required procedures. »

- ✓ **Law on the Labor Code (n°98-004 of January 27, 1998)** which legislates, among other things, on working conditions as well as occupational health and safety rules. Given that dozens of people will be employed on the site, the promoter will have to ensure the provisions of the Beninese labor code. In its article 182, it prescribes that in order to protect the life and health of the workers, the employer is bound to take all the useful measures which are adapted to the conditions of exploitation of the company.

The conditions of recruitment, work and poaching during the development or operation of the flyover must follow the conditions and procedure for recruitment, placement of labour and termination of employment contracts in the Republic of Benin.

- ✓ **Law No. 97-029 of 15 January 1999 on the organisation of communes**

According to this law, the municipality "gives its opinion whenever the creation of any project on its territory that is likely to affect the environment is envisaged. It shall take into consideration the protection of agricultural land, pastures, green spaces, the water table, surface water bodies and watercourses in the siting of various public or private projects" (Article 95).

Other laws define the ways in which municipalities exercise their powers in terms of environmental protection and management in Benin. **These include law no. 98-007 of 15 January 1999 on the financial regime for communes in the Republic of Benin.**

The laws are reinforced by implementing decrees and national standards to which all project promoters must ensure that their activities comply so as not to cause irreversible damage to the environment.

In view of all this, it is imperative that the municipality of Cotonou, as the beneficiary of this project, support the various players involved in the process of implementing this project in its territory.

✓ **Decree no. 2022 - 390 of 13 July 2022 on the organisation of environmental assessment procedures in Benin**

According to article 26 of the Decree, "an Environmental Impact Assessment is required for any project or activity likely to have an impact on the environment and falling into one of the following categories:

- Category A projects, which are subject to a detailed or in-depth environmental and social impact assessment;
- Category B projects, which are subject to a simplified environmental and social impact assessment;
- Category C projects subject to environmental and social requirements or environmental and social impact notices.

The Environmental Impact Assessment may be simplified or extended".

The Decree sets out the administrative procedure for the issue of the Environmental Compliance Certificate (ECC) by the Minister responsible for the environment. It applies to any policy, plan, program, and project or development activity likely to have positive and/or negative effects on the environment. It takes into account the Strategic Environmental Assessment (SEA), the Environmental and Social Management Framework (ESMF), the Environmental Impact Assessment (EIA), the Environmental Audit (EA), the Public Hearing (PH) and the Environmental Inspection (EI).

The flyover construction project is subject to an in-depth ESIA. The developer will have to take into account the requirements of decree no. 2022 - 390 of 13 July 2022 by obtaining an Environmental and Social Compliance Certificate for the project. During development activities, it must collaborate with the ABE's environmental inspectors in order to provide them with the best conditions for carrying out their inspection mission.

✓ **Decree no. 2001-110 of 4 April 2001 setting air quality standards**

In particular, the decree includes ambient air quality standards applicable throughout the country (art. 3), as well as standards for emissions from new or used light vehicles and Lorries (art. 7), new or used heavy-duty vehicles (art. 8), new or used motorbikes (art. 9) and establishments (stationary sources) (art. 17).

pollutants	Duration of the measurement period	Average value
Ozone (O ₃)	average over 8 hours	0.08ppm
Carbon monoxide (CO)	average over 1 hour average over 8 hours	40mg/ m ³ 10mg/ m ³
Sulfur dioxide (SO ₂)	average over 1 hour 24 hours average annual average	1300µg/ m ³ 200µg/ m ³ 80µg/ m ³
Suspended particles (< 10 microns)	24 hours average annual average	230µg/ m ³ 50µg/ m ³
Nitrogen dioxide (NO ₂)	24 hours average annual average	150µg/ m ³ 100 µg/m ³
Lead (Pb)	annual average	2µg/ m ³

This project is affected by these standards because, during the construction phase, sand, cement, rubble, etc. will be handled, generating significant quantities of dust. In addition, the various machines operating on the site will emit gases containing particles of varying degrees of toxicity.

Some specific activities will result in air pollution. The promoter will ensure compliance with the provisions of the decree when implementing the sub-project.

➤ **Decree No. 2022-301 of May 25, 2022 regulating noise**

This Decree governs in particular the permissible noise levels. The limit values authorized by the Decree vary according to the type of zone and according to the time of day. As specified in articles 14 and 18 of the decree, these noise levels must be measured outside the sources.

Table 46: Noise emission standards

Area type Time slot	Public space	private space
7 a.m. to 1 p.m.	70	60
1 p.m. to 3 p.m.	50	50
3 p.m. to 10 p.m.	70	60
10 p.m. to 7 a.m.	50	50

During construction work, companies must comply with noise emission standards.

➤ **Decree No. 2003-332 of August 27, 2003 on solid waste management**

The management of solid waste produced in the Republic of Benin, including industrial waste, is governed by this Decree. Its main aim is to prevent the production of waste and its harmfulness, promote the recovery of waste (recycling, reuse, etc.), organize the disposal of waste, limit, monitor and control the transfer of waste and ensure the rehabilitation of Site (s). Thus, any discharge of solid waste into a receiving environment must comply with the standards and safety measures prescribed in this decree.

The operation of the site and the flyover will generate waste. Steps must be taken to manage waste rationally.

➤ **Decree No. 2003-330 of August 27, 2003 on the management of used oils**

This decree lays down the methods of collection, transport, grouping, pre-treatment, elimination or recovery of used oils in application of the provisions of law n° 98-030 of February 12, 1999 relating to the framework law on the environment in the Republic of Benin. In articles 4 to 6, it defines all the characteristics that used oils may have that are likely to be used as an energy source by approved or unapproved structures. It also sets out the conditions for approval of structures for collecting, transporting and disposing of used oils.

At the carwash, waste management station, etc., steps must be taken to better manage used oil.

➤ **Decree No. 2001-094 of February 20, 2001 setting drinking water quality standards**

Drinking water quality standards are set by this Decree. They relate to the physical-chemical and bacteriological quality of drinking water and the protection of water resources. Chapter VI of Law No. 87-015 of September 21, 1987 on the public hygiene code includes certain provisions relating to drinking water. In particular, it is specified in article 70 that the drinking water standards are set by order of the Minister in charge of Public Health in accordance with the WHO. In addition, according to article 72, if non-potable water is used in a building, it must be clearly identified.

The construction company must ensure the quality of the drinking water made available to workers during work.

➤ **Decree No. 2001-109 of August 4, 2001 setting the quality standards for waste water.**

Quality standards for waste water (i.e. industrial and domestic waste water) in the Republic of Benin are set in this Decree. Waste water is defined therein in article 2 as “industrial waste water and domestic waste water”. Industrial wastewater is “water that carries solid, liquid or gaseous substances from an industrial process or establishment”.

According to Articles 4 to 9 of Decree No. 2001-109, a discharge permit must be obtained before any discharge of industrial wastewater into the receiving environment and the discharge must comply with the requirements contained in the permit which will be issued. This permit is issued by the Minister responsible for the environment. Article 3 of Decree No. 2001-109 specifies that the discharge of industrial wastewater into rainwater drainage channels is prohibited. The discharge standards to be met for industrial wastewater are also presented.

Articles 18 to 28 state that domestic wastewater can only be discharged into the natural environment after undergoing appropriate treatment. In addition, discharge into the receiving environment must comply with the requirements contained in the “discharge permit” (art. 4) requested from the Minister responsible for the environment. This Decree also defines the discharge criteria applicable to treated domestic wastewater.

Apart from Decree No. 2001-094, the wastewater treatment sub-sector in Benin is currently governed by Law No. 87-015 of September 21, 1987 on the public hygiene code, Law No. 2010-44 on water

management in the Republic of Benin as well as the Interministerial Order No. 069/MISAT/MEHU/MS/DC/DE/DATC/DHAB of 4 April 1995 regulating the activities of collection, evacuation, treatment and disposal of waste materials.

Table 47: Discharge standards for conventional and unconventional contaminants in industrial wastewater

Wastewater				
Physical-chemical parameters	Units (1)	(A) Permissible Daily Average Concentration		(B) Amount of contaminant released
		If rejected quantity < B	If rejected quantity > B	
Conventional parameters				
DBO	mg/l	100	30	30 kg/d
MES	mg/l	100	35	15 kg/d
DCO	mg/l	300	125	100 kg/d
Total oils and fats	mg/l	100	30	1 kg/d
pH	6 < pH<9 at all times			N / A
Temperature	C°	5°C higher than the temperature of the receiving waters		N / A
Unconventional parameters				
Phosphorus (2)	mg/l	100	10 ⁽²⁾	15 kg/d
Total nitrogen (NTK) (2)	mg/l	200	30 ⁽²⁾	50 kg/d

Mg/l: milligram (mg) of contaminant per liter (1) of liquid.

Table 48 : Toxic substances discharge standard

Settings	Allowed daily average concentration	Release quantity limit for exemption
Sulfides	2.5mg/l	50g/l
Fluorides	4mg/l	150g/l
Cyanides	1.0mg/l	1g/l
Metals:		
Arsenic	0.5mg/l	1g/l
Cadmium	1.0mg/l	5g/l
Hexavalent chromium	0.1mg/l	1g/l
Total chromium	2.5mg/l	5g/l
Copper	2.5mg/l	5g/l
Mercury	0.03mg/l	0.1g/l
Nickel	2.5mg/l	5g/l
Lead	1.0mg/l	5g/l
Zinc	5.0mg/l	20g/l
Phenolic compound	1.0mg/l	3g/l
Total hydrocarbons	10mg/l	100g/l
Monocyclic aromatic hydrocarbons (HAM)	0.5mg/l	1g/l
Total halogenated hydrocarbons	0.5mg/l	1g/l
Polycyclic aromatic hydrocarbons	0.5mg/l	1g/l
Polychlorinated biphenyls (PCBs)	0.15mg/l	0.5g/l
Other inorganic contaminants (each)	5.0mg/l	10g/l
Other organic contaminants (total)	0.5mg/l	1g/l

Given that the works phase will require several employees, they will generate a significant quantity of wastewater through various means of discharge. This water must be analysed and treated before any discharge or reuse.

1.28.3. Legal and regulatory provisions relating to resettlement

The concept of resettlement introduced into Beninese legislation through Decree No. 2017-332 of July 6, 2017 on the organization of environmental assessment procedures, reflects a limitation of the right of use and ownership of a heritage asset of a natural or legal person.

In Benin, the right to property is a constitutionally enshrined and protected right. Thus, the Constitution of December 11, 1990, provides in its article 22 that: "Property is sacred and inviolable. No one may be deprived of his property except for reasons of public utility and against just and prior compensation". Therefore, the dispossession of an individual's property can only take place after he has previously been the subject of an expropriation procedure and received compensation corresponding to the value of his property.

1.28.3.1. Land status in Benin

As mentioned above, the Constitution of Benin provides that the right to property is subject to the law. Hence Law 2017-15 amending and supplementing Law 2013-01 on the Land and State Code (CFD) which was adopted to organize land and domain in Benin. The new land code specifies in its article 4 that: **The land regime in force in the Republic of Benin is that of the confirmation of land rights.** It governs all rural, peri-urban and urban land and is based **on a contradictory procedure for confirming land rights which leads to the issuance of a land title.** This procedure for confirming land rights focuses on:

- In urban and peri-urban areas, on the confirmation of rights based on documents of presumption of land ownership or a final court decision;
- In rural areas, on the confirmation of rights based on documents of presumption of land ownership, the register of beneficiaries of the rural land plan or a final court decision.

The procedure for confirmation of land rights is based on a final court decision and on the documents of presumption of ownership, which are:

- Certificate of customary detention;
- Resettlement certificate;
- Tax notice for the last three years;
- Certificate of Registration;
- Administrative certificate;
- Rural land certificate.

The reminder of these legislative and regulatory provisions clarifies the status of a person affected by the project (owner, tenant, manager, employee, etc.). It also indicates the methods according to which one can bring the proof of the possession of a title of ownership.

1.28.3.2. Expropriation for public utility

Expropriation is the procedure allowing a legal person governed by public law (State, local authority) to oblige a private person, individual or company, to transfer their real estate rights to them in return

for "just and prior" compensation. In accordance with the provisions of Article 211 of the Land and State Property Code, "the expropriation of buildings, in whole or in part, or real property rights for public utility purposes takes place, in the absence of an amicable agreement, by court decision and against the payment of just and prior compensation".

It should be noted that the Land and State Property Code has enumerated the cases in which expropriation for public utility is used or pronounced. These are the construction of roads, railways, ports, airports, schools and universities, military works, town planning works, urban development, rural development, research or mining works, preservation of the environment, hygiene and public sanitation, development and distribution of water, energy, installation of public services, creation or maintenance of the public domain and all other works or investments of general, regional, national or local interest. The expropriation procedure is divided into two phases:

1. The administrative phase, characterized by the declaration of public utility, the determination of the parcels to be expropriated as well as the persons holding rights thereto (commodo and incommodo surveys) and the taking of the administrative act relating to the transferability of the parcels concerned.
2. The judicial phase, corresponding to the procedure for the transfer of ownership of the property and the compensation of the owners.

Schematically, the expropriation procedure is divided into five (05) main stages which are:

- (i) Declaration of public utility;
- (ii) Convenience and inconvenience survey;
- (iii) Taking of the act of transferability;
- (iv) Payment of compensation to expropriated persons;
- (v) Transfer of ownership.

Expropriation gives the right to so-called "just and prior" compensation; this allocated compensation must cover "all the direct, material and certain damage" caused by the expropriation. The expropriated party must be able, thanks to this indemnity, to find themselves in a material state similar to that which they knew before. He must be able to acquire a new property equivalent to the one he sold. However, only direct damage is compensated; are considered as indirect damages:

- ❖ borrowing, interest or tax charges;
- ❖ searches for new accommodation, security deposits, rent advances;
- ❖ loss of resale value;
- ❖ the costs generated during the resettlement and due by virtue of a legal obligation external to the expropriation;
- ❖ Damage caused by public works.

1.28.4. JICA Operational Policy

The key principle of JICA's policies on involuntary resettlement is summarized below.

- V. Forced resettlement and loss of people's income must be avoided by exploring all viable alternatives.
- VI. If despite everything no solution is found, measures guaranteeing the minimization of the impacts and the compensation of the damage must be proposed with the agreement of the populations who will be affected.
- VII. Populations affected by forced resettlement and loss of income must be compensated and supported in an adequate way to improve living conditions, income opportunities and the level of production or, at least, to restore the social situation. -economic prior to the project.
- VIII. Compensation will be granted, as far as possible, up to the full replacement cost.
- IX. Compensation and other types of assistance should be provided prior to displacement.
- X. For projects involving large-scale forced resettlement, resettlement plans should be prepared and disseminated to the public. It is desirable that the resettlement plan include the elements defined in the World Bank's Environmental and Social Management Framework Plan (OP 4.12, Annex A).
- XI. Beforehand, consultative meetings will be organized with the affected populations and their communities after having provided them with the necessary information in advance. During these consultations, the explanations must be provided according to a presentation and in a language understandable by the affected populations.
- XII. It is necessary to encourage the mobilization of the populations and communities who will be affected to ensure their effective participation in the planning, implementation and monitoring stage of the forced resettlement plans and the measures guaranteeing the maintenance of their means of subsistence.
- XIII. Appropriate complaints procedures must be put in place for affected populations and communities.

The above principles are supplemented by the World Bank's OP 4.12, since it is stated in the JICA guideline that "JICA confirms that the projects do not materially deviate from the safeguard policies of the World Bank". Other key principles based on the World Bank's OP 4.12 are as follows.

- XIV. Affected people should be identified and registered as soon as possible to establish their eligibility through an initial baseline survey (including a population census that serves as the cut-off date for eligibility, an inventory of assets and a socio-economic survey), preferably at the project identification stage, to prevent a later influx of people who abuse the benefits in question and want to get ahead of others.

- xI. Eligibility Criteria. Displaced persons can belong to one of the following three categories: holders of a formal right to land; those who have no formal right to land at the time the census begins, but who have land or other titles—provided such titles are recognized by law; and those who have neither formal rights nor titles likely to be recognized on the lands they occupy.
- xII. Land resettlement strategies should be preferred for displaced populations whose livelihoods are derived from the land.
- xIII. Provide support during the transition period (between displacement and livelihood restoration)
- xIV. Particular attention will be paid to the needs of vulnerable groups within displaced populations, including people living below the poverty line, landless workers, women and children, indigenous peoples and ethnic minorities.
- xV. For projects that involve land acquisition or involuntary resettlement of less than 200 people, an abbreviated resettlement plan should be prepared.

In addition to the above-mentioned basic principles of JICA's policy, emphasis is also placed on a detailed resettlement policy including all the above points, a project-specific resettlement plan, an institutional framework for implementation, a monitoring and evaluation, an implementation schedule, a detailed financial plan, etc.

Table 49: JICA Guidelines and Guidelines for Environmental and Social Considerations

Number	Main article	Minor item
1	Context of the project	• Commercial operator identification • Summary of activities to be carried out under the project • Presentation of environmental protection policy • Reason for project implementation and site selection Outline of the project • Summary of other related projects, if any • Reasons why the project is the best choice over other options
2	Overview of the project execution area environment	• Survey area selection • Description and analysis of related project components
3	Description and analysis of project alternatives	• Identify the project proposal • Describe the characteristics of the alternative • Comparative analysis of alternatives • Checking the validity of the selected plan
4	Impact analysis	• Identification of the cause of the impact, detailed explanation of the project • Specification of expected impact
5	Assess the significance of the project's impact	• Specify environmental impact mitigation or compensation measures • Evaluate the impact of the project
6	Technical management of accidental crisis, crisis management	• Identify the risks of technical accidents • Determination of security measures • Overview of emergency measures
7	Supervision planning and follow-up	• Environmental monitoring program submission

Source: Results of fieldwork, November 2022

1.28.5. World Bank Operational Policies

World Bank Operational Policy 4.12 provides certain principles applicable to involuntary resettlement. Operational policy OP 4.12 "Involuntary Resettlement of Populations" is followed when a project financed by the World Bank or by an institution that has chosen to apply its policy is likely to lead to involuntary resettlement, impacts on the means of existence, land acquisition or restrictions on access to natural resources.

1.28.5. Comparison of Environmental Guidelines for Road Construction in Benin and JICA Framework Objectives

Below are the environmental elements of the environmental guidelines for road construction in Benin and JICA comparison of the scope elements based on the guidelines).

Table 50: Comparison of environmental guidelines for road construction in Benin and JICA scoping objectives

Work	Environmental elements according to Benin environmental guidelines	JICA Scoping Target
Preparatory phase of the project		
Survey	Vegetation dwellers	10 Ecosystem 13 resettlements
Equipment Delivery	Vegetation, wildlife habitat resident Road safety	Ten Ecosystem 13 resettlements 29 accidents
Land acquisition	Land use by residents National and archaeological heritage	13 resettlements, 14 poor, 15 Ethnic minorities/indigenous peoples 17 land use 23 cultural heritages
Construction stage		
Deforestation	Air quality water Surplus land Wildlife habitat sediments Decor Human activities, economy, employment cultural heritage	1 Air pollution 2 Water pollution 3 Waste 4 Soil contamination Ten Ecosystem 12 topography/geology 24 decorations 16 Local economies of employment and livelihoods 23 cultural heritages
Equipment Delivery	Air quality water Ground noise Wildlife Habitat Resident Infrastructure road safety	1 Air pollution 2 Water pollution 4 Soil contamination 5 Noise/vibration 10 Ecosystem 13 resettlements, 14 poor, 15 Ethnic minorities/indigenous peoples 19 Existing social infrastructure 29. Accident

Work	Environmental elements according to Benin environmental guidelines	JICA Scoping Target
Excavation and other road construction	Air quality water Surplus land Wildlife habitat sediments Inhabitants, Economy, Employment Human Activities National and archaeological heritage Public health	1 Air pollution, 2 Water pollution, 3 Waste, 10 Ecosystem, 12 Topography/geology, 13 Resettlement, 16 Local economies of employment and livelihoods, 17 Land use and local resource use 23 cultural heritages, 27 HIV/AIDS infections such as
Remediation work	The water excess soil Flora, wildlife habitat Sediments Residents Human activity Stormwater drainage plan, water use National and archaeological heritage Public health	2 Water pollution 3 Waste 4 Soil contamination ten Ecosystem 12 Topography/geology 13 Resettlement 16 Local economies of employment and livelihoods 18 water uses 23 cultural heritages 27 HIV/AIDS infections such as
Use stage		
Transportation and distribution	Air quality noise Road safety	1 Air pollution 5 Noise/vibration 29 accidents
Presence of infrastructure	Stormwater Drainage Treatment Sediment Soil Air quality noise Public Health Residents	18 water drinks 12 topography/geology 1 Air pollution Five Noise/vibration 27 HIV/AIDS infections such as 17 Land use and local resource use
Maintenance phase		
Maintenance and repair	The water ground Air quality noise Public Health Residents Road safety	2 water pollution Four Soil contamination 1 Air pollution Five Noise/vibration 27 HIV/AIDS infections such as 17 Land use and local resource use 29 accidents
Mechanical treatment	Vegetation, wildlife habitat inhabitants	Ten Ecosystem 17 Land use and local resource use
chemical treatment	Water and groundwater air quality Vegetation, wildlife habitat remediation Residents	2 water pollution 1 Air pollution Ten Ecosystem 27 HIV/AIDS infections such as Seven Land use and local resource use
Transportation and distribution	ground water Air quality noise green Highway Safety Residents	Four Soil contamination 2 water pollution 1 Air pollution Five Noise/vibration Ten Ecosystem 29 accidents Seven Land use and local resource use

Source : Résultats des travaux de terrain, Novembre 2022

1.29. Institutional framework

As part of the implementation of the project, several actors will be involved: these are the competent administrations, local communities, NGOs and development associations, etc. The structures taken into account in the analysis below are part of the project's institutional framework.

1.29.1. Ministry for the Living Environment and Transport in charge of Sustainable Development (MCVT)

The MCVT is responsible for defining, monitoring the implementation and evaluating State policy on housing, urban development, urban mobility, cartography, geomatics, regional planning, sanitation, the environment, managing the effects of climate change, reforestation, protecting natural and forest resources, preserving ecosystems and protecting riverbanks and coastlines. It is also involved in defining and monitoring the State's land and land registry policy.

The MCVT is the competent authority responsible for issuing the Environmental Compliance Certificate (ECC).

✓ General Directorate for the Environment and Climate (DGEC)

Its mission is to draw up and ensure the implementation as well as the monitoring-evaluation of the State's policy and strategies on the environment, the management of the effects of climate change and the promotion of the green economy, in collaboration with the other structures concerned.

As part of this project, the DGEC must be involved in both the design and construction of the planned infrastructure to take account of climate change.

✓ The Direction Départementale du Cadre de Vie et des Transports en charge du Développement Durable du Littoral (DDCVT Litt)

As part of this project, the DDCVT Litt will carry out all the functions devolved to the Ministry of the Environment and Sustainable Development for the Littoral department. It will also be responsible for environmental policing.

The DDCVT will therefore monitor the implementation of the ESMP activities carried out for this sub-project and ensure that there is no degradation of environmental components (water, air, fauna, flora, human environment, etc.) linked to the activities of this sub-project.

✓ Benin Environment Agency (ABE)

This is a public body set up under article 4 of law 98-030, the framework law on the environment. It is responsible for implementing the national environmental policy adopted by the government as part of its development plan. It works in collaboration with other sectoral ministries, local authorities, non-governmental bodies, civil society and the private sector. It manages all environmental assessment

procedures and is legally responsible for validating Environmental Impact Assessments (EIA) and other types of environmental assessment in Benin.

✓ **General Directorate of Water, Forests and Hunting (DGEFC)**

The DGEFC is a structure of the public security forces and assimilated whose mission is to develop and ensure the implementation as well as the monitoring and evaluation of the policy and strategies of the State in terms of water management, forests and hunting. As such, it is responsible, among other things, for:

- to elaborate the policies and strategies of the State as well as the legislative and regulatory texts in the field of reforestation and sustainable management of natural resources (forestry, wildlife and others) and to ensure the monitoring and evaluation of their implementation;
- Ensure the role of the National Focal Point for multilateral agreements on natural resources and forestry in its areas of competence;
- ensure the constitution and preservation of the integrity of the State's forestry domain;
- Etc.

As part of the implementation of this project, the DGEFC, through the Atlantic Forestry Inspectorate, will issue authorisation for the felling of trees identified before the right-of-way for the work is vacated, and will assist the promoter in drawing up and implementing the reforestation plan.

✓ **The Land and Air Transport Department (DTTA)**

The Land and Air Transport Department is responsible for:

- Defining, developing, monitoring and evaluating state policies and strategies in the field of transport infrastructure, road and air transport, as well as monitoring their implementation.

As part of the implementation of this project, the DTTA will be supported by the National Land Transport Agency (ANTT) and the Departmental Directorate of Living Environment and Transport in charge of Sustainable Development (DDCVTDD).

✓ **Society for Road Infrastructure and Land Management (SIRAT SA)**

The SIRAT aims, in the Republic of Benin:

- to manage, develop and maintain all road infrastructures except rural tracks, non-toll roads and all other road infrastructures expressly excluded from its management
- to carry out or participate in the mobilization of appropriate financing for the realization of road infrastructures falling within the scope of its corporate purpose;
- to operate or arrange for the operation of tolls and related services and to organize the securing of resources from the operation of the road network;

The direct or indirect participation of SIRAT in all industrial, commercial or financial activities or operations, movable or immovable, in any form whatsoever, as long as these activities or operations

can be directly or indirectly related to the company's purpose or to any similar, related or complementary purposes; and more generally, all economic operations that fall within the scope of the company's purpose or that are likely to promote its development.

SIRAT is the project promoter and is responsible for all aspects and dimensions of the project to ensure that its objectives are achieved.

✓ **The National Road Safety Center (CNSR)**

The CNSR is the national body in charge of road safety issues in Benin. Its main mission is “the study, research and implementation of all the means intended to increase the safety of road users, in particular through measures to prevent and combat road accidents”. In the case of this project, the CNSR will be involved in all actions aimed at reducing the risk of traffic accidents during all phases of the implementation of the said project; in this case, raising awareness of road safety rules in order to reduce the risk of accidents.

In the case of this sub-project, the CNSR will be responsible for raising awareness of road safety rules among drivers and local residents in order to reduce the risk of accidents during all phases of implementation of the sub-project.

1.29.2. Ministry of Economy and Finance (MEF)

The mission of the Ministry of Economy and Finance (MEF) is to design, implement, monitor and evaluate the general policy of the State in economic, financial and monetary matters, and in matters of constitution and conservation of the land and property assets of the State. On behalf of the State, it develops strategies for mobilizing and securing resources, ensures the quality of expenditure and the proper management of assets as well as financial, national and international commitments, in accordance with international conventions, laws and regulations in force in the Republic of Benin.

National Domain and Land Agency (ANDF)

The National Domain and Land Agency (ANDF) was created to ensure equitable access to land, securing investments, effective management of land disputes, in order to contribute to poverty reduction, the consolidation of social peace and the achievement of integrated and sustainable development.

The National Land and Land Agency (ANDF) is a technical and scientific public institution which has a mission to secure and coordinate land and land management at the national level. It is placed under the supervision of the Ministry of Economy and Finance. According to decree 2015-010 of January 29, 2015 on the attributions, organization and functioning of the ANDF, it is responsible for implementing policies, strategies and programs of the Beninese State in land and state matters.

1.29.3. Ministry of health

The mission of the Ministry of Health is to design, implement and monitor and evaluate the State's health policy, in accordance with the principles and values of governance, the laws and regulations in force in Benin and the Government's development visions and policies. To this end, the Ministry is responsible for promoting health development in Benin and executing the Government's decisions and instructions in the health sector. It works with the Ministry of the Living Environment and Sustainable Development to promote the basic sanitation development strategy.

As part of this project, the responsibilities of this institution will be carried out primarily through the Departmental Health Directorate of the Atlantic (DDS-A). Through its network of health centres in Abomey-Calavi, it will assist LTA site personnel, LTA users and communities in the management of cases of illness, accidents and victims of GBV/VCT, if need be.

- The **Departmental Directorate of Health (DDS)** of the Littoral is concerned by the realization of this project. It is responsible for monitoring activities related to public health in all phases of the project.

The DDS-A will monitor certain activities (related to human health) involved in implementing the ESMP for this sub-project.

- **The National Directorate of Public Health (DNSP)**

In accordance with the provisions of Decree No. 426 of July 20, 2016, on the attribution, organization and functioning of the Ministry of Health, the DNSP is responsible for:

- develop policies, standards and regulations in the various areas of public health and in accordance with the national health development program;
- develop health programs and projects in accordance with the national health development program;
- promote public health and basic hygiene and sanitation services;
- coordinate, monitor and evaluate ongoing programs and projects;
- developing public-private partnership mechanisms in the health sector;
- coordinate, monitor and evaluate the interventions of the denominational and liberal private sectors;
- Carry out epidemiological and sanitary surveillance.

As part of the project, the DNSP will carry out periodic epidemiological and health surveillance at the Logistics Port.

4.2.1. Ministry of Labour and Civil Service (MTFP)

The Ministry of Labour and the Civil Service (MTFP) is responsible for defining, implementing and monitoring-evaluating State policy on labour, the civil service and administrative and institutional reform, in accordance with the laws and regulations in force in the Republic of Benin and the Government's development vision and policies.

As part of this sub-project, the MTFP will ensure compliance with labour standards on the project site.

- **Atlantic/Littoral Departmental Labour and Civil Service Directorate (DDTFP)**

The Departmental Directorate of Labour and the Civil Service (DDTFP) is responsible, within its territorial jurisdiction, for implementing the tasks assigned to the Ministry in terms of labour administration, the civil service and administrative and institutional reform. It is the DDTFP of the Atlantic region that is involved in this project, located in the Commune of Abomey-Calavi. It will be involved in monitoring activities relating to safety at work in the implementation of the project.

It will be involved in monitoring activities relating to safety at work in the implementation of the sub-project.

- **National Social Security Fund (CNSS)**

It is a public social institution under the supervision of the MTFP and is responsible for managing the general social security scheme for employees in the structured sector subject to the provisions of the Labour Code. It is responsible for the pension, occupational risks, family and maternity branches. Through its occupational risks branch, the CNSS works to prevent and compensate for accidents at work and occupational illnesses. This compensation takes the form of benefits in kind and in cash.

During both the construction and operating phases, companies, developers and delegated project managers must cooperate with CNSS.

4.2.1. Ministry of Small and Medium-sized Enterprises and Employment Promotion

The Ministry of Small and Medium-sized Enterprises and Employment Promotion is responsible for defining, monitoring the implementation and evaluating the State's general policy on promoting small and medium-sized enterprises and employment, in accordance with international conventions, laws, regulations and other legal instruments in force in the Republic of Benin.

- **National Employment Agency (ANPE)**

The ANPE is responsible for implementing national employment policy in collaboration with the relevant national and international bodies. It also promotes the professional integration of young unemployed graduates and provides support for initiatives with the potential to create jobs for young people. It uses voluntary work to promote national and local development.

As part of this project, the ANPE will help learners and young graduates to find jobs or internships. It will also help to bring together the skills of companies looking for skilled labour.

1.29.4. Littoral prefecture

In accordance with the provisions of Law No. 97 028 of January 15, 1999 on the organization of territorial administration in the Republic of Benin, the prefect is the depositary of State authority in

the department. In this capacity, he is the sole representative of the government and of each of the ministers taken individually. He communicates directly with each of the ministers and sends copies of all correspondence to the minister responsible for territorial administration. Similarly, the minister in charge of territorial administration is the executor of all correspondence sent by a minister to the prefect. The departmental consultation and coordination council must be consulted on the economic, social and cultural development programs of the municipalities and on the consistency of these with the national programs. Thus, the departmental consultation and coordination council deliberates on:

- the land use plan and development projects of the department;
- environmental protection measures;
- the policy for the creation and use of collective facilities of departmental interest such as general, technical and vocational secondary education establishments; departmental hospitals and solidarity with vulnerable populations ; departmental road and communication infrastructure; tourism ; energy; classified forests and hunting areas; the promotion of regional culture ; twinning projects between departments or cooperation with national or foreign institutions; proposals for merger, split and modification of the boundaries of the departmental territory or those of the municipalities that make it up; arbitration of inter-municipal disputes.

The Prefect of the Littoral will play a leading role in the implementation of the Project, particularly with regard to issues relating to the management of complaints from PAPs and the establishment of the Technical Resettlement Committee.

The Littoral Prefect will play a leading role in the implementation of the Project, particularly with regard to issues relating to the management of complaints from PAPs and the setting up of the Technical Resettlement Committee.

1.29.5. Municipality of Cotonou

It is articles 84 and 86 of law 97-029 of January 15, 1999 on the organization of Communes in the Republic of Benin which make the Town Halls responsible for the establishment and application of planning documents for the development of the communal territory and of land use. The municipality exercises its powers in accordance with the sectoral strategies, the national regulations and standards in force (article 108). Individual road alignments, building permits and other road permits are issued by the Mayor.

The municipality has its own powers as a decentralized territorial community. It also exercises, under the control of the supervisory authority, other attributions which fall within the competences of the State. *It contributes with the State and the other communities to the administration and to **the planning of the territory**, to the economic, social, health, cultural and scientific development as well as to the protection of the environment and the improvement of the framework of life* (Article 82).

The municipality draws up and adopts its development plan. It sees to its execution in **harmony with the national guidelines** with a view to ensuring the best living conditions for the entire population. In this context, it draws up the necessary planning documents:

- the town's development master plan;
- the economic and social development plan;
- urban plans in agglomerated areas;
- the rules relating to the use and allocation of land;
- Detailed plans for urban development and subdivisions.

It issues residence permits and building permits and ensures the permanent control of the conformity of achievements and constructions with the regulations in force (Article 84).

The municipality gives its opinion each time the creation on its territory of any project likely to harm the environment is envisaged. The Mayor of the Commune of Cotonou, as the beneficiary of the project to develop a flyover in Cotonou, has a double responsibility. Specifically, before the start of construction works, he has the duty to manage all issues related to the involuntary displacement of populations. It is in this perspective that it will set up at the level of each district impacted by the project, a Local Resettlement Committee. Moreover, after the construction of the flyover, he is in charge of the maintenance of the structure.

The local authority is a key stakeholder in the implementation of the project. It provides the host sites and helps to mobilise the local communities. It issues planning permission and building permits and ensures ongoing monitoring of the compliance of developments and buildings with the regulations in force (Article 84). It gives its opinion whenever the creation of any project likely to harm the environment is envisaged on its territory.

1.29.6. Sanitation and waste management company of Grand-Nokoué (SGDS-GN)

The SGDS-GN is a company set up by the Beninese government to carry out the following activities on its own behalf or on behalf of third parties:

- To collect, sort and recycle waste, or have waste collected, sorted and recycled;
- To process and recover waste, in particular the deconditioning of household waste, the shredding of bulky waste, the elimination and recovery of waste and all related operations;
- Transporting and trans-shipping waste for disposal in incinerators, off-site incinerators and technical and sanitary landfill sites;
- Assisting local authorities in implementing the best waste management and environmental protection solutions;
- Carrying out, in conjunction with local authorities, all operations relating to public health, in particular maintenance work on urban roads, sweeping and paving public roads and squares,

and cleaning gutters;

- To promote compliance with environmental protection rules in the fields of recycling, recovery and clean technologies;
- To participate, directly or indirectly, in any industrial, commercial or financial activities or transactions involving movable or immovable property, in any form whatsoever, provided that such activities or transactions are directly or indirectly related to the corporate purpose or to any similar, related or complementary purposes.

As the SGDS is now a key player in waste management in the Greater Nokoué area, which includes the municipality of Cotonou, it will be involved in measures relating to waste management within the logistics platform. It is therefore involved in the implementation of the ESMP measures.

4.2.1. National Fire Brigade Group

The GFBP will be involved in activities relating to the safety of goods and people in connection with the project from the construction phase and throughout the operational phase (emergency plan and training on fire-fighting measures concerning the use of fire-fighting equipment, etc).

1.29.7. NGOs and development associations

Public consultation has also been extended to NGOs and development associations whose field of interest is environmental and social and whose activities cover the territory on which the project subject to environmental assessment is carried out. The development associations took an active part in the public consultations and have been involved since the studies were carried out. Their involvement and intervention will extend to the implementation phase.

Their involvement is required in the management of sensitive complaints and the fight against gender-based violence (GBV).

1.29.8. Company in charge of the work

Environmental, Health and Safety (EHS) clauses will be included in the tender documents. The Tender Documents will require each tenderer to provide an EHS methodology which describes how it intends to meet the requirements and objectives specified in the EHS clauses of the sub-project.

The company's task will be to carry out the construction work on the flyover for which it has been awarded in accordance with the rules of the trade, while complying with the environmental, social, safety and health specifications contained in the contract, the stated objective being the best possible environmental and social management of the site.

1.29.9. Control mission

The inspection team will check all the documentation required before, during and after construction of the flyover.

In addition, it will have to ensure that the company complies with the environmental and social clauses and that all the environmental and social safeguards that will be drawn up as part of the flyover construction work are properly implemented.

V. ANALYSIS OF ALTERNATIVES (INCLUDING THE ZERO OPTION)

5.1. Project site description

The Toyota Junction is a roundabout intersection with the inside diameter of 36 m, the outside diameter of 61 m and the lane width of 12.5 m. A traffic light was installed there according to the growing traffic. As for the roads linked to the Toyota crossroads, the lane widths are disparate: 39.6 m for the western road, 35.5 m for the eastern road, and 20 m for the northern road and 35.2 m for the southern route according to the preliminary study carried out (see Figure 25).

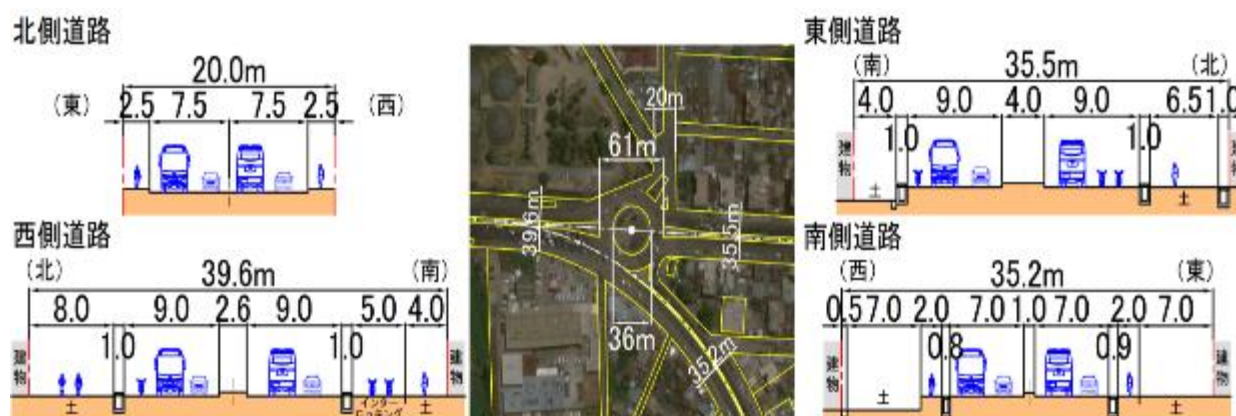


Figure 26: Situation of the roads linked to the Toyota crossroads

Source: JICA, 2019

In addition, Presidential Decree No. 2001-092 defines the widths of road rights-of-way (ROW) in Benin: 40 m for international roads, 30 m for national roads, 20 m for departmental roads and 15 m for municipal roads. The visual count of traffic carried out found a malfunction as an intersection. Indeed, the signaling system does not manage the concentrated traffic: vehicles and two-wheelers remain stationary at the roundabout.

The introduction of traffic from other directions aggravated the congestion. This is present most of the day, from 7 a.m. to 8 p.m., and the police officers' direct traffic by gestures during the morning rush hour and at the end of the day. Morning traffic is concentrated mainly in west-to-east and west-to-south directions. Traffic from the east and south to west is added to this at the end of the day. The congestion begins at the Toyota intersection and extends east and west to the levels of the neighboring intersections, that is, the stadium intersection and the Place de l'Etoile rouge.

[Overview of the result of the 2015 traffic study by Louis Berger]

- Traffic is primarily "east to west" and "south to west".
- Traffic is split between 17% cars, 1% heavy trucks and 82% motorcycles.

In addition, the Godomey intersection, located west of the Toyota intersection, was congested before the installation of a grade-separated intersection which relieved congestion, by Chinese assistance. This study should take these developments into consideration for the formulation of the project. In addition, the results of the traffic studies carried out by EIFFAGE and Louis Berger, analyzed by our

consortium, coupled with the observation of the current traffic situation according to the directions, allow us to obtain an estimate of the evolution of traffic by 2035 where the traffic would be about three times higher than today. By supplementing this estimate with the characteristics of the traffic in each direction and the level of traffic saturation on each lane, it turns out that the main ones present a high risk of congestion.

The current Toyota Junction congestion results from the malfunction of the traffic light caused by the following facts: four-wheeled vehicles and coexisting two-wheeled vehicles remain stationary at the roundabout where traffic is concentrated, and the introduction of traffic from other directions causes congestion there. The Godomey junction, located west of the Toyota junction, has lanes reserved for two-wheelers and reserved for four-wheelers; the main traffic flow of the four wheels passes through the grade-separated intersection in the form of a bridge, while the two wheels pass through the at-grade intersection, which ensures the smooth flow of traffic.

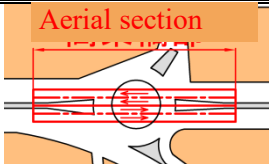
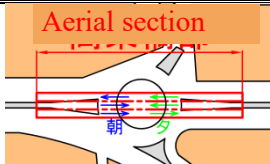
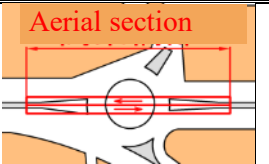
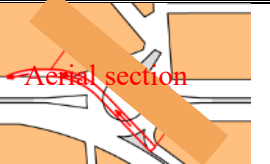
5.2. Analysis of project variants

5.2.1. Principles of air traffic system study

Three systems informed the decision of the most favorable variant. These systems take into consideration "the effect of reducing traffic congestion, while taking into account the reality of local transport", "the ease of commissioning the system, including the acquisition of equipment and the costs involved", "ease of maintenance and operation activities", "power source" and "transmission network".

Technically and economically viable means of carrying out the project have been studied. This analysis considered options as well as the general environmental effects associated with these options, and justified the option selected. Particular attention has been paid to the following sets of options:

Option Group 1: Example plans for bridge and number of lanes

Basic options A, B, C and D [Aerial section]				
Schematic plan				
	Plan 1.A: 4-lane road "East ↔ West"	Map 1.B: 3-lane road "East ↔ West"	Plan 1.C: road to 2 lanes "East ↔ West"	Plan 1.D: 2-lane road "South → West"
Characteristic	Always 2 lanes of traffic for each direction	The separating strip moved in the morning and in the evening, in order to leave 2 lanes on the busy side.	1 lane for each direction	1 lane road
Theoretical traffic capacity	1500 vehicles / hour / lane	1500 vehicles / hour / lane (when using 2 lanes)	1250 vehicles / hour / lane	1250 vehicles / hour / lane

Option Set 2: Examples of at-grade intersection improvement plans

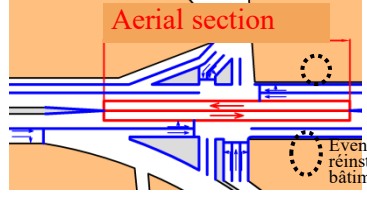
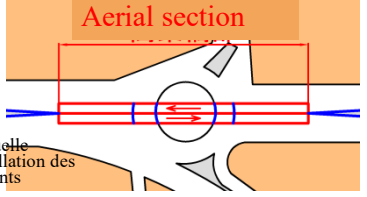
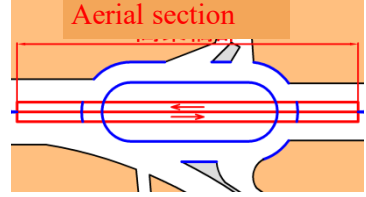
Basic Improvement Policy - Plan II [At-grade Junction (A draft, in case Plan C above shows promise)]			
Schematic plan			
	Plan 2A: Intersection with traffic lights	Map 2B: Roundabout	Plan 2C: Deformed roundabout
Particularity	⊗ : Large traffic capacity	△ : Limited traffic capacity	○ : Larger capacity than plan 2B
Impact on the environment	△ : A certain number of buildings to be reinstalled	○ : Few buildings to relocate	△ : A number of buildings to be relocated
Effects on the structure of the bridge	○ : Since the length of the bridge remains almost the same as the plan b, which of the span at the level of the passage is greater.	○ : Span length at the level of the lesser passage (this plane allowing to put pillars in the crossroads)	△ : Span length at the lesser passage (this plan for placing pillars in the crossroads), on the other hand, the bridge will be longer.
Economic efficiency	○ : Construction costs and compensatory allowances are greater than plan b, but its traffic capacity is the highest.	○ : Lower construction costs and compensatory allowances, but a small traffic capacity.	△ : Construction costs and compensatory allowances are high.

Figure 27 : Procedures for developing the intersection plan

Source: JICA, 2019

Regarding to option groups 1, since the aerial sections are reserved for vehicles, it turns out that the traffic capacity of the two-lane road (one lane for each direction) will be exceeded, because the volume of vehicle traffic circulating "from west to east", estimated according to the available results of traffic analysis, will reach in 2035 a figure of 1873 light and heavy vehicles all combined. As the definition of the number of lanes to be built has a direct impact on the whole project and in terms of implementation and costs, as part of this analysis, a counter-survey of the volume of future road traffic will be carried out., taking into account the cost-effectiveness ratio, as well as other projects that may affect the plans at hand.

5.2.2. Design principles for the traffic light control system

As part of the development of a plan for the realization of an at-grade intersection, when the introduction of traffic lights in the intersection proves effective. Since there is an old network of traffic lights, the electrical source must be available. However, a study for the introduction of a new power supply system will be conducted to ensure the stability of the power grid.

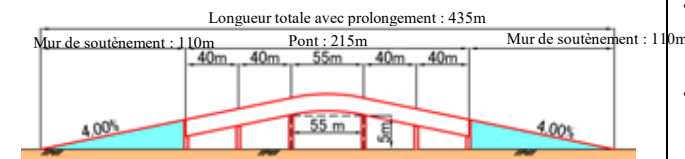
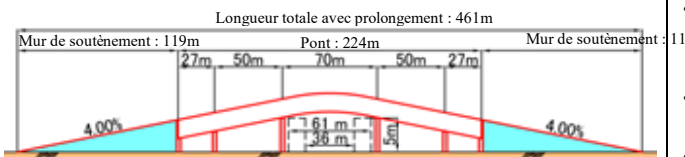
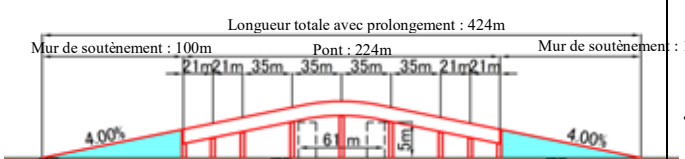
For both maintenance and personnel operations, it is expected that an expert(s) will be seconded during the detailed design phase to assist and provide technical guidance (during the "soft component" phase). Since each traffic light is more than one kilometer away, the effectiveness of zonal traffic control would be limited, however research will be carried out to optimize the duration of the red light, as well as to find out whether placing the detectors at equal distances between two lights contributes to improving the plug length.

To optimize the option of air traffic, the concept of the longitudinal slope of 4 to 6% in accordance with the standard of the reference work of design "ICTAVRU" in force in French-speaking Africa was taken into consideration of the gauge of the section free at the intersection with traffic lights (assuming it is 55m (wide) x 5m (high)): * the width having been determined taking into account the

pedestrian crossings and the distance of visibility at the intersection (details below -after); the size of the free section at the roundabout (for example 61m (wide) x 5m (high)), and a height of 3m for the superstructure beam.

The longitudinal slope significantly influencing the drivability, the characteristics of the vehicles which use the highway, the ease of access to the access road and the economic efficiency. Taking these clarifications into account, the following variants (25) in relation to the bridge plan (project) for different types of intersection when the slope is 4%, as well as their characteristics.

Table 51: Bridge plan (project) and its characteristics

Junction type	Profile view	Features
Crossroads with traffic lights [Range: 55m]		- The greatest range will be around 55m for crossing the traffic light intersection. - The bridge will be made of prestressed concrete box girder or steel box girder. - The bridge is very expensive.
roundabout (without pillar in the center) [Range: 70m]		- The greatest range will be around 70m to cross the roundabout. - The bridge will be made of steel box girder. - This solution is more expensive than the above solution.
roundabout (with pillar in the center) [Range: 35m]		- The bridge crossing the roundabout with a pillar in the center of the crossroads, the span will be approximately 35m. - The bridge will be a prestressed concrete T-beam. - This solution may be the cheapest (depending on the design of the foundations).

Source: JICA, 2019

It was also important to ensure good visibility for cars arriving at the intersection via the service road

Figure 27 shows profiles of the abutment that will be examined to select the best solution.

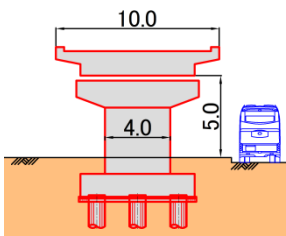
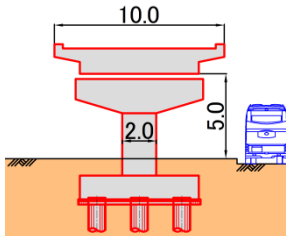
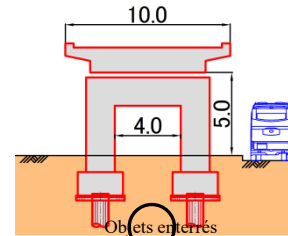
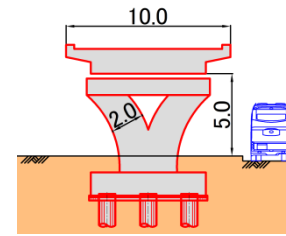
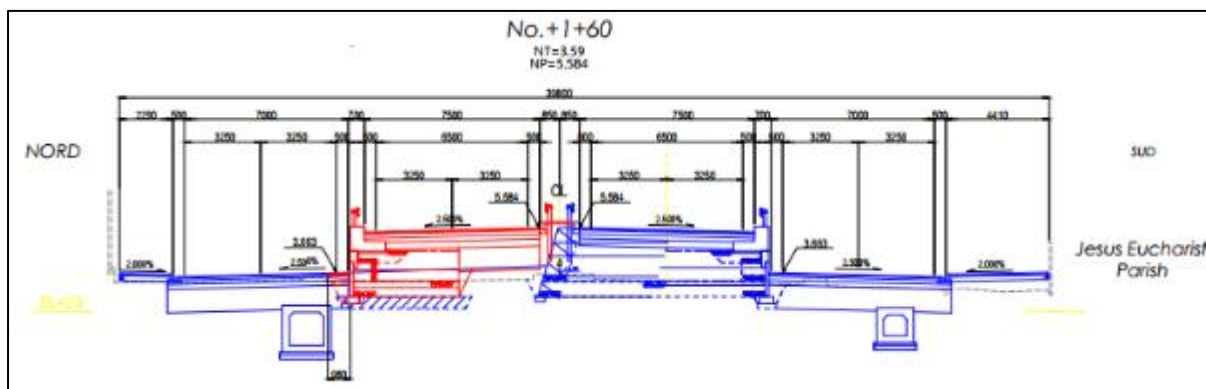
Reinforced concrete veil pillar	Single row of concrete pillars	Reinforced concrete portal	Veil pillar with two support points
			
- Conventional pillar - Usual construction method therefore inexpensive	- Reduced pillar width for visibility - If the cantilevered parts are too long, they need to be prestressed.	Solution to avoid non-transferable underground objects	- Pillars in harmony with the site - Solution already adopted in the country - Its execution entails constraints.

Figure 28: Pillar profiles and their particularities

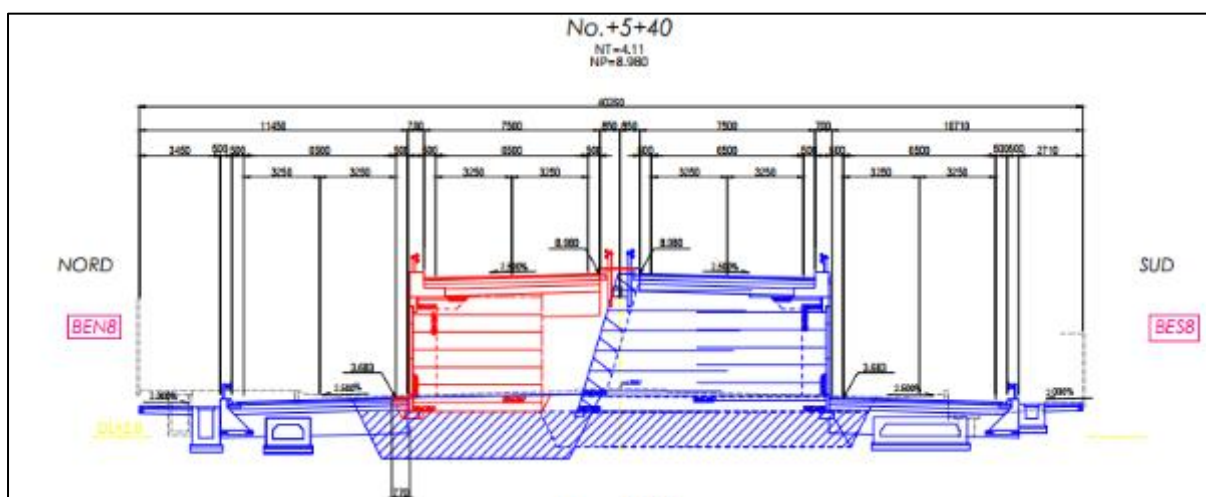
Source: JICA, 2019

The best solution must take into account the existence of the networks in place. The results of the working sessions with the network concessionaires (SBEE, SONEB, and Benin Telecom) and MCA-Benin II require rational management of space, network movements, or a construction variant that facilitates the pulling of cables of MCA-Benin II and the operation of the networks of SBEE, SONEB and Benin Telecom.

This variant turns out to be, the variant whose pillars can avoid non-transferable underground objects. It is then the bridge with reinforced concrete porticoes (figures 28, 29 and 30).

**Figure 29: Cross section West side (NO.1+60)**

Source: JICA, 2022

**Figure 30: Transverse section East side (NO.5+40)**

Source: JICA, 2022

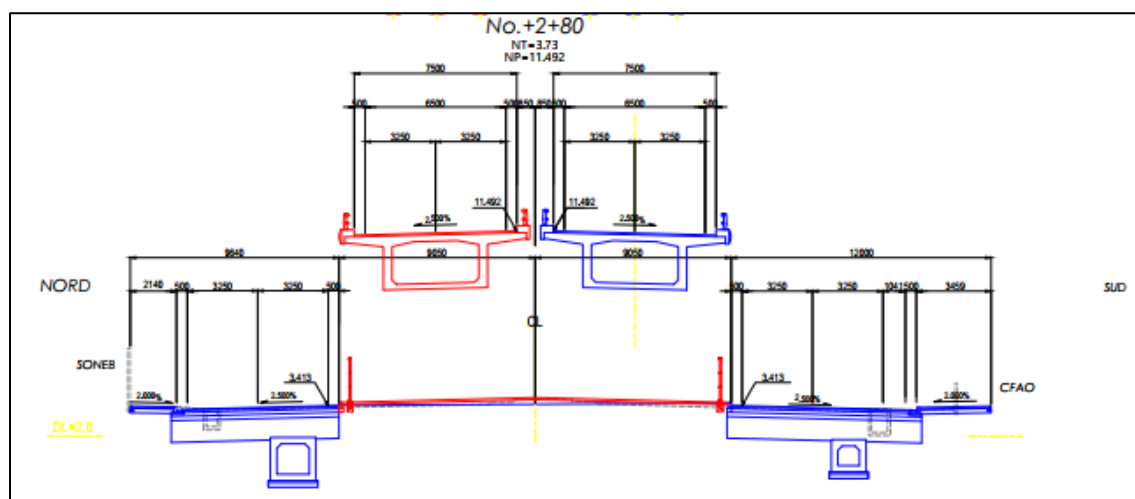


Figure 31: Cross section West side (NO.2+80)

Source: JICA, 2022

Figure 32: anti-entry fence and the northern edge

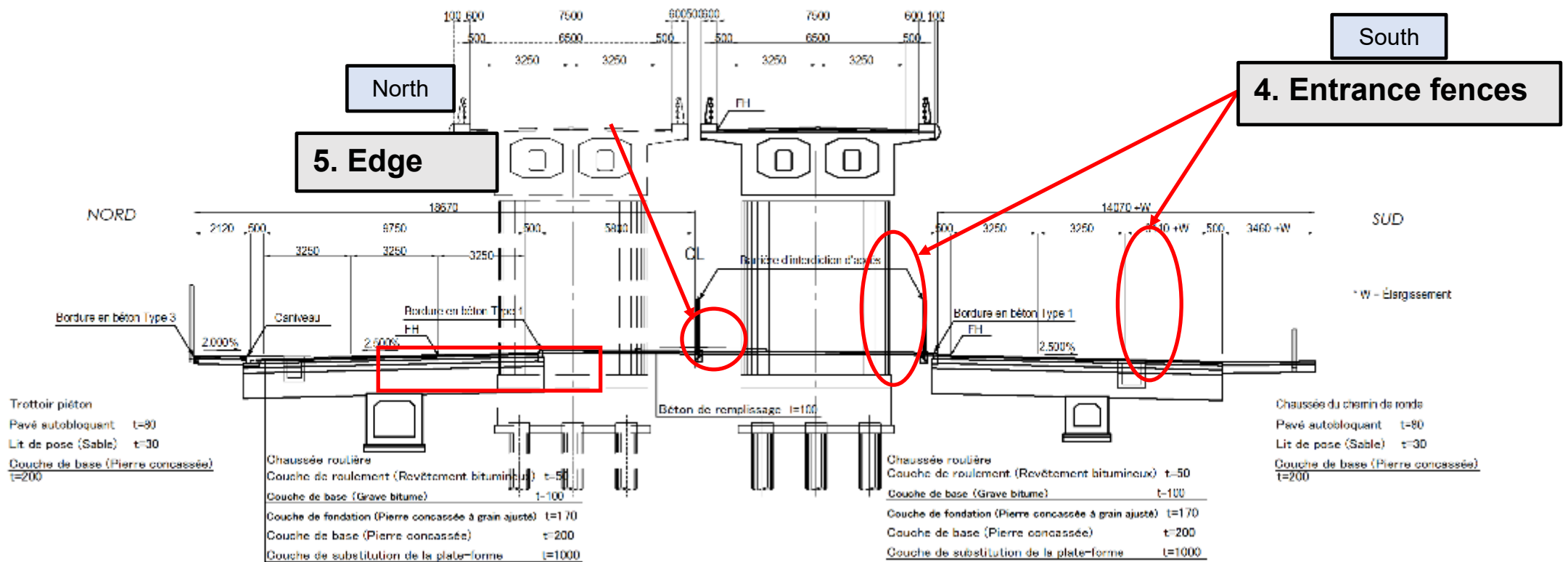


Figure 33: Route proposals

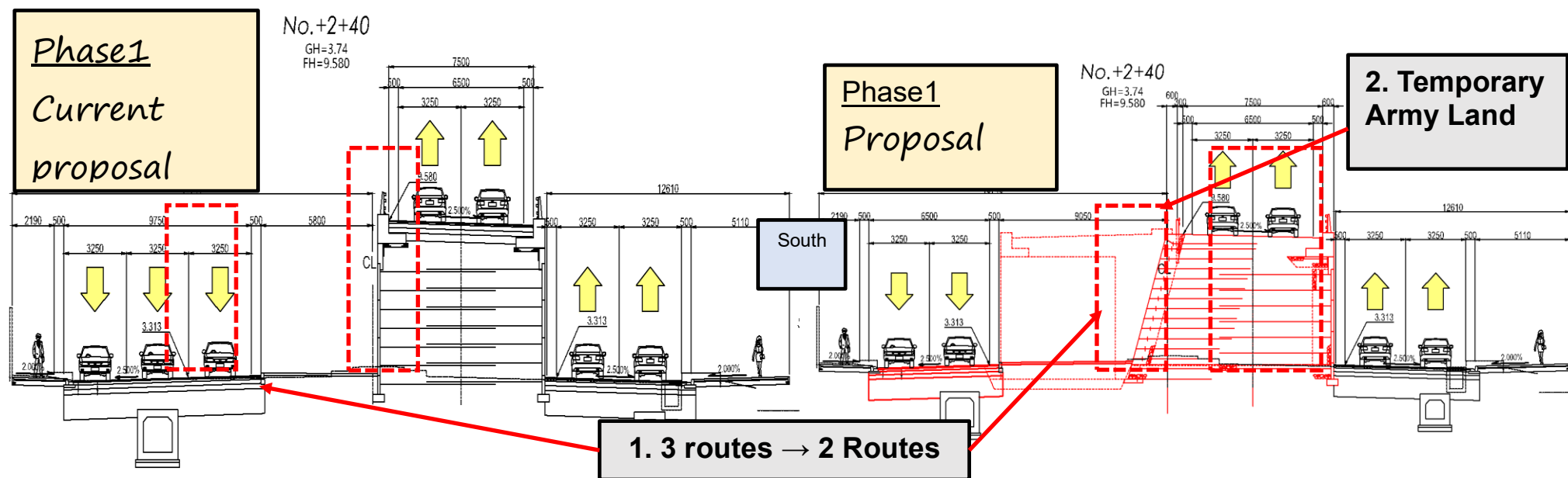
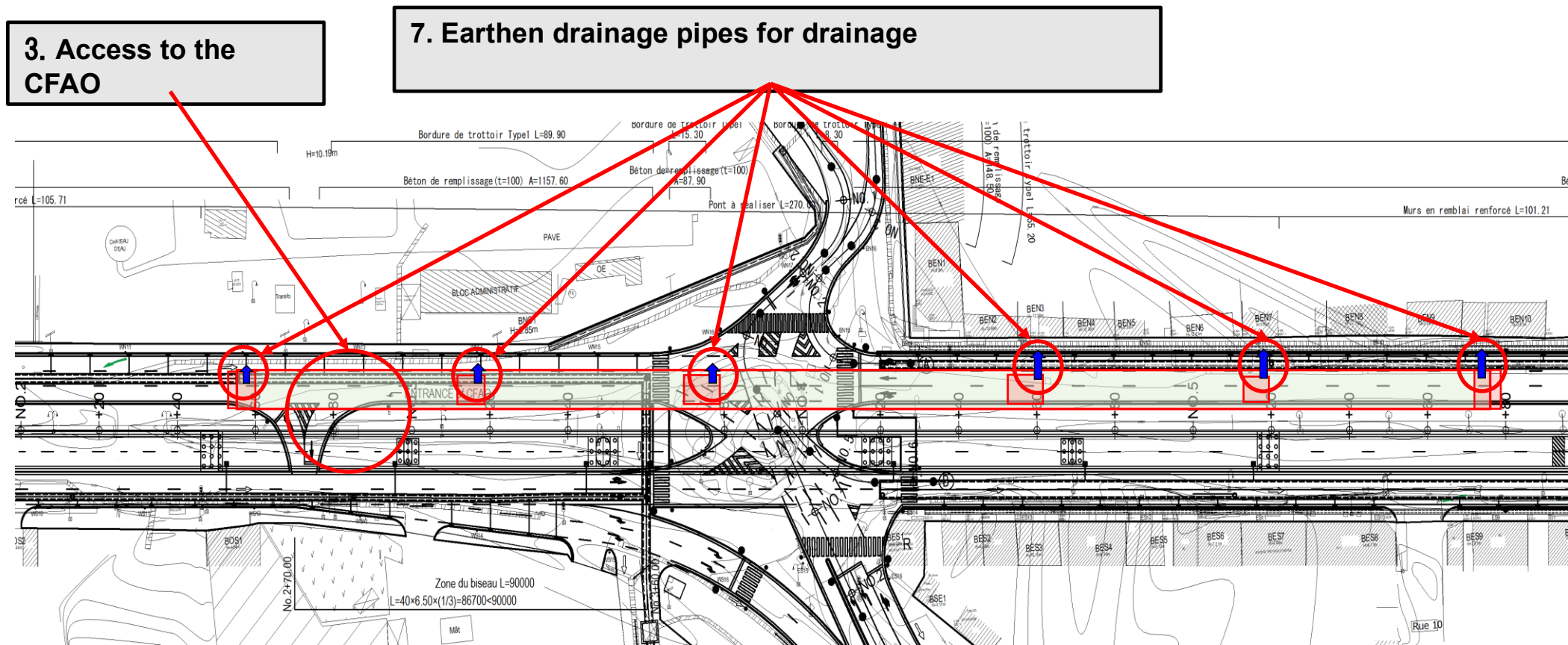


Figure 34: Access and perspectives of drainage pipes during construction.



VI. SURVEY RESULTS

5.3. Inventory of affected assets and persons

The census operations made it possible to inventory the assets of the people affected by the project and who are eligible for compensation. The results of the surveys show 167 women or 37.70% and 276 men or 62.30%. These PAPs have varied statuses depending on their installation, the mode of occupation of the space (table 53).

Table 52: Number of Affected Persons in the works area

Status of PAPs/Sex	Women		Men		Total	
	Effective	%	Effective	%	Effective	%
Store employee	60	13.54	147	33.18	207	46.73
Employee Occupant of the public domain	1	0.23	0	0.00	1	0.23
Occupant of the public domain	22	4.97	23	5.19	45	10.16
Shop owner	84	18.96	105	23.70	189	42.66
Owner Heir	0	0.00	1	0.23	1	0.23
Total	167	37.70	276	62.30	443	100.00

Source: Results of fieldwork, November 2022

The results in table 53 show that there were 207 shop employees, divided into 60 women and 147 men, ie 33.18% men against 13.54% women. It is also listed in the rights-of-way of the works of the employees of the owners occupying the public domains. It should be noted that in the right-of-way of the project, two categories of owners have been identified, the owners of places of business (shops, hangar, barracks and others) and the owners of land housing these infrastructures. On the side of private land properties for commercial use, the manager of CFAO Motors is added.

The owners of the shops represent 42.96%, among these 36.04% are men against 18.71% women.

5.4. Public social infrastructure services affected, social and cultural characteristics of displaced communities

The loss of socio-collective infrastructure gives rise to the loss of access to public social services. In the right-of-way of the project, no socio-community or collective infrastructure has been assessed for destruction. On the other hand, a church, a mosque, a primary school and a private institute are identified in the area of influence of the project. Users of these infrastructures will experience restricted access and noise pollution. Provisions must be made during the implementation of the project to reduce its disturbances as much as possible.

The construction of the interchange will also require the relocation of various networks (water, electricity and telephone). In order to limit disruptions in the supply of public services related to these displacements, it is expected that the construction company, in conjunction with the decentralized services of SONEB, SBEE and Telecommunications, will limit the duration of the interventions and inform the population in advance of the said disturbances.

5.5. Compensation for losses

In this part, it is a question of highlighting the results of the evaluations of the compensations of all the categories of the goods and the costs of compensation of each PAP as well as the specific support measures granted to the PAPs within the framework of the Action plan of Resettlement.

The total cost of the allowances is estimated at **484 030 124 F.CFA (four hundred and eighty-four million thirty thousand one hundred and twenty-four francs)**. This budget includes the following compensations:

- Compensation for loss of private land for commercial use;
- Compensation for the loss of private land for residential use;
- Compensation for losses of private buildings for commercial use;
- Compensation for loss of private residential buildings;
- Compensation for temporary loss of income;
- Compensation for tree losses
- Support to vulnerable PAPs.

5.5.1. Compensation for loss of private land for residential and commercial use

The total surface area of private land for residential and commercial use assessed in the right-of-way of the work is 565 m² (Figure 33).



Figure 35: Configuration of private key spaces

Its cost of compensation is estimated at **169,500,000 CFA francs** (one hundred sixty-nine million and five hundred thousand francs). The square meter in this area varies between **300,000F CFA**. Table 54 below shows the two (2) lands assessed.

Table 53: Land for commercial use assessed in the right-of-way of the works

Typology		Unit	Unit price (in CFA francs)	Total area m ²	Total costs
Plot / Affected Lands	CAD/CAM Motors	m ² –	300,000	419	125,700,000

	Mobile Shop	m2 –	300,000	146	43,800,000
Total				565	169,500,000

Source: Results of fieldwork, November 2022

The registration fee of the real estate agency is **1,200,000 CFA francs (one million two hundred thousand francs) due to 600,000 francs per plot.**

5.5.2. Compensation for losses of private buildings for commercial use

The private buildings for commercial use assessed in the right-of-way of the works consist of a commercial building and the CFAO Motors fence with a dimension of 150 linear meters. Table 55 below shows the valuation of these assets.

Table 54: Infrastructure for commercial use assessed in the right-of-way of the works

Types of goods	Assets affected	Unit	Unit price	Amount	Total area (m ²)	Total cost
Place of business / infrastructure for commercial use	Shop	m ²	150000	1	146	21,900,000
	Fence	ml	150000	2	150	22,500,000
Total				3	296	44,400,000

Source: Results of fieldwork, November 2022

5.5.3. Compensation for temporary loss of income

The compensation values obtained by types of income covered are:

- ✓ Store employee
- ✓ Employee Occupant of the public domain
- ✓ Occupant of the public domain
- ✓ Shop owner
- ✓ home owner

The table presents the overall cost of temporary loss of income

Table 55: Compensation for temporary loss of income

Status of PAPs	Number	Cost (F CFA)/month	Duration (90 days)	Clearing cost
Shops that face the project road in the project area Shop owners Shop workers				
Shop owners	188	300,000	3 months	169,200,000
Store employees	207	65,000	3 months	40,365,000
Occupants of the public domain				
Owners	45	200,000	3 months	27,000,000
Employees	1	65,000	3 months	195,000
Mobile shop at southeast corner of IC				
Owners	1	360,000	3 months	1,080,000
Employees	0	65,000	3 months	0
Owner built	1	360,000	3 months	1,080,000
Trades with affected land/attachment absent				
Owner	1	360,000	3 months	1,080,000
Total	444			240,000,000

Source: BANCA, December 2022

5.5.4. Compensation for loss of plants

Table 57 presents the evaluation of the compensation costs for the loss of plants of economic value affected in the project right-of-way.

Table 56: Compensation for the loss of plants of economic value

Types of goods	Assets affected	Feet	Features	Unit price	Number	Total cost
Plants of economic value affected	Neem	Feet	Young	12500	3	37,500
	Oil palm tree	Feet	Adult	25000	7	175,000
	Oil palm tree	Feet	Young	15000	6	90,000
	Ficus umbelata	Feet	Young	12500	3	37,500
	Mango	Feet	Young	25000	2	50,000
	Mango	Feet	Adult	40000	4	160,000
	kola tree	Feet	Adult	25000	22	550,000
Total					47	1,100,000

Source: BANCA, December 2022

5.5.5. Support to vulnerables PAPs

The cost of supporting vulnerable people is estimated at **10,980,000 F.CFA** (ten million nine hundred and eighty thousand francs). Table 58 presents the mode of compensation for these PAPs.

Table 57: Cost of Support to Vulnerable PAPs

Support to vulnerable PAPs	Number	Cost (F CFA) / month	Duration (90 days)	Compensation cost (CFA Francs)
Vulnerable PAPs	61	60,000	180,000	10,980,000

Source: BANCA, December 2022

5.5.6. Travel assistance

A total of 137 PAPs will see their kiosks set up along the project right-of-way moved during the works. Travel support will be granted to them for moving these kiosks (Table 59).

Table 58: Cost of support to Vulnerable PAPs

Travel assistance	Number	Cost (F.CFA)	Compensation cost (CFA Francs)
Vulnerable PAPs	137	50,000	6,850,000

Source: BANCA, December 2022

5.5.7. Compensations budget

The global compensation budget is evaluated at **484 030 124 F.CFA** (four hundred and eighty-four million thirty thousand one hundred and twenty-four francs).

Budget item		Amount (FCFA)
Compensation measures	Compensation for the loss of private land for commercial use	125 700 000
	Loss of land for residential use	43 800 000

	Compensation for the loss of infrastructure for commercial use	44 400 000
	Compensation for loss of related infrastructure	0
	Compensation for loss of infrastructure for residential use	10 000 124
	Compensation for commercial income	240 000 000
	Support measures for vulnerable PAPs	10 980 000
	Travel assistance	6 850 000
	Compensation for loss of plants of economic value	1 100 000
	Registration fees	1 200 000
TOTAL 1		484 030 124

Source: BANCA, December 2022

VII. MAIN ENVIRONMENTAL AND SOCIAL CHALLENGES OF THE PROJECT

The analyses of biophysical challenges and social issues was based on public consultations carried out in the districts and on the proximity surveys and discussion with the concerned authorities.

5.6. Main challenges for the biophysical environment

The impact receptors of the project activities are the components of the physical and biological environment that will directly receive the positive or negative effects of said activities, depending on the phase.

5.6.1. Physical issues

The physical issues concern the quality of the air, surface water, soil and vegetation in some areas. Air quality directly affects the human environment. The concerns related to air would be expressed during the construction phase, especially during the realization of the major works, the various movements of people and goods, and the emissions of polluting gases. With regard to surface water, special attention will be paid to wetlands and marshes (especially outlets). During the works, the outlets and retention basins littered with garbage will be cleaned and redeveloped for a better sanitation of the living environment.

5.6.2. Biological issues

This concerns the fauna and flora. Wildlife is almost absent from all the investigation areas except for the basins consisting of swamps, lagoons and lakes/outlets, which are frequently disturbed by anthropic activities through various types of exploitation. The disturbance of wildlife habitats, especially migratory birds, is a concern that should be mentioned, due to the destruction of certain habitats during the works.

The degradation of the fishery resources mentioned in the inventory is also a major concern, since the cleaning of the basins through the removal of sludge and silt will put pressure on the fishery resources.

5.7. Main social and economic issues

Socio-economic and safety receptors concern public health, land, economic activities, safety of people and property, etc.

5.7.1. Estimated number of people impacted by the project

The calculation of the number of people to be impacted by the project infrastructure started from the determination of the area (in ha or Km²) of the area of influence of the infrastructure (IGIP, 2018). Then, the area of the area of influence of the infrastructure was multiplied by the population density per km² of this area to find the total number of people directly impacted by the project. The footprint of the Vêdoko flyover construction project takes into account five (05) districts of Cotonou. These

are Vêdoko, Missogbé, Houéyiho 2, Kouhounou and Ahogbohoulé Cité Eucharistie. Figures 34 and 35 illustrate the footprint of the project.



Figure 36: Perspective of the integrated circuit

Source: JICA, 2019

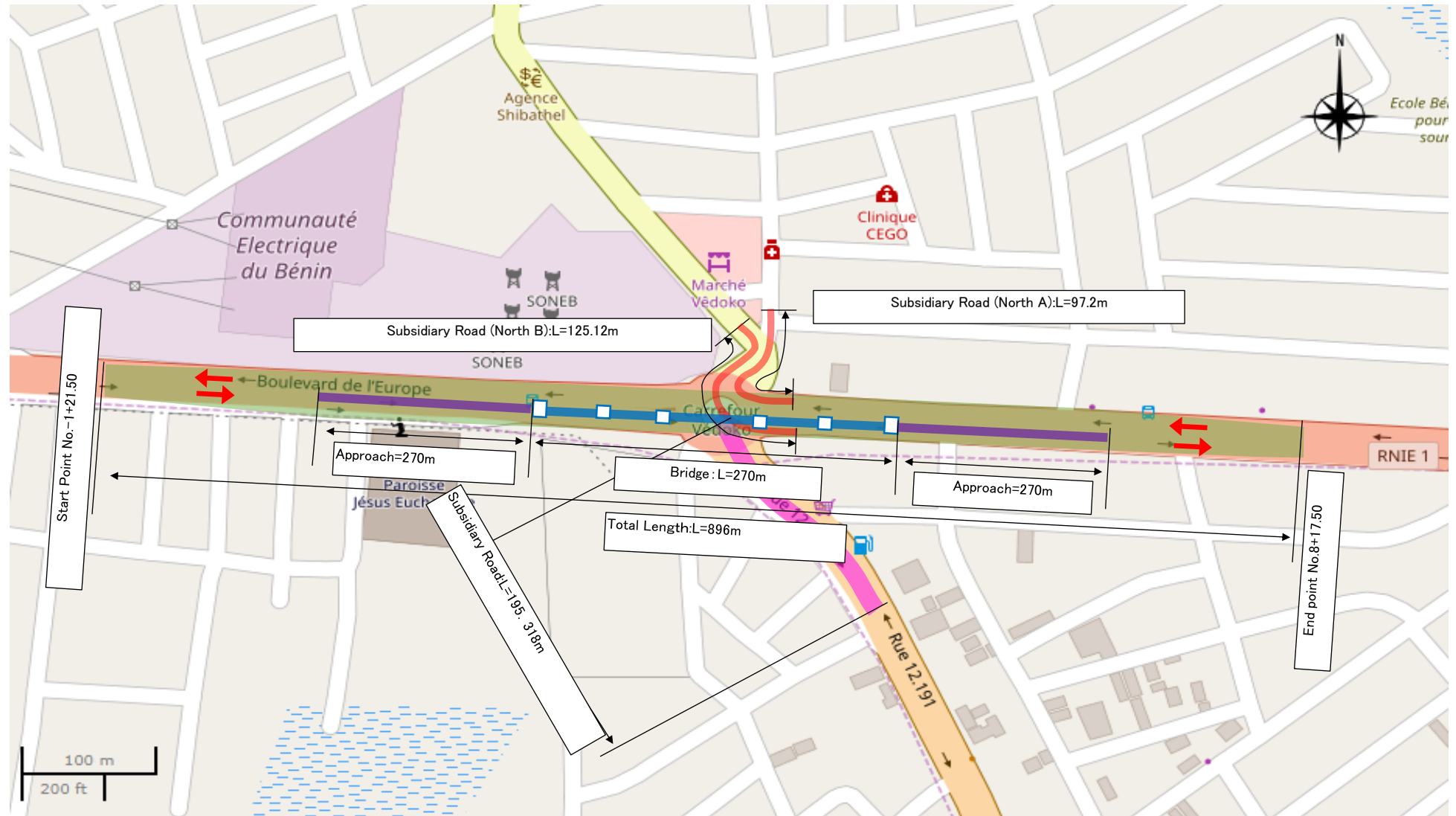


Figure 37: Project footprint
Source: JICA, 2022

5.7.2. Land issues

The land concerns are mainly related to the encroachment on the domain of the CFAO Motors Company and the laptop sales shop at the Toyota crossroads. In addition, these development works require the creation of living quarters for various sub-works.

These concerns are significant issues that should be mentioned in order to analyze them in the part reserved for the impact analysis.

5.7.3. Issues related to access, circulation, surroundings and household living conditions

Access and traffic will be mainly disrupted for local residents during the construction phase. The temporary disruption of access and traffic indirectly concerns economic activities and the safety of goods and people.

The living environment could be temporarily and locally disturbed by the nuisances caused by the work, mainly dust and air pollution caused by the site machinery and earthworks in general, and odors in the case of excavation work in particular. Living conditions should be positively improved in the project areas insofar as rainwater will be well drained, traffic made easier and flooding controlled.

5.7.4. Issues relating to network relocation

The works will entail the relocation (sometimes temporary, sometimes permanent) of existing networks. The main infrastructures and other existing services to be relocated will be as follows:

- ✓ water supply pipes;
- ✓ electricity distribution systems
- ✓ telecommunications systems; and,
- ✓ Infrastructure and services identified on the basis of information and concerns communicated during stakeholder engagement activities.

The relocation of infrastructure will be studied, budgeted and carried out by suitably qualified contractors under the supervision of the concessionaires (SONEB, SBEE, and SBIN).

VIII. ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

The environmental analysis of the Cotonou flyover construction project uses the same methodological approach as most projects which, due to their nature, can generate pollution or degradation of the environment.

5.8. Impact identification and assessment

The environmental assessment consisted of determining the main parameters to be assessed based on the identification of the various components of the environment potentially affected by the project activities. This identification is based on the application of Leopold's matrix (1971) and results from the cross-referencing of the activities marking the variant retained for each phase of the project (preparation, construction, operation and closure) with the environmental elements likely to be affected.

The identification (Table 60) of the environments affected by the project activities is made by crossing the project activities with the elements of the environment.

Table 59: Environmental components potentially affected

PROJECT PHASES	ACTIVITIES (Sources of impact)	Environmental components potentially affected												
		Natural environment (biophysics)								human environment		Landscape		
		Ground		Water			Air		Flora and fauna					
		Soil quality	Profile and slope	Runoff and infiltration	Water quality of surface	Groundwater quality	Air quality	Musical	Species	Habitat	Health and security	Economic aspects	Visual field	Special elements
I. Preparation phase	Cleaning of the site and installation of the construction site (the living base)	x		X	x		x	x	x	x	x	x	x	x
	Clearance of the right-of-way			X	x	x	x	x						
	Labor recruitment											X		
	Deployment of machinery and equipment						x	x			x	X	x	
	Supply of building materials						x	x			x			
II. Construction phase														
	Moving and installation of various networks (electrical, telephone and water supply)	x				x	x				x	x	x	
	Earthwork (clearing, backfilling, leveling, etc.)	x					x	x		x	x	x	x	x
	Construction of embankments	x	x	X	x		x	x			x	X	x	X
	Construction of sanitation works	x	x	X	x		x	x	x	x	x	X	x	X
	Development of tracks and related	x					x	x	x	x		X	x	
	Transport and storage of materials		x	X			x				x	X	x	
Development of diversions	X					x				x	x			

Table 60: Environmental components potentially affected (continued)

PROJECT PHASES	ACTIVITIES (Sources of impact)	Environmental components potentially affected													
		Natural environment (biophysics)								human environment		Landscape			
		Ground		Water			Air		Flora and fauna						
		Soil quality	Profile and slope	Runoff and infiltration	Water quality of surface	Groundwater quality	Air quality	Musical ambiance	Species	Habitat	Health and security	Economic aspects	Visual field	Special elements	
III. Operation phase	Commissioning of the structure (movement of people and goods)	x					x					x	X		

The sources of impact, represented by all the activities marking the different phases of the project, directly or indirectly, qualitatively or quantitatively affect the different components of the environment. The changes generated are either negative or positive in nature and material or not.

5.9. Negative impacts on the natural environment and mitigation measures

5.9.1. Preparatory phase

The activities prior to the work are limited to the installation of the site, the installation of site machinery and equipment (concrete mixers, wheelbarrows, trucks, and compactor), the movement of trucks for the supply (gravel, sand, iron, cement, etc.).

The significant impacts are identified at the level of the soil (degradation, digging, development of space and modification of the landscape, modification of drainage if it rains) and water (slight increase in turbidity and drainage of materials towards the outlets).

5.9.1.1. Fauna and flora

The objective of this project, which is to improve an existing road (construction of a grade-separated intersection), does not require "significant rights-of-way, nor modification of the environment", which makes it possible to avoid impacts on the natural environment and ecosystem, such as "the significant degradation of flora and habitats of wild animals". However, the activities to clear the right-of-way will lead to the felling of the alignment trees located in the central reservation of the section that will be occupied by the structure. Thirty trees will therefore be felled.

Assessment of the impact of the disappearance of fauna and flora

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Punctual	Medium	Medium

Actions to take:

Carry out reforestation in compensation on a site identified with the population.

5.9.1.2. Soil degradation and reworking

Actions to take:

- Install the base camp on the upstream part of the site;
- Avoid deep cuts;
- Limit stripping strictly to the footprint of the facilities to be installed.

5.9.1.3. Land occupied by temporary structures and by the storage of various materials and equipment

The work to install the base camp, clean up and earthworks on the site, including clearing, excavation, backfilling and levelling, constitute real sources of modification of the configuration of the soil and then degradation of the physical properties (structure, texture, permeability) of soil and subsoil.

These modifications will affect almost all of the project's right-of-way and the disturbances they will have afflicted will be profoundly due to the sensitivity of the environment.

Assessment of impacts related to soil degradation

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed measure:

- Develop and organise the site area
- Avoid spreading and spilling products on the ground

5.9.1.4. Degradation of borrow sites

The removal of materials from the quarries will degrade the soil: large quantities of sand, laterite and gravel will be removed from different sites, making the rights-of-way concerned unusable for agriculture.

The hole resulting from the excavation constitutes a lasting modification of the geomorphology of the site as well as of the landscape.

Assessing the impact of borrow sites

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Local	Strong	Strong

Proposed measures:

- *Operate quarries and borrow areas that have been the subject of an ESIA (with a CCE);*
- *Ensure the restoration of borrow sites and exploited quarries (restitution of topsoil, planting and other site enhancement activities).*

5.9.1.5. Impact on air quality

The activities of transporting materials by trucks will generate air pollution due to dust raised by delivery trucks, the emission of dust and exhaust gases from moving machinery and trucks. Similarly, the transport of materials risks raising dust on the roads if no protective measures are taken.

Assessment of the impact related to air quality (dust emissions and exhaust gases)

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed measures:

- *Wet down potentially dusty platforms before use;*
- *Regularly maintain construction machinery and truck engines;*
- *Put under tarpaulin the materials transported by the trucks*

8.2.1.6 Impacts on linear infrastructure (roads and networks)

Underground and overhead networks are likely to be affected by the construction work on the Vèdokô flyover, as they may be torn up, severed or perforated by the construction machinery. These networks, which can include drinking water and gas pipes, telephone and internet networks, as well as power lines, are easy to identify overhead, but much less so underground. While in the first case the risk is of snagging the lines with a shovel (or other construction equipment), in the second case excavation work could inadvertently reach a buried network and damage or even sever it. This damage would lead to more or less temporary disruption to its use, and could even render it unusable. It could also lead to a dangerous situation if a water or gas pipe were to be pierced.

The construction of the flyover will have a greater impact on linear infrastructure than the transformer substations. The flyover will be built along the existing RNIE 1 right-of-way. As with all transport infrastructure works, excavation work to open the trenches is likely to affect buried networks.

Traffic will therefore be disrupted, and in areas that are already heavily congested, traffic is likely to be even more congested. The increase in traffic to bring in the equipment and materials needed for the works is also likely to damage the roads and disrupt their use by users.

Assessment of the impact on linear infrastructures (roads and networks)

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Strong	Medium

Proposed measure:

- Obtain from network operators the location of their networks in the project area.
- Implement an emergency procedure in the event of a chance encounter with a network.
- Maintain access on the main routes or propose diversions. In all cases, these route modifications must be defined and local residents and road users must be informed of the conditions of use of these roads.
- Provide safe routes for pedestrians.
- Provide appropriate road signs.
- Restore all the roads used for the project to their original state, including the surfacing, whether they have been used by vehicles or opened up in trenches.

5.9.2. Construction phase

5.9.2.1. On the ground and subsoil

Soil degradation (changes in profile, properties and erosion) will be caused by heavy machinery traffic, earthworks and excavation work. This type of modification occurs during the construction phase.

5.9.2.1.1. *Rain erosion and soil sealing*

Les The numerous movements of earth caused by the earthworks are likely to lead to the modification of the relief and the sealing of the soil. In addition, the installation of buried supports will require excavations which are a source of rain erosion.

Erosion impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Weak	Weak

Proposed action:

Respect the soil protection measures, especially during the rain.

5.9.2.1.2. *Compaction and partial sealing of the soil*

Construction work on the flyover will require the use of heavy machinery which, in addition to the impact of their mass on the ground, will compact the footprint of the various areas and the road network. In addition, the surface of the ground will be waterproofed by the break of paving, bitumen or other surface treatment for the installation of the platform.

Assessment of the impact linked to compaction and partial soil sealing

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Punctual	Weak	Weak

Proposed measures:

- *Carry out the work preferably during the dry period (dry season)*
- *Ensure good drainage of the platform*

5.9.2.2. *Air quality*

5.9.2.2.1. *Construction noise emission*

All construction activities on the site (use of machinery and various materials) will generate noise and vibrations. The most important noises will come from motor graders, compactors, pneumatic drills, cement mixers, etc.

Noise impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed measures:

- *Regularly maintain construction machinery;*
- *Avoid noisy work during rest hours.*

5.9.2.2.2. *Dust emission*

The construction work on the exchanger cannot be done without atmospheric emissions insofar as engine-powered equipment will be used for the needs of the work and for handling and services.

The work, particularly which of the structural work, leads to the emission of earth and sand dust: earthworks, handling of cement for the preparation of concrete, cleaning of the site, etc.

Assessment of the impact linked to dust emissions

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed measures:

- *Wet down potentially dusty platforms before use;*
- *Put under tarpaulin the materials transported by the trucks.*

5.9.2.2.3. *Gaz emission*

The engines of construction vehicles and machinery as well as the trucks transporting the materials will emit gases, the quantity of which depends on the quality of the engines in question.

Assessment of the impact linked to the emission of gas

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed action:

Regularly maintain construction machinery and truck engines.

5.9.2.3. *Traffic disruption*

During the construction work, the supply of materials and equipment to the site is carried out by trucks, which means a temporary increase in traffic and therefore a disruption of existing traffic. Normal traffic on the site may be disrupted from time to time at this location and in the immediate vicinity. This disruption will depend on the flow of trucks, which will be more accentuated at the start of the work.

Traffic impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Regional	Medium	Medium

Proposed measures:

- *Put in place traffic regulation devices to avoid conflicts around the site and on the quarry-site routes (site);*
- *Position a man with a flag to regulate traffic from time to time, especially at peak times*

5.9.2.4. *Production of site waste*

A lot of waste will be produced on the site. These include rubble, metal shavings, spikes, bits of wood, and waste similar to household waste: packaging (plastic bags, sheets, paper, cardboard, empty boxes, etc.), remains of food ...

The scale of the work and the number of site personnel testify to the quantity of waste produced.

Waste impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Local	Medium	Medium

Proposed measures:

- Define and implement a site waste disposal plan;
- Provide the base camp and the construction site with garbage cans for the pre-collection of household and miscellaneous waste;
- Subscribe to existing local structures for the pre-collection of waste;
- Make toilets available to workers and prohibit defecation in the vicinity.

5.9.2.5. Soil pollution by used oils

We could also record accidental spills of hydrocarbons and waste oils from generators or the emptying of vehicles and construction machinery. These potential impacts are direct, temporary and low in scope. They can be corrected or avoided with the implementation of a system for the pre-collection and collection of used oils during the construction phase.

Assessment of the impact linked to used oils

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Action to take:

Set up an adequate collection system for used oils and monitor it

5.9.2.6. On surface water

Construction works will affect the quality of this water if arrangements are not made to collect solid and liquid waste (used oils, etc.) for the regular removal of this waste in order to avoid their overflow and accidental spills that could long-term pollute the waters.

5.10. Negative impacts on human environment and mitigations measures

5.10.1. Preparation and work phase

5.10.1.1. Health and safety impacts

5.10.1.1.1. Risk of noise-related illnesses

Various noise pollution (traffic or construction noise) can cause various diseases: ENT, stress and blood pressure, etc. Provisions to limit this nuisance are necessary in order to protect the health of staff and local residents.

Health impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Punctual	Strong	Medium

Proposed measures:

- *Require the wearing of protective devices (ear muffs, earplugs, etc.);*
- *Avoid noisy work during rest hours.*

5.10.1.1.2. Road accidents and construction accidents

The various transport of materials and equipment by trucks in the vicinity of the site, on the transport routes linked to the project constitute for any person in general and the populations neighboring the site and the routes of the various transport vehicles in particular, risks of 'accident.

There are also risks of accidents on the construction site: handling of machinery, movement of construction machinery, excavations and deep pits, injury by scrap iron, injury by glassware, puncture by spikes, various falls, etc.

Accident impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Strong	Medium

Proposed measures:

- *Put in place traffic control devices to avoid traffic conflicts around the site and on truck routes;*
- *Periodically educate site personnel on individual safety measures;*
- *Regularly raise the awareness of truck drivers (recommend the speed to be observed on the various routes and in built-up areas);*
- *Provide the site with an infirmary.*

5.10.1.1.3. Increase in disease prevalence rate

The raising of dust, the inhalation of fumes and gases generated by the work constitute real threats to the health of anyone working on the site.

Many people will have to work away from their marital home. The risk of developing sexual activities is great. The prevalence of sexually transmitted diseases, particularly HIV/AIDS, could increase as a result of this project.

HIV AIDS impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Regional	Medium	Medium

Proposed measures:

- *Organize Information, Education and Communication sessions for site personnel, residents of the area and any user of the site under construction.*
- *Water the sections in built-up areas on the material transport routes.*

5.10.1.1.4. Unwanted pregnancies

The mixing of populations and the development of sexual activities could lead to unwanted pregnancies which will lead to marriages without prior consent.

Evaluation of the impact related to unwanted pregnancies

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Weak

Proposed measures:

Organize Information, Education and Communication sessions for site personnel, residents of the area and any user of the site under construction.

5.10.1.1.5. Public health attacks

Attacks on public health take the form of the nuisances and illnesses that workers and/or local people will develop, or to which they are exposed due to the contamination of their living environment by substances produced during the execution of various project activities. The most important concern:

Respiratory conditions and allies

The operation of the platforms, the transport and storage of products and goods and then the circulation of machinery will generate dust, smoke, odors and noise which can cause nuisance and respiratory illnesses among workers and other users of the site. The manifestations of the effects of air pollution on human health depend on the nature of the pollutant as shown in Table 62 below.

Table 61 : Impacts de quelques polluants émis dans l'air sur la santé humaine

POLLUTANTS	HEALTH IMPACTS
Nitrogen oxides (NOx)	Migraines, irritations, reduced immune defences, impaired lung functions, inflammation of the bronchi
Carbon oxides (COx)	Anorexia, cardiovascular disorders, migraines, dizziness, vision disorders
Unburnt hydrocarbons (HC)	Eye irritation, cough, carcinogenic actions
Butane (C4H10)	Arrhythmia followed by asphyxia on prolonged exposure.
Dust	
(PM2.5 and PM10)	Transport of pollutants in the lungs, tuberculosis, carcinogenic actions, acute respiratory infections (ARI)

Risk of increased disease prevalence rate (ENT, OPHTHALMO, TRAUMA, NEUROLOGICAL AFFECTIONS, etc.).

Disease impact assessment

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Regional	Medium	Medium

Proposed measures:

Organize Information, Education and Communication sessions for site personnel, area residents and all users.

5.10.1.1.6. Sexually Transmitted Diseases and HIV/AIDS

Execution of the project construction works will lead to a significant mobilization of people (workers, employees, etc.), particularly during the operation phase. This gathering of individuals of different origins and statuses will create a mix between the users of the site and the populations of the neighboring localities with possibly a change in the behavior of young people, induced by the increase in their income, thus increasing the risks of spread of STDs and HIV/AIDS.

Assessment of the impact on public health damage

Feature	Duration	Extent	Intensity	Importance
Negative	Permanent	Local	Strong	Strong

Actions to take

Raise awareness among site personnel and local residents about preventive methods to fight against STIs and HIV/AIDS.

5.10.1.1.7. Impacts on living conditions

IX. Involuntary displacement of people

The release of the right-of-way at the start of the work will cause the involuntary displacement of people. The surveys revealed that only two people are significantly affected in terms of land. It is the owner of a shop selling mobile phones and the CFAO Company. The work will encroach on their domains.

In addition, there are other PAPs who will not be moved. The latter will be directly affected by the disturbances linked to the work. A total of 433 PAPs will see their activities disrupted by the works and will suffer a loss of income related to the restriction of access that the project will cause.

Assessment of the impact linked to the involuntary displacement of people

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Medium	Medium

Actions to take:

- *Take into account during the development of the RAP, the expectations of the PAPs;*
- *Pay compensation or resettlement aid before the start of work;*
- *Respect the deadlines of the RAP and ensure its full application.*

X. Cuts in electricity, water or telephone due to the displacement of dealer networks (SBEE and OPT)

During the works phase, the displacement of the networks could lead to temporary interruptions for SBEE and OPT subscribers, thus causing inconvenience for the local populations. This negative impact is medium importance.

Assessment of the impact linked to network displacements

Feature	Duration	Extent	Intensity	Importance
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Negative	Temporary	Local	Medium	Medium
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Actions to take:

- *Plan and minimize the delays of possible interruptions of dealer networks;*
- *Inform the populations about the periods of disturbance;*
- *Set up new networks before disrupting existing networks.*

XI. Violations of travel conditions

The right-of-way will be closed to traffic during the work; this will make travel conditions difficult by forcing users to take time on detours, to walk around, or to park vehicles with neighbours, in neighboring streets.

It should be noted that the project has taken this aspect into account and has already provided for diversions to be developed. For the probable deviations, three options were analyzed in order to find the perfect proposals to facilitate traffic for road users in general, local residents and for construction vehicles. Table 63 presents the different proposals.

Table 62: Probable deviations

Streets visited (Deviations)	Existing state	Difficulties identified	Suggested solutions	Concluding remarks
Street along the fence of CICA-TOYOTA	Existing street leading to the site chosen to serve as a base for the company carrying out the work	Obstructed by rubbish deposits cutting off access to the base, but also to a good part of the lowlands	Clear the heaps of rubbish from the course and create a track that can be used as an exit for the trucks and machines of the base.	Appropriate passage to serve the base. However, it will be recommended to take into account the gutters on site and used for partial sanitation of the environment.
Street along the fence of the Catholic church of Vèdokô	Existing street leading to the site chosen to serve as a base for the company carrying out the work	Gives a visual overview of the base, but access to the site is congested by trucks and cars in the depot of the mechanical workshops.	Partially cleared access road to be developed that can be used at the entrance to the site for trucks and base machinery.	Appropriate passage to serve the base. Carry out the clearance and necessary arrangements for the entrance to the site
Street along the fence of the police hospital	Non-existent street at the start of the lane until halfway up the CEB fence	Alley obstructed by the presence of a shallow, impassable even in dry weather.	It will be envisaged to proceed with the opening of the way intersected by the shallows halfway	The opening of the road is necessary to relieve the local residents who will be directly impacted by the works of this structure. But also to serve for the sanitation of the area
Street along the CEB fence on the market side	Existing street but in degradation halfway up the CEB fence	Alley obstructed by the presence of a shallow, impassable even in dry weather. This lane is the normal extension of that of the police station.	It will be envisaged to proceed with the opening of the way intersected by the shallows halfway and to connect it to the previous one.	
Extension of the track facing	Existing street under	No probative difficulties apart	Hope for the completion of the	Once completed, this developed lane will be

the pavement along the fence of the CEG Védoko	development (asphalting project)	from the fact that work is in progress on the section.	paving work on this axis to reduce the hassle of users.	able to serve as a detour for users of the main road under construction. Especially since this bypass falls on the track passing in front of the Mathieu KERÉKOU stadium
Street of the agglomeration of Ahogbohoulè.	Impassable street identified by the population	Will require very large capital to implement	It will be envisaged to proceed with the opening of the way which passes by place in a basfond	Once completed, this developed lane will be able to serve as a detour for users of the road axis under construction and will greatly avoid traffic conflicts and will be very beneficial for the population.

Source: Fieldwork, 2019

Assessment of the impact related to travel conditions

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Strong	Strong

Actions to take:

Develop, indicate and maintain temporary diversions.

XII. Disruption of economic activities

Les The effects on income and activities come in particular from the closure of the track but also from the animation created on the site. The decline in activities and therefore in income will affect local activities because they have become difficult or even impossible to access.

Economic and income-generating activities will be temporarily disrupted during the works, resulting in a loss and/or drop in income for some traders. Itinerant vendors as well as businesses located on the road will be the most affected. The impact of the project on economic activities is negative and moderately significant. A Resettlement Action Plan is planned to take into account the interests of the PAPs.

Assessment of the impact linked to the disruption of economic activities on the section occupied by the works

Feature	Duration	Extent	Intensity	Importance
Negative	Temporary	Local	Strong	Medium

Actions to take:

- *Take into account the expectations of the PAPs during the development of the RAP;*
- *Pay compensation or resettlement aid before the start of work;*
- *Respect the contractual deadlines for the execution of the work.*

5.10.2. Operation phase

After the works, during the operation of the structure, the impacts are positive with regard to urban mobility, income and social organization.

Depending on the activities to be carried out and the environmental dimensions affected, the summary of the environmental repercussions is presented as specified in Table 64.

Table 63: Environmental impact assessment results

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In service	Before the works / After the works	In use	
Preventive measure against pollution	1	Air pollution	B-	B±	B-	B±	During the works: Following the use of construction machinery, the quality of the atmosphere may deteriorate, even temporarily. In service: Depending on the increase in traffic, there may be an increase in air pollution due to exhaust gases. Moreover, the improvement in circulation reducing traffic jams, it can contribute to improving the quality of the atmosphere.
	2	Water pollution	B-	B-	B-	B-	During the works: The waste water resulting from the use of the work machinery evacuated from the site risks polluting the watercourse system. In service: Rainfall can carry dust and hydrocarbons present on the surface of the site.
	3	Waste	B-	D	B-	D	During the works: There may be excess soil and rubble. There will be no waste that could affect the environment.
	4	Soil pollution	D	D	D	D	During the works: The purpose of this project being limited to the improvement of an existing road (creation of an uneven crossroads), there are no planned works likely to lead to soil pollution. In service: Soil pollution will not be aggravated compared to its current state.
	5	Noises / Vibrations	B-	C	B-	D	During the work: The use of construction machinery and vehicle traffic can generate noise. In use: Increased traffic means increased noise level. Moreover, as the road will be raised, there will be a greater distance between the flow of traffic, sources of noise, and neighboring buildings, therefore less noise pollution.
	6	Ground subsidence	D	D	D	D	During construction and in service : As the objective of this project is to improve an existing road (construction of a grade-separated crossroads), no works likely to cause ground subsidence are planned.

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In service	Before the works / After the works	In use	
	7	Bad smell	D	D	D	D	During the works: Given the nature of the project works, no operation that could cause odor nuisance is planned. In service: No activities that could generate bad odors will take place within the framework of the project.
	8	Alluvium	D	D	D	D	During construction and in service: There are no watercourses in the vicinity of the project site, and no earthworks are planned that could upset the sediment deposits.
	-	Sunshine	D	D	D	D	During the works: and in service: The problem of sunlight loss will not arise, given the latitude of the site, and given the height of the intersection, as well as the density of neighboring buildings.
	-	Radio interference	D	D	D	D	During the work and in service: Given the location of the TV transmitting station, the height of the intersection and that of the antennas mounted on neighboring buildings, there cannot be any radio interference.
	-	Light pollution	D	D	D	D	During the works and in service: Around the site, there are no cultivated fields, nor habitats for rare insects, which exhibit phototaxis. So there should be no light pollution problems during the works and with the work put into service because of the lighting.
Natural environment	9	reserve area	C	C	B-	C	During the works and in service: A large part of the area of Cotonou is on the Ramsar list; however, the project site and its surroundings are significantly urbanized.
	10	Ecosystem	C	C	B-	C	During the works and in service: The objective of this project, which is to improve an existing road (construction of a grade-separated intersection), does not require "significant rights-of-way, nor modification of the environment", which makes it possible to avoid impacts on the natural environment and the ecosystem, such as "the significant degradation of the flora and the habitats of wild animals".
	11	Hydromete or	D	D	D	D	During the works: No operation is planned that could modify the watercourse system and their bed. In service: As this project does not cross any watercourse or body of water, there is no underwater construction, so there will be no perverse effects on the hydrometeor.
	12	Terrestrial relief and the nature	D	D	D	D	During works and in service: The purpose of this project, which is to improve an existing road (construction of a grade-separated junction),

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In service	Before the works / After the works	In use	
		of the terrain					does not require "significant excavation work or backfilling; the modification of the land relief, nor that of the nature of the terrain are not to be feared.
Social environment	13	Occupation of the site and resettlement of the inhabitants	B-	D	B-	D	Before the work: During the engineering phase, for the right-of-way of the land necessary for the extension of the road, it will be necessary to proceed with the acquisition of land from private properties. During the works: The acquisition of private land will be completed before the start of the works. In service: After the commissioning of the engineering structures, there will be no additional rights-of-way or resettlement of local residents.
	14	Poor class	C	B+	B-	C	Before and during the works: Street vendors may suffer the repercussions of the works. In service: The construction of a grade-separated intersection in place of the existing level intersection will alleviate traffic congestion, thanks to which spin-offs will facilitate access to the market and social services, such as school, hospital, even for the poor class.
	15	Ethnic minority and indigenous ethnicity	C	C	D	C	Before, during the works and in service: This project will have no adverse effects for the ethnic minority and the indigenous ethnic group.
	16	Local economy providing the population with jobs and subsistence	B-/B+	B-/B+	B-/B+	B+	During the works: These intersection improvement works may have repercussions on some of the existing stores. This work will create jobs. In service: The development of the intersection, once completed, could provide benefits to some of the existing stores. The local economy will be revitalized through improved logistics.
	17	Use of land and local resources	D	D	D	D	During construction and in service: As the purpose of this project is to improve an existing road (construction of a grade intersection), there will be no impact on the use of local land and resources.
	18	Use of water	C	C	D	C	Before and during the works: The works of the project will not have repercussions on the use of water, since there will be no evacuation of muddy water during the works. In service: There cannot be adverse effects on the use of water.

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In service	Before the works / After the works	In use	
	19	Existing social infrastructure and social services	B-	B+	B-	B+	During the works: There must be traffic jams during the works. In service: The number of road accidents should decrease following the development of the existing intersection (in a grade-separated intersection).
	20	Social fabrics, such as social capitals and decision-making bodies	D	D	D	D	During works and in service: As this project aims to improve an existing road (construction of a grade-separated intersection), it is not expected to have repercussions on the social fabric, including social capital and decision-making bodies.
	21	Unequal distribution of damages and benefits	C	D	B-	C	During the works: Due to road traffic restrictions introduced during the works, the free movement of local residents and access to stores could be hampered or restricted. As for the possible implementation of a relief route, the residents of this route risk suffering the consequences of the traffic jam caused and the noise of the traffic. In service: As the present project aims to improve an existing road (construction of a grade-separated intersection), it will not bring the neighboring districts either benefit or unfair damage.
	22	Competition of interests in the region	D	D	D	D	Before and during the works, and in use: As this project aims to improve an existing road (construction of a grade-separated junction), it will not have a significant impact on the competition of interests in the region.
	23	Cultural Heritage	C	C	D	C	Before and during the works, and in service: No cultural heritage is known either in the area covered by this project, or in its surroundings.
	24	Landscape	D	D	D	D	During the works and in service: As this project aims to improve an existing road (construction of a grade-separated junction), the landscape will not be affected.
	25	gender aspect	C	D	D	C	Before and during the works: The gender problem will not be particularly aggravated by the implementation of the project. In service: The gender problem will not be particularly heightened by the implementation of the project.
	26	Children's rights	C	D	B-	D	During the works: It will be necessary to ensure the absence of child workers on the construction site.

Category	No.	Section concerned	Establishing the scope of the environmental assessment		Evaluation according to the results of the study		Reason for evaluation
			Before the works / After the works	In service	Before the works / After the works	In use	
							In service: As part of this project, the rights of children will not be infringed.
	27	Infectious diseases, such as HIV/AIDS	B-	D	B-	D	During the works: Large-scale works are not planned, however the risk of the epidemic spreading is not ruled out at the site level due to the massive arrival of construction workers. In service: The road works themselves will not have any particular effects on infectious diseases.
	28	Work environment (including work safety)	B-	D	B-	D	During the works: It is necessary to take care of the working environment of the construction workers. In service: No operation is programmed to the detriment of the workers, during commissioning.
Others	29	Accident	B-	B+	B-	B+	During the work: Accidents may occur during the work. In service: After the completion of the grade-separated intersection, it is expected that the volume of traffic and travel speed will increase, however with the new grade-separated intersection, the number of accidents would be reduced.
	30	Impact on the natural environment in a transboundary context, and climate change	D	B+	D	B+	Before and during the works: The objective of this project is to improve an existing road (construction of a grade-separated junction), and given its smaller scale, there are no impacts from the cross-border context and climate change. In service: The emission of greenhouse gases will be reduced due to the reduction of traffic congestion.

A+/- : significant positive/negative influences expected

B+/- : Positive/negative minor influences expected

C : Influence that may or may not occur, the intensity and extent of which are uncertain. An in-depth analysis will be required

D : No or minimal influence. No need to conduct further studies.

Source: JICA Study Team

5.10.2.1. Positive impact on the study

5.10.2.1.1. Jobs and income

The clearing, earthworks, construction and exploitation works constitute a real source of temporary and permanent jobs likely to improve the level of income of the workers, in particular the competent

young people of the area of influence of the project. To do this, the recruitment of workers and employees must be done primarily at the local level for the skills available on site.

The increase in activities and income will affect the people who work for the site (staff of the companies and the control office), as well as those who benefit from the performance of this work (various suppliers, sellers of foodstuffs, owners renting rooms for workers, etc.). These impacts are significant and of medium importance.

5.10.2.1.2. *Living conditions of women and vulnerable groups*

The implementation of the preparation, construction and operation works could be an opportunity for women to improve their income by carrying out petty trade and catering activities in the vicinity of the site. This impact is significantly positive for the project.

5.10.2.1.3. *Traffic facilitation*

The presence of the flyover will facilitate traffic at Vêdoko and reduce traffic conflicts during peak hours. It will contribute to the safety and stability of traffic on the Abidjan-Lagos corridor. The major traffic problems around this axis will therefore be reduced. This will save user's time. The impact is positive and of major importance.

Table 64: Summary of impacts and measures

Phase / Source of Impacts	Potential negative impacts	Significance of negative impact	Positive impact	Reduction measures	Maximization measures
1. PREPARATORY PHASE					
1.1. Cleaning of the site and installation of the construction site (the living base)	1.1.a.1 Loss of alignment shafts on the TPC	Medium	1.1.b.1 Job creation	1.1.a.1.1 Carry out reforestation as compensation on a site identified with the population	1.1.b.1 With equal skills, give priority to local labor
	1.1.a.2 Settlement and partial soil sealing	Weak		1.1.a.2.1. Ensure good drainage of the platform 1.1. A.2.2. Carry out the work preferably during the dry period (dry season)	
1.2. Clearance of the right-of-way	1.2.a.1 Involuntary displacement of people and loss of land	Medium		1.2.a.1.1. Inform the PAPs of the start of the works 1.2.a.1.2. Pay compensation or resettlement aid before the start of work 1.2.a.1.3. Set up a complaints management mechanism	
	1.2.a.2 Disruption of normal traffic on the section	Medium		1.2.a.2.1 Develop, indicate and maintain temporary diversions	
1.3. Deployment of machinery and equipment / Supply of materials to the site	1.3.a.1. Traffic accident	Medium		1.3.a.1.1. Put in place traffic control devices to avoid traffic conflicts in the vicinity of the site 1.3.a.1.2. Regularly educate truck drivers on road safety rules	
	1.3.a.2. Air pollution (emission of dust and exhaust gases)	Weak		1.3.a.2.1 Wet down surfaces likely to generate dust 1.3.a.2.2. Maintain machinery regularly 1.3.a.2.3. Put under tarpaulin the materials transported by the trucks.	
	1.3.a.3. Noise pollution	Medium		1.3.a.3.1. Avoid noisy work during rest hours 1.3.a.3.2. Provide workers with Personal Protective Equipment (PPE) and ensure that they are actually worn	
1.4. Removal of materials from quarries	1.4.a.1. Degradation of borrow sites	Strong		1.4.a.1.1 Operate quarries and borrow areas that have been the subject of an EIEIS (equipped with a CCE) 1.4.a.1.2. Ensure the restoration of exploited quarries and borrow areas (restitution of topsoil, planting and other site development activities).	

Phase / Source of Impacts	Potential negative impacts	Significance of negative impact	Positive impact	Reduction measures	Maximization measures
2. WORK STAGE					
2.1. Displacement of various networks (electricity and telephone)	2.1.a.1. Inconvenience related to network interruptions	Medium		2.1.a.1.1 Plan and minimize the delays of possible interruptions of dealer networks. 2.1.a.1.2 Inform populations about periods of disturbance	
2.2. Supply of materials to the site	2.2.a.1 Traffic accident	Medium		2.2.a.1.1. Put in place traffic control devices to avoid traffic conflicts in the vicinity of the site 2.2.a.1.2. Regularly educate truck drivers on road safety rules 2.2.a.1.3. Provide men with flags to organize traffic on the site	
	2.2.a.2 Atmospheric pollution	Weak		2.2.a.2.1 Cover materials transported by trucks 2.2.a.2.2 Regularly maintain machinery and vehicles	
2.3. Stripping and excavation work	2.3.a.1. Rain erosion and soil sealing	Weak		2.3.a.1.1. Respect the soil protection measures, especially during the rain	
2.4. Construction of the exchanger	2.4.a.1. Disruption of the normal circulation of users	Strong	2.4.b.1 Creation of jobs and income	2.4.a.1.1. Develop, indicate and maintain temporary diversions	2.4.b.1.1 With equal skills, give priority to local labor
	2.4.a.2. Disruption of economic activities on the section occupied by the works	Medium		2.4.a.2.1 Pay compensation or resettlement aid before the start of works; 2.4.a.2.2. Respect the contractual deadlines for the execution of the work.	
	2.4.a.3. Accidents at work / construction site	Medium		2.4.a.3.1. Develop and implement a Hygiene, Health, Safety and Environment Plan 2.4.a.3.2. Periodically educate workers on safety measures at work 2.4.a.3.3. Provide workers with PPE and ensure they are actually worn 2.4.a.3.4. Provide the construction site with a medicine box 2.4.a.3.5. Recruit an HSE manager on site 2.4.a.3.6. Develop and implement an emergency plan (POI or PU) in the event of accidents and/or fire	

Phase / Source of Impacts	Potential negative impacts	Significance of negative impact	Positive impact	Reduction measures	Maximization measures
	2.4.a.4. Increase in respiratory and allied ailments	Weak		2.4.a.4.1 Provide workers with PPE and ensure they are actually worn	
	2.4.a.5. Increased incidence of STIs and HIV/AIDS	Strong		2.4.a.5.1. Raise awareness among site personnel and local residents on preventive methods to fight against STIs and HIV/AIDS	
	2.4.a.6. Floor clutter with solid waste and lack of hygiene on site	Medium		2.4.a.6.1. Provide the base of the construction site with garbage cans and subscribe to a pre-waste collection structure. 2.4.a.6.2. Equip the construction site with toilets 2.4.a.6.3. Define and implement a site waste disposal plan (solid waste, toilets, inert waste, etc.)	
	2.4.a.7. Soil pollution by accidental spillage of used oils	Medium		2.4.a.7.1. Install a watertight platform for handling hydrocarbons 2.4.a.7.2. Set up an adequate collection system for used oils and monitor it.	
	2.4.a.8. Noise	Medium		2.4.a.8.1. Avoid noisy work during rest hours 2.4.a.8.2. Provide workers with Personal Protective Equipment (PPE) and ensure that they are actually worn	
3. OPERATIONAL PHASE					
3.1. Commissioning of the exchanger			3.1.b.1. Improved movement of people and goods		3.1.b.1.1 Put in place speed limitation devices when descending the flyover
			3.1.b.2. Improvement of the landscape aspect of the section occupied by the flyover		
			3.1.b.3. Reduced risk of accidents		
			3.1.b.4. Revitalization of the local economy through		

Phase / Source of Impacts	Potential negative impacts	Significance of negative impact	Positive impact	Reduction measures	Maximization measures
			improved logistics.		

X. ENVIRONMENTAL MANAGEMENT PLAN WITH MITIGATION MEASURES AND COST ESTIMATES

The environmental and social management plan is a logbook and constitutes the guide for the implementation of project activities through all its phases. It makes it possible to monitor the measures (maximization and mitigation) proposed in the impact analysis table on the one hand, to propose those responsible for the monitoring and follow-up of these measures on the other hand.

This environmental and social management plan includes several activities which are nothing other than the maximization and mitigation measures proposed for the successful outcome of the project on the environmental level. Impacts, activities, impact indicators, types and mechanisms of monitoring as well as those responsible for monitoring and surveillance. Some measures include the intervention of state structures and local communities. The implementation of this plan is coordinated by the Benin Environment Agency (ABE). It integrates:

- activities aimed at mitigating impacts;
- the list of indicators for monitoring the implementation and impact of activities;
- the timetable for implementing the various measures/activities;
- the description of the different actors, their roles and responsibilities;
- ESMP activity implementation costs (if required);
- the development of the monitoring and environmental monitoring program;
- The protocol(s) for the acquisition and use of the measures carried out recommended by the ESMP (if necessary).

10.1. ESMP objectives

The Environmental and Social Management Plan (ESMP) is the program for implementing and monitoring the measures envisaged to eliminate, reduce and possibly compensate for the harmful consequences of the project on the various components of the environment.

This program will make it possible to establish the environmental specifications which will accompany the environmental compliance certificate (CCE) issued by the Ministry of the Living Environment and Sustainable Development. The integration of the measures envisaged into the already existing environmental management provisions will reflect the commitment of the promoter of the rainwater drainage project of the city of Cotonou for sustainable development. The organizational framework to be put in place must make it possible to achieve several objectives if we want to ensure the success of the ESMP in the short and long term. To do this, the Project promoter and the Client must seek to achieve the objectives below:

- ensure that the populations directly concerned can actively participate in the choice of options;

- Guarantee that all the legitimate needs of the populations concerned are taken into account in an equitable manner. It will therefore be necessary to have an organization which will be able, on the one hand, to identify the real needs, and on the other hand, which will have sufficient authority to refute the unjustified requests or emanating from groups which will see in the project opportunities to seize;
- ensure that the means that will be planned and implemented are effectively distributed for the benefit of the populations concerned and in the most profitable way possible;
- ensure that the follow-up of the actions that will be undertaken is sufficient to prevent the negative effects from compromising the sustainable development of the city of Cotonou and its surroundings;
- Ensure that there is always very good coordination between stakeholders. Perfect coordination will also ensure information in a coordinated manner for all the parties concerned;
- Ensure that the basic objectives of the project are achieved. Thus, some options that could be decided cannot jeopardize the project itself;
- Ensure that the organizational structure that will be put in place can also ensure good continuity in the actions and their medium-term follow-up.

10.2. Reduction measures

Presented above, they are summarized in the following table and will help to significantly reduce the anticipated impacts and improve the project in order to develop an environmental reflex among the populations and the promoter of this project.

Table 65 : Environmental and Social Management Plan

Action implementation activities	Indicators	Schedule	Monitoring/Tracking		Cost (F.CFA)
			Responsible surveillance	Responsible monitoring	
1.1.a.1. Carry out reforestation in compensation on a site identified with the population	Number of trees installed	Preparatory phase	Company in charge of the works Project Owner's Representative (MOD) SEES	City hall of Cotonou Local monitoring committee DDCVDD Atlantique-Littoral Atlantic-Littoral Forest Inspectorate	2,500,000
1.2.a.1.1. Inform the PAPs of the start of the works	Briefing report Releases published	Preparatory phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Atl/Litt Local monitoring committee DDCVDD Atl/Litt	1,000,000
1.2.a.1.2. 2.4.a.2.1 Pay compensation or resettlement aid before the start of work	Number of PAPs compensated Lack of complaints	Preparatory and works phases	MOD SEES	City hall of Cotonou DDIT Atl/Litt Local monitoring committee DDCVDD Atl/Litt	-
1.2.a.1.3. Set up a complaints management mechanism	Existence of a complaints management mechanism Number of complaints recorded and processed	Preparatory phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Atl/Litt Local monitoring committee DDCVDD Atl/Litt	10,000,000
1.2.a.2.1 2.4.a.1.1. Develop, indicate and maintain temporary diversions	Number of planned diversions Number of maintenance performed	Preparatory and works phases	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Atl/Litt Local monitoring committee DDCVDD Atl/Litt	-
1.3.a.1.1. 2.2.a.1.1. Put in place traffic control devices to avoid traffic conflicts in the vicinity of the site	Number of traffic signs installed Number of accidents recorded	Preparatory and works phases	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Atl/Litt Local monitoring committee DDCVDD Atl/Litt CNSR	-
1.3.a.1.2. 2.2.a.1.2. Regularly educate truck drivers on road safety rules	Number of awareness sessions carried out per quarter	Preparatory and works phases	Company in charge of the works MOD SEES	City hall of Cotonou Local monitoring committee DDIT Atl/Litt DDCVDD Atl/Litt CNSR	-

1.3.a.3.1. 2.4.a.8.1. Avoid noisy work during rest hours	Number of complaints recorded against noise	Preparatory and works phases	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
1.3.a.3.2. 2.4.a.3.3. Provide workers with Personal Protective Equipment (PPE) and ensure that they are actually worn	Number of workers with PPE	Preparatory and works phases	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
1.4.a.1.1 Operate quarries and borrow areas that have been the subject of an EIEIS (equipped with a CCE)	Existence of CCE for all borrow sites and quarries operated	Preparatory phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
1.4.a.1.2. Ensure the restoration of exploited quarries and borrow areas (restitution of topsoil, planting and other site enhancement activities).	Existence of Site Restoration Plans borrow pits and quarries operated	Preparatory phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
2.1.a.1.1 Plan and minimize the delays of possible interruptions of dealer networks	Existence of outage programming	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
2.1.a.1.2 Inform populations about periods of disturbance	Existence of a communication plan on blackout periods	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
2.2.a.1.3. Provide men with flags to organize traffic on the site	Number of men with flags to regulate traffic in the construction area	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt CNSR	-
2.4.b.1.1 With equal skills, give priority to local labor	Percentage of local workers recruited	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-

2.4.a.2.2. Respect the contractual deadlines for the execution of the work	Work schedule	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	-
2.4.a.3.1. Develop and implement a Hygiene, Health, Safety and Environment Plan	Existence of a Hygiene, Health, Safety and Environment Plan Activity report available	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	-
2.4.a.3.2. Periodically educate workers on safety measures at work	Number of awareness sessions carried out per quarter	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	-
2.4.a.3.4. Provide the construction site with a medicine box	Presence of a box well-equipped pharmacy on the site	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	15,000,000
2.4.a.3.5. Recruit an HSE manager on site	Presence of an HSE manager on site	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	-
2.4.a.3.6. Develop and implement an emergency plan (POI or PU) in the event of accidents and/or fire	Contingency plan available and implemented Number of simulations	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt National group of firefighters	-
2.4.a.5.1. Raise awareness among site personnel and local residents on preventive methods to fight against STIs and HIV/AIDS	Number of awareness sessions carried out per quarter	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDS Atlantic Local monitoring committee DDCVDD AtI/Litt	20,000,000
2.4.a.6.1. Provide the base of the construction site with garbage cans and subscribe to a pre-waste collection structure	Number of bins installed on site Subscription contract to a solid waste pre-collection structure	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT AtI/Litt Local monitoring committee DDCVDD AtI/Litt	-
2.4.a.6.2. Equip the construction site with toilets	Number of toilets installed on site	Work phase	Company in charge of the works	City hall of Cotonou DDIT AtI/Litt	-

			MOD SEES	Local monitoring committee DDCVDD Ati/Litt	
2.4.a.6.3. Define and implement a site waste disposal plan (solid waste, toilets, inert waste, etc.)	Site waste disposal plan approved and implemented	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	
2.4.a.7.1. build a watertight platform for hydrocarbon handling	Presence of a watertight platform for storage and manipulation of hydrocarbons	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
2.4.a.7.2. Set up an adequate collection system for used oils and monitor it.	Existence of sealed containers for storing used oils Contract with an approved structure for the removal of used oils	Work phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt	-
3.1.b.1.1 Put in place speed limitation devices when descending the flyover	Number of speed limit signs installed	Operation phase	Company in charge of the works MOD SEES	City hall of Cotonou DDIT Ati/Litt Local monitoring committee DDCVDD Ati/Litt CNSR	-

To ensure the implementation of the ESMP, a number of bodies will be mobilized. Table 67 shows the organs for the implementation and supervision of socio-environmental measures.

10.3. Organizational structure of environmental management and monitoring.

Table 66: Roles and responsibilities of the organizations concerned in the implementation of environmental management

Step	Organisation name	Roles and responsibilities
Before and during the works (3 years)	Mission de contrôle	
	MCVTDD/SIRAT	It coordinates with each of the organisations concerned to implement the environmental and social management plan (ESMP). It supervises the ESMP implemented by the construction company. He examines and approves the environmental monitoring report submitted by the supervising construction consultant and the environmental consultant, and gives them the necessary instructions. Once the report has been approved, he forwards it to the EBA.
	Project Management Consultant	Based at the site office, he will supervise the Project's construction company on a full-time basis, working with the environmental consultant as part of the construction supervision consultant. He oversees the technical, scheduling and safety aspects of the Project.
	Environmental consultant	He supervises the monitoring and mitigation of negative impacts, which are approved and implemented on site. In addition, he periodically attends meetings with the supervising construction consultant, the executing agency and the contractor to share information. He reviews and revises the environmental monitoring report (RSE) submitted by the Project construction company and forwards it to the implementing body (MIT and SEES).
	Project construction company :	
	Construction company (contractor)	Under the instructions of the supervising construction consultant and the environmental consultant, it implements the approved EMP. Periodically, on a weekly or monthly basis, it sends the environmental consultant a report (CSR) on all measures taken to mitigate negative impacts on the site.
	Administration	
	Benin Environment Agency (ABE)	It is responsible for implementing national environmental policy. It works in collaboration with other sectoral ministries, local authorities, non-governmental bodies, civil society and the private sector. It manages all environmental assessment procedures and is legally responsible for validating ESIA's and other types of environmental assessment.
After commissioning (3 years)	Cotonou Town Hall	The municipality gives its opinion whenever there are plans to carry out a project on its territory that is likely to harm the environment. As the beneficiary of the Cotonou flyover development project, the Mayor of Cotonou has a dual responsibility. Specifically, prior to the start of construction work, it has a duty to manage all issues relating to the involuntary displacement of populations. To this end, it will set up a Local Resettlement Committee in each district affected.
	Implementing organisation :	
	SIRAT	On the basis of the approved ESIA, it carries out environmental monitoring and environmental management for a period of 3 years. It periodically submits the results of the environmental monitoring to the EBA.
	Administration	
	Cotonou Town Hall	It is responsible for implementing the national environmental policy adopted by the government as part of its development plan. It works in collaboration with other sectoral ministries, local authorities, non-governmental bodies, civil society and the private sector.
	Cotonou Town Hall	Once the flyover has been built, it is responsible for its maintenance.

Source: JICA Study Team

For a targeted intervention, a monitoring plan is proposed for the implementation period and after the completion of the Project.

10.4. Environmental monitoring plan.

The environmental monitoring and follow-up program makes it possible to ensure the application of mitigation measures and to document certain long-term impacts of the project on the environment, including those that cannot be anticipated. In this case, it will be necessary to ensure that the mitigation measures are correctly applied.

Table 67: Environmental monitoring program and mitigation measures (plan)

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
Before the works									
Natural environme nt	1	Ecosyste m	Release of rights of way	If necessary, draw up an afforestation program for the crossroads and the edges of the roads.	Road geometry Selection and layout of fixed installation sites	Consultant under contract	SEES and the authorities concerned	City hall of Cotonou EBA	
Social environment	2	Acquisitio n of land and resettlem ent of inhabitant s	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those concerning assistance in the recovery of means of subsistence. The implementation of the monitoring of the living standards of the resettled residents, according to the defined abbreviated resettlement plan.	Compliance with PAR	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou EBA	
	3	Poor class	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those concerning assistance in the recovery of means of subsistence. The implementation of the monitoring of the living standards of the resettled residents, according to the defined abbreviated resettlement plan.	Compliance with PAR	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou EBA	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
	4	Local economy providing the population with jobs and subsistence	Release of rights of way	The holding of an explanatory meeting on the compensation policy provided for in the context of the right-of-way of the land. Residents to be resettled will all be invited to understand the policy and obtain their consent. Taking the measures prescribed in the defined abbreviated resettlement plan, including compensation and those relating to the recovery of livelihoods.	Road geometry Information and public consultation (for the record) Compensation for expropriated persons (for the record) Preservation of constructions on rights-of-way Information of the populations on the interruptions of networks	Resettlement Technical Committee	SEES and the authorities concerned	City hall of Cotonou EBA	
During the works									
Measure against pollution	5	Air pollution	Realization of infrastructure: - work on the right-of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	[Measurement against fine suspended particles] - Watering in construction areas and temporary installations; - Dust screens will be placed around the demarcation lines, as required.	Coverage of material transport trucks Installation of the asphalt plant Compliance with gas emission standards Standard-compliant gas emission measurements	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	
	6	Water pollution	construction wastewater	- Installation, as needed, of a temporary grit trap - Appropriate management, treatment and disposal of hydrocarbons - Installation of latrines at the base of the project; - Appropriate treatment and disposal of human excrement collected at the base camp;	Stream bed cleaning and restoration Management of liquid pollutants and solid waste Wastewater analysis results	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
	7	Waste	Discharge of construction waste	[Construction site waste] - Construction site waste (felled trees, excess earth, cuttings) will be managed as necessary, depending on the nature of the waste to be reused or disposed of in the public dump, in accordance with the regulations in force in the country; - Appropriate management, treatment and disposal of waste from the base camp; - Human excreta will be disposed of at the designated sewage treatment plant, after temporary storage within the project in a slop tank.	Management of liquid pollutants and solid waste Presence of latrines on the site	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	
	8	Noises and vibrations	Realization of infrastructure: - work on the right-of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	- Use of low-noise construction machinery and equipment, limitation of the work schedule; - If necessary, installation of a noise barrier (sheet piling or tarpaulins)	Arrangement of working hours	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	
Natural environment	9	Nature reserve	<i>Ditto</i>	refer to Air Pollution, Water Pollution, Waste, Noise and Vibration	-	-	-	-	
	10	Ecosystem	<i>Ditto</i>	Carrying out the program by planting trees.	Reforestation actions Preservation of alignment plantations Line plantings	Co-Sensitization of staff to environmental protection consulting under contract	SEES and the authorities concerned	City hall of Cotonou EBA	
Socio	11	Local economy	Realization of infrastructure:	In order to ensure traffic at avenue François Mitterrand, a relief route will be	income level	Construction contractor	SEES	City hall of Cotonou EBA	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
		providing the population with jobs and subsistence	- work on the right-of-way, earthworks, pavement layers and coating	set up and, if necessary, other routes giving access to commercial facilities located along the road. Public car parks will be set up which will be used during the works. Losses of earnings suffered by local traders will be subject to compensation, if applicable.		(Construction company) Compensation for loss of earnings will be provided by Benin.			
	12	Existing social infrastructure and social services	<i>Ditto</i>	The transfer of utilities and public facilities through consultation with the authorities concerned. Provide in the work schedule for road traffic to be maintained during the work. The traffic management plan to ensure traffic flow	access to infrastructure	Construction contractor (Construction company)	SEES and the authorities concerned	City hall of Cotonou EBA	
	13	Unequal distribution of damages and benefits	<i>Ditto</i>	Provide in the work schedule for road traffic to be maintained during the work. The traffic management plan to ensure traffic flow	income level access to houses / shops / infrastructure	Construction contractor (Construction company)	SEES and the authorities concerned	City hall of Cotonou EBA	
	14	Gender	Employment of construction workers	equal pay for men and women facilities for female workers	salary facilities	Construction contractor (Construction company)	SEES and the authorities concerned	City hall of Cotonou EBA	
	15	Children's rights	Employment of construction workers	The prohibition of child labor will be stipulated in the contract for construction works. The possible presence of working children will be monitored and strictly controlled.	detection of child labor	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	
	16	Infectious disease	Influx of construction workers	The site will be equipped with a proper drainage system with the aim of eliminating any mosquito habitat. Sanitary facilities (latrines) will be made available to workers. The implementation of medical examinations and the mandatory periodic medical visit. For the prevention of infectious diseases, organize educational activities not only for	Staff awareness of STIs/AIDS	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
				construction workers, but also for local residents.					
	17	Work environment (including work safety)	Realization of infrastructure: - work on the right-of-way, earthworks, pavement layers and coating - transport of fine materials (loamy sands) - operation of the asphalt plant	Ensure the working environment in accordance with the requirement of IFC(SFI) (Performance Standard 2 Workers and Working Conditions)	The emergency plan is implemented Monthly IEC reports Annual internal audit report Compliance with work safety rules	Construction contractor (Construction company)	SEES	City hall of Cotonou EBA	
Others	18	accidents	Passage of construction vehicles	- Installation of traffic controllers - Installation of safety panels - Marking of the work area, using signs and barriers of security - Lighting for night work - Development of car parks and waiting areas for works machinery - Traffic speed limit on site - Organization of safety training for construction workers. - Implementation of detour routes, during the work period, for the safety of local residents, commuters and schoolchildren.	Specific road signs and traffic officers are visible Weekly outreach reports Activity reports Number of awareness sessions carried out Signaling of construction sites and maintenance of traffic	Construction contractor (Construction company)	SEES		
In service									
Measure against	19	Air pollution	Passing more vehicles	- proper vehicle maintenance	Compliance with gas emission standards	Road operator	SEES and the authorities concerned	City hall of Cotonou EBA	-

Category	No.	rubric	period Impact-generating activities	Main Planned Mitigation Measures of Environmental Impacts		Implementing and supervisory bodies			cost for mitigation measures
				measures	Indicators	Executive body	Supervisory body	monitoring body	
					Standard-compliant gas emission measurements				
	20	Water pollution	Road discharge	- adequate road drainage	Wastewater analysis results	Road operator	SEES and the authorities concerned	City hall of Cotonou EBA	
	21	Noises and vibrations	Passing more vehicles	- Depending on the need, noise barriers will be installed.	noise and vibration level	Road operator	SEES and the authorities concerned	City hall of Cotonou EBA	
Others	22	accidents	Passing more vehicles	Installation of safety signs (Speed limit, prohibition to cross, except at the passage provided for this purpose, etc.)	Number of accidents	-	SEES	City hall of Cotonou EBA	

Source: JICA Study Team

Table 68 : Monitoring plan

No.	Environmental elements	Elements	Location	Frequency (duration after commissioning is also indicated)	Supervisory body	monitoring body	cost
<u>Before the work:</u>							
1	Ecosystem	• Green spaces are established and maintained	Area concerned by the Project	Before the works	SEES	City hall of Cotonou EBA	included in design cost
2	Acquisition of land, resettlement of inhabitants	• Clearing Fee Payment Status	Area concerned by the Project	Before the works	SEES	Consultant	included in RAP budget
3	Poor class	• <i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>
4	Local economy providing the population with jobs and subsistence	• <i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>	<i>Same</i>
<u>During the works :</u>							
5	Air quality	• NO ₂ • SO ₂ • CO	Establishments to preserve such as the school and the church located near the site	Once/month	SEES	City hall of Cotonou	included in the construction cost

		PM2.5 et PM10				EBA	
6	Water quality (surface)	- BOD - SM - COD - Total oil and fats - PH - Temperature, - etc	Marsh located southeast of the site	Once/month	SEES	City hall of Cotonou EBA	included in the construction cost
7	Waste	liquid pollutants and solid waste Latrines on the construction site	Area concerned by the Project Disposal site	Once/month	SEES	City hall of Cotonou EBA	included in the construction cost
8	Noise	Leq(A)	Establishments to be preserved such as the school, the church and housing located near the site	Once/month	SEES	City hall of Cotonou EBA	included in the construction cost
9	Nature reserve	refer to Air Pollution, Water Pollution, Waste, Vibration					
10	Ecosystem / Landscape	Green spaces are established and maintained	Area concerned by the Project	after construction	SEES	City hall of Cotonou EBA	included in the construction cost
11	Local economy providing the population with jobs and subsistence	- Traffic situation - Complaint of affected residents	Area concerned by the Project	Once/3 months	SEES	Consultant	included in RAP budget
12	Existing infrastructure and social services	- Traffic jam - Traffic situation - Complaint of affected residents	Area concerned by the Project	Once/3 months	SEES	Consultant	included in RAP budget
13	Unequal distribution of damages and benefits	- Traffic jam - Traffic situation - Complaint of affected residents	Area concerned by the Project	Once/3 months	SEES	Consultant	included in RAP budget
14	Gender	- salary - facilities	Construction site	Once/3 months	SEES	City hall of Cotonou EBA	included in the construction cost
15	Children's rights	detection of child labor	Construction site	Once/3 months	SEES	City hall of Cotonou EBA	included in the construction cost
16	Infectious disease	Number of awareness sessions carried out	Construction site	Once/3 months	SEES	City hall of Cotonou	included in the construction cost

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17	Work environment (including work safety)	• safety training • security equipment	Construction site	Once/month	SEES	EBA City hall of Cotonou	included in the construction cost
18	accidents	• Specific road signs and traffic officers • Number of awareness sessions carried out • Signaling of construction sites and maintenance of traffic	Construction site	Once/month	SEES	EBA City hall of Cotonou	included in the construction cost
After commissioning:							
19	Air quality	• NO₂ • SO₂ • CO • PM2.5 et PM10	Establishments to be preserved such as the roadside hospital and church	Once/3 months (2 years after commissioning)	SEES	EBA City hall of Cotonou	FCFA 350,000
20	Water quality (surface)	• BOD • SM • COD • Total oil and fats • PH • Temperature	Marsh located southeast of the site	Once/6 months (2 years after commissioning)	SEES	EBA City hall of Cotonou	FCFA 350,000
21	Noise and vibration	• Leq(A) • m/s²	Establishments to be preserved such as the hospital, church and roadside dwellings	Once/3 months for noise and once every 6 months for vibration (2 years after commissioning)	SEES	EBA City hall of Cotonou	FCFA 350,000
22	Local economy such as employment and livelihoods etc.	• Revenue	Area concerned by the Project	3 years after commissioning	SEES	Consultant	included in RAP budget

Source: JICA study mission

10.5. Stakeholder engagement (two-stage consultation meetings to engage the public)

In the general ESIA guide, it is clearly indicated that if the impact study proves to be an essential tool in the identification and evaluation of the consequences and repercussions that certain projects may have on the natural and human environments, however, it cannot be exhaustive. It can neither determine with a sufficient degree of precision what is desirable or a priority, nor evaluate according to a scale of values what is compatible with the quality of life of the citizens of a given region or locality. Public participation allows people, groups or municipalities affected by the project to have access to technical information, to express their opinions on the project and to highlight the collective values that must be considered in decision-making.

The public consultation makes it possible to verify whether there are no unforeseen consequences to the implementation of a project. In addition, it makes it possible to carry out a summary inventory of the goods and people affected. It is separate from the public hearing procedure. The public consultation also makes it possible to identify the blocking factors of the project and to provide adequate responses to them for the benefit of the stakeholders. Concerning the project of construction of the flyover, the questions of land, the questions of displacement of networks and commercial position, if they are not treated with tact, risk hindering the process of implementation of the said project.

In addition to the public nature of the meetings, the target groups identified were officially invited through the heads of the districts and heads of neighborhoods who actively invested in mobilizing the public. It emerges from the various public consultations that the participants and especially the local populations are aware of the relevance of the project. They are aware of the causes of traffic jams and their consequences. They also recognize their role in the realization of projects, but sometimes take the politico-administrative authorities as responsible. However, concerns have been registered everywhere else, including:

- informing the people affected before the demolition works;
- Compensation for affected persons;
- pollution problems and various nuisances;
- Local staff recruitment;
- raising workers' awareness of bad behaviour;
- the safety of users during the works;
- traffic problems during the works;
- Accident risks;
- the involvement of the town hall, local elected officials and local populations (local residents' committee) in raising awareness and monitoring the work;

- etc.

10.6. Consultation with stakeholders

To involve the populations in general and the target groups directly concerned by the project in particular, several public consultations were carried out. Through these consultations, local residents have shown that they have already understood the need for the Project. And expressed their concerns, particularly about access during the works and the diversion route, and explanations were provided to them during the discussion. The following points were addressed during the consultation with local residents:

- Current situation of the Vêdoko intersection;
- Result of the traffic volume study;
- Overview of the Project and its options;
- Image of the intersection produced by the Project;
- Areas undergoing impacts;
- Project impacts;
- Work schedule;

The summary of public consultations (Table 70) presents the categories of people who participated in these meetings, the subjects discussed, the questions raised by the PAPs, the answers provided by the consultant and the civil engineering technician. Suggestions and recommendations were made by participants. (cf. Minutes of the consultation related to the principles of eligibility and consultation in Annex 1).

Table 69: Results of stakeholder consultations _

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
October 6, 2022	13th district –	Total of Participants: 10, Population: 00 Local officials: 05 BANCA: 05	❖ The diversion route must be well studied, as it would have a significant impact on the neighborhood. ❖ It is desirable that the intersection be designed taking into consideration all surrounding roads. ❖ It is desirable to favor local labor ❖ It is desirable to take flood risk management measures in the Project. ❖ What is the exact extent of the area that is impacted? ❖ Will access during the works be in place?	❖ It is examined as part of the study. The project will be designed so as not to interrupt traffic at the intersection. ❖ They are taken into consideration during the study. ❖ Arrangements will be made to ensure the recruitment of local labor ❖ Flood prevention measures are included in the Project. ❖ The physical impact concerns only the mobile phone store and the wall in front of the CFAO building. ❖ The layout of the access will be studied in the planning of the construction works.
8, 2022	13th district –	Total participants: 06 Population: 00 Local Officials: 03 BANCA: 03	❖ The diversion route must be well studied, as it would have a significant impact on the neighborhood. ❖ It is desirable to take flood risk management measures in the Project. ❖ It is advisable to examine the possibility of hiring local residents for the works. ❖ The limitation of access to the stores during the works is to be feared.	❖ These issues will be taken into account in the EMP. The project will be designed so as not to interrupt traffic at the intersection. ❖ Flood prevention measures are included in the Project. ❖ It will be taken into consideration within the framework of the ESIA and the PAATRP. ❖ The layout of the access will be studied in the planning of the construction works.
October 10, 2022	13th district –	Total of participants : 17	❖ What is the duration of the work?	❖ It is estimated for about 4 years.

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
		Population : 13 Local Official : 01 BANCA : 03	❖ The diversion route must be well studied, as it would have a significant impact on the neighborhood. ❖ Take flood risk management measures in the Project. ❖ Examine the possibility of hiring local residents for the works. ❖ Work together with local authorities to better define the route of diversions. ❖ Set up a project management committee at the borough level	❖ These issues will be taken into account in the EMP. The project will be designed so as not to interrupt traffic at the intersection. ❖ Flood prevention measures are included in the Project. ❖ It will be considered as part of the EIA and PAATRP.
Friday, October 21, 2022	Office of the Mayor of Cotonou	Total participants: 09 Population: 00 Local officials: 05 BANCA : 04	❖ Why do we need to update studies? ❖ What is the theoretical duration of the work ❖ When does the work actually start? 	❖ The studies were carried out in 2019. Three years after these studies, the work has not started. For the imminent implementation of the project, the studies must be updated taking into account the new aspects of the project. ❖ The duration of the works is 04 years ❖ At the latest in 2023 with the displacement of the networks.
Friday, November 18, 2022	Meeting room of the 10th District offices	Total participants: 55(40 men, 15 women) Population: 36 Local officials: 15 BANCA: 04	❖ What is the fate reserved to companies finding themselves in the right-of-way of the works, as well that the delay granted for moving ❖ What are the risks related to the reduction in the width of the	❖ As part of the project, no involuntary movement is planned outside of a shop located at the crossroads, as well as the two service stations located at the "LA VIE" crossroads. ❖ The developments to be made at the level of the

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
			roadway at the level of the church Catholic Jesus Eucharist and CFAO Motors ❖ How will the rubbles be managed? ❖ What are the procedures for recruiting local labor _ ❖ How will the issue of population mobility be resolved during the works? ❖ What is the duration theory of work ❖ What is the fate reserved for people affected by the project ❖ During construction, will there be no traffic jams at the General Mathieu Kerekou Stadium intersection? ❖ Some companies in charge of the execution of the works do not respect the technical standards after the signature of the contracts. Trenches are opened without protection. Trucks are speeding. So many things that cause fatal accidents. ❖ What is planned within the framework of this project to avoid similar situations?	Jesus the Eucharist Catholic Church and CFA Motors will not result in any reduction in the width of the roadway. ❖ The management of the rubble will be done at the level of the Town Hall ❖ Priority will be given to local labor but the emphasis will be on skills. ❖ The recruitment procedure will be transparent. ❖ Diversion routes are planned to facilitate the mobility of populations during the works. ❖ The duration of the works is 04 years ❖ People affected by the project will be compensated ❖ A series of developments are planned at the crossroads " LA VIE " , AGONTINKON and the roundabout of the Red Star to settle this question. ❖ Occupational safety and risk management will be a priority during the construction works. ❖ Speed limiting devices will be installed on trucks ❖ Occupational health and safety teams will be installed on the site in addition to the control mission

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
				
Thursday, November 24, 2022	Meeting room of the offices of the 11th - District	Total participants: 29 (22 men, 07 women) Population: 21 Local officials: 06 BANCA: 02	❖ What major changes have occurred at the project level since 2019 ❖ How will the rubble be managed ❖ Extraordinary slowness is observed in the processing of compensation files ❖ The detours constitute a real danger for the populations because of the excess speed observed by the trucks ❖ How will the populations access the houses located in the right-of-way of the works?	❖ In 2019, the end date of the first and second phases were unknown to the public ❖ The rubble will be managed at the level of the Town Hall ❖ Compensation will be paid to those affected as soon as the files are processed. Because it is public money and its management must be orthodox ❖ Safety devices will be installed at the level of the diversion lanes and even on the trucks transporting the materials. ❖ Walkways will be installed where needed

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
Thursday , November 24 , 2022	Office meeting room 13th - District	Total of participants: 44 (20 men, 24 women) Population: 37 Local officials: 05 BANCA: 02	❖ What are the routes chosen as diversion routes in the Ahogbohoulé-Eucharistie district? ❖ What is planned to facilitate the crossing of the Carrefour VEDOKO – Stade Général Mathieu KEREKOU interstate road for populations who are often victims of fatal accidents? ❖ The Ahogbohoulé district has become a flood zone due to the asphaltting of the roads. ❖ What is planned within the framework of this project so that the situation does not become alarming ❖ The amounts of compensation are often derisory and do not take into account the actual duration of the work ❖ Why was the updating of the list of people affected not entrusted to investigators from the neighborhood rather than to foreigners who do not master certain realities? ❖ What will be the fate of local labor during the works? ❖ What is the length of the work	❖ The detour routes will be chosen by the company that will be in charge of the works. ❖ Traffic lights, traffic lights will be installed at the level of the structure ❖ The situation will improve in the Ahogbohoulé district upon completion of the rainwater drainage project in the city of Cotonou ❖ Compensation takes into account a number of parameters unknown to citizens ❖ Investigators assigned to the census of affected people undergo appropriate training before the launch of operations ❖ Hiring operations will be transparent ❖ Bridge: 270m
29/12/2022	Office of the 10th District	Total of participants: 31 (23 men, 08 women) Population: 16 Local officials: 12	❖ What is the effective starting date of the project?	❖ The project has already started with the study phase (ESIA, RAP, etc.) - Normally the phase of moving the networks (SBEE, SONEB, SNIB) should follow one another if there had not

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
		BANCA: 03	❖ What are the reasons for increasing or decreasing the amount of compensation? ❖ What about the Complaint Management Committee ❖ By what mechanisms will the local workforce be recruited in priority? ❖ What happens to a person impacted by multiple projects? ❖ What is planned to facilitate the crossing of the road at the level of the Parish Jesus Eucharist and at the level of the crossroads "LA VIE"?	been certain dysfunctions in the procurement process ❖ The ANDF is the only structure competent to assess the amount of compensation. It ensures that there is no double or triple compensation. Because several projects are carried out in the area, namely the Millenium Challenge, the PAPC, the paving phase 2, etc. ❖ A Local Compensation Committee exists at the District level and a Technical Compensation Committee exists at the Town Hall level. ❖ Labor recruitment will be competency-based and transparent. ❖ Compensation will be for a single project. ❖ Studies are underway to see the possibility of building footbridges at these levels. 
29/12/2022	11th District Office	Total participants: 15 of 03 (12 men, women) Population: 07 Local officials: 05 BANCA: 03	Some concerns raised during the meeting of Thursday, November 24, 2022, have resurfaces. This is in particular : ❖ How will the spoil be managed? ❖ A extraordinary slowness is observed in the processing of compensation files	❖ Safety devices will be installed on the detour roads and even on the trucks transporting the materials ❖ Walkways will be installed if necessary

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
			❖ The detours constitute a real danger for the populations due to excessive speed observed by trucks ❖ How are the people access to houses located in the scope of the work? 	
29/12/2022	13th District Office	Total participants: 11 of 06 (05 men, 06 women) Population: 08 Local officials: 00 BANCA: 03	Some concerns raised during the session of Thursday, November 24, 2022, have resurfaced. These concerns include: ❖ What are the roads chosen as bypasses in the Ahogbohoulé-Eucharistie district? ❖ What is planned to facilitate the crossing of the interstate road Carrefour VEDOKO - Stade Général Mathieu KEREKOU to the populations often victims of fatal accidents? ❖ The Ahogbohoulé district has become a flood zone due to the paving of the roads. ❖ What is planned in the framework of this project to prevent the situation from becoming alarming? ❖ The amounts of compensation are often derisory and do not take	The necessary clarifications to these various concerns can be summarized as follows: ❖ The detour routes will be chosen by the company in charge of the work ❖ Traffic lights will be installed at the level of the work ❖ The situation will improve in the Ahogbohoulé district once the rainwater drainage project in the city of Cotonou is completed ❖ Compensation takes into account a number of parameters unknown to citizens ❖ The investigators assigned to the census of affected persons receive appropriate training before launching the operations

Date	Location	Number of participants	Concerns and worries	Responses and Countermeasures
			into account the real duration of the work ❖ Why has the updating of the list of people affected not been entrusted to investigators from the neighborhood rather than to foreigners who do not master certain realities? ❖ What will be the fate of the local workforce during the work? ❖ How long is the work?	❖ The hiring operations ❖ hiring will be transparent ❖ 500 m including the 270 m bridge
29/12/2022	Office of the Mayor of Cotonou	Total of participants : 07 (06 men, 01 women) Population: 00 Local officials: 03 BANCA: 04	The major concern raised after the summary made to the Mayor, is what mechanism to put in place to ensure harmonious coordination of all the projects running in the area. The wish expressed by the Mayor is that appropriate solutions be found to the dysfunctions that occurred during the award of contracts, so that the construction work can start as soon as possible for the happiness of the populations.	

Source: JICA Study Team

Plates 9 and 10 provide an overview of the various public consultations held in the project's host environment.



Plate 9: View of the assembly and the presidium during the public consultation organised at Cotonou town hall in the presence of the project owner (MIT)

Shooting: BANCA, January 2020



Plate 10: Phase of gathering concerns and providing responses

Shooting: BANCA, January 2020

XXIII. ARBITRATION PROCEDURES/COMPLAINTS MANAGEMENT MECHANISM

The World Bank's Environmental and Social Standard 5 and JICA's Guidelines for Environmental and Social Considerations emphasize that the borrower shall establish a complaint management process to receive concerns and complaints from project-affected parties in relation to the project. The World Bank's Environmental and Social Standard 5 and JICA's Guidelines for Environmental and Social Considerations state that the complaint management mechanism should be established as early as possible in the project preparation phase, to deal in a timely manner with specific concerns raised by displaced persons (or others) in relation to compensation, resettlement or livelihood restoration.

In any resettlement process, difficulties of various kinds may arise in the form of complaints. To this end, a complaints management mechanism (MGP) has been set up and made operational. The MGP is structured at three levels: the local complaints management committee, the communal complaints management committee and the national complaints management committee.

The following mechanism is proposed to resolve conflicts that may arise as a result of project implementation.

10.7. How to access the Complaints Handling Mechanism

The way in which complaints are lodged will be diversified to respect the principle of accessibility and contextualisation. Different points and channels will be used for lodging complaints:

- ✓ by self-referral to the various complaints management committees ;
- ✓ by formal letter sent ;
- ✓ by e-mail; or
- ✓ by telephone call, SMS, WhatsApp
- ✓ by sending an anonymous message depending on the sensitivity of the complaint;
- ✓ by contact via the SIRAT website;
- ✓ by presentation of the complainant,
- ✓ Through an intermediary.

A communication plan on the MGP with a focus on procedures for managing sensitive complaints will be developed in order to inform all Project stakeholders through the various channels, with particular attention paid to communicating with vulnerable groups in beneficiary communities, employees and workers associated with the Project.

10.8. Organisational framework of the CMM

10.8.1. Different levels of non-sensitive complaints management

The implementation of the CMM will be based on a three (03) level organisation chart, namely: the base committee (neighbourhood/District), the communal level and the higher level (Project Management Unit). This arrangement will be put in place to ensure better accessibility and facilitate local management of complaints.

- ◆ **Level 1:** This is the District Complaints Management Committee (CAGP), which will be set up at District level in the project area. It will be chaired by the Heads of the said Districts (CA). The Committee will be set up and formalised by a municipal by-law.
- ◆ **Level 2:** the Communal Complaints Management Committee (CCGP) will be set up at Cotonou Town Hall. This is the body responsible for resolving complaints that have not been dealt with at the first level of management (CAGP). If a complaint cannot be resolved at the first level (neighbourhood/district), an amicable settlement will be sought through arbitration by the committee at the municipal level, wherever possible with a view to reaching a consensus. The Committee will be set up and formalised by a municipal by-law. It will be chaired by the Mayor or his representative.
- ◆ **Level 3:** this is the National Complaints Management Committee (CNGP), which is set up at the level of the Project Coordination Unit. This committee is responsible for steering the MGP. To this end, it is the supreme body for resolving complaints and appeals not settled by the Committees set up at levels 1 and 2.

NB: when a quorum is reached, the committee members can sit and take decisions.

Any complainant may refer the matter to any level that suits him or her, either in person or in writing (email, text message, WhatsApp, hard copy) or by calling the dedicated telephone number. The complaint will be recorded and dealt with within the time limits set out in the specific procedures for each level and on a case-by-case basis. However, it should be noted that any complaint received by any level and/or format must be notified in writing and recorded on the computerised complaints management platform.

In addition, the Project will endeavour to put in place procedures enabling stakeholders to have access to accurate information in a timely manner; complainants to express themselves freely in the best possible conditions (without wasting time and at no cost); victims of degrading behaviour to benefit from anonymity, confidentiality, security, transparency, equal rights and to be taken care of in a timely manner. A strategy will be developed to enable all complainants and in particular vulnerable people (elderly complainants, women, widows, poor women, young people, under-age girls, etc.) to access and participate in the process of resolving their complaints and grievances.

The various players in the complaints management chain will be informed and trained on the organisational provisions of this mechanism. In this way, all complaints management bodies will take ownership of the operating procedure of the Complaints Management Mechanism (CMM) as described in section 6 of this document.

10.8.2. Composition of comitees by level

The bodies of the MGP that will be set up by an administrative act of the competent structures on the creation, composition and operation of the complaints management committees are presented in table 72.

Table 70 : Composition of complaints management bodies and supporting documents for committees

Comitees	Compositions	Actors	Responsibilities
District Complaints Management Committee (DCMC)			
CAGP	Chairman	District Manager	Coordinates the complaints management process, particularly the investigation aspects of the process, and transfers unresolved complaints to the next level.
	Reporter	District Secretary	- Receiving and recording complaints; - Support in handling complaints and drafting decision minutes (reporting).
	05 members	-Heads/neighbourhoods concerned ; - one youth representative; - two representatives of the PAPs (Men and Women) as part of a sub-project; - a representative of the District Development Association.	- Support in raising awareness and providing information about the MGP; - Support for processing, researching and proposing responses to complaints.
	Headcount	07 (dont au moins trois Womens de préférence)	
Communal Complaints Management Committee (CCGP)			
CCGP	Chairman	Mayor of Cotonou or his/her representative	Coordinates the complaints management process and transfers unresolved complaints to a higher level (CNGP)
	Reporter	Technical officer of the town hall	– Support for mobilisation and information; – support in handling complaints; – Drawing up minutes of decisions (reporting).

Comitees	Compositions	Actors	Responsibilities
District Complaints Management Committee (DCMC)			
	07 members	- One (01) representative of the Direction Départementale du cadre de vie et des transports in charge of sustainable development; - One (01) representative of the Cotonou City Council's estates, land and environment department - one (01) representative of young people; - one (01) representative of the PAPs; - one (01) representative of a women's organisation at District level or representative of an NGO working on gender issues.	– Support in handling and responding to complaints; – raising awareness and providing information about the MGP; – support in the payment of compensation; – processing complaints and drafting decision minutes (reporting); – Support for social mediation.
	Headcount	07 (preferably including at least three women)	
National Complaints Management Committee (CNGP)			
CNGP	Chairman	DG SIRAT or his/her representative	Coordinates the complaints management process.
	Vice-Chairman	UCP Coordinator or his/her representative	Coordinates the complaints management process.
	Reporter	UCP Environmental and Social Safeguarding Specialist	- Support in coordinating the complaints management process, finding solutions and implementing them; - management of the computerised platform; - support for social mediation.

Comitees	Compositions	Actors	Responsibilities
District Complaints Management Committee (DCMC)			
	1 member	- a youth representative; - one (01) representative of the Directorate-General for Social Affairs and Microfinance (DGAS); - one (01) representative of the Institut National de la Women (INF); - a representative of SMEs and Employment Promotion; - one (01) representative of the Minister for the Living Environment and Transport in charge of Sustainable Development; - The Director General of ANDF or his/her representative; - SIRAT's Environmental and Social Safeguarding Specialist - SIRAT's Project Legal Manager	– Appui au traitement et la réponse aux plaintes ; – sensibilisation et information sur le MGP ; – appui à la recherche de solution pour les cas complexes ; – appui dans le paiement des compensations ; – appui à la médiation sociale.
	Headcount	12 (including at least 05 women, preferably)	
Support materials for complaints management committees			

Comitees	Compositions	Actors	Responsibilities
District Complaints Management Committee (DCMC)			
Project Complaints Management Mechanism Manual ; A register for recording and following up solutions to complaints (complaints registration form, complaint resolution report form, complaint follow-up sheet, complaint fence sheet); Information flyers; Audio-visual clips; Android phone; Communication credit and internet connection.			

Source : Enquête de terrain, BANCA novembre 2022

N.B:

- ◆ With the exception of sensitive complaints, all committee members may receive complaints and may also directly acknowledge receipt of complaints received.
- ◆ Each complaint handled or not handled within the committees must be the subject of a report and must be recorded on the Project's computerised complaints management platform (to be developed) by the main users of the system at UCP level (in this case the Environmental and Social Safeguarding Specialists at SIRAT and UCP). The computerised platform will be equipped with an automatic system for recalling unprocessed complaints.

10.9. Role of complaints management committees**10.9.1. Districts complaints management committee (DCCM) : Level 1**

At this first level, the PGM is seen as a mediation tool for maintaining good relations with communities, local authorities and all other stakeholders. To this end, the role of the PMM is to:

- Raising awareness and informing beneficiaries and other stakeholders about the MGP in the three (03) Districts and neighbourhoods;
- receiving, recording and processing complaints and claims;
- receiving, recording and transferring complaints and claims that could not be dealt with at level 1 to the Communal Complaints Management Committee (level 2);
- notifying complainants of the outcome of complaints;
- Report and document the entire process.

10.9.2. Communal complaints management committee (CCMC) : Level 2

At level 2, the MGP is seen as a mediation tool for supervising the operation of the MGP at District level. To this end, the role of the CCGP is to:

- raising awareness and informing the beneficiary population and other stakeholders about the MGP at communal level;
- receive, record, process and archive complaints brought directly to his/her level by the complainant;
- receiving, recording and processing complaints and claims not resolved at level 1;
- receiving, recording and transferring complaints and grievances that could not be dealt with at level 1 to the national complaints management committee;

- raising awareness and informing the beneficiary population and other stakeholders about the MGP at communal level;
- receive, record, process and archive complaints brought directly to his/her level by the complainant;
- receiving, recording and processing complaints and claims not resolved at level 1;
- receiving, recording and transferring complaints and grievances that could not be dealt with at level 1 to the national complaints management committees

10.9.3. National complaints management committee (NCMC): Level 3

The NCMC is the national complaints management body for project activities. To this end, the role of the CNGP is to:

- raise awareness and train members of local and communal committees on the MGP ;
- Receive, record, process and archive complaints lodged directly with it by the complainant;
- receiving, recording, processing and filing complaints that have not been processed or resolved at levels 1 and 2;
- monitor the operation of level 1 and 2 complaints management committees;
- responding to and implementing corrective measures to resolve complaints;
- Monitoring, supervising, reporting on, capitalising on and archiving the implementation of the MGP.

The National Complaints Management Committee must, under normal conditions, satisfy the complainant's concerns. It is the supreme body for resolving out-of-court complaints and appeals that have not been settled by the committees set up at district and municipal level. If a complaint is not resolved by this committee, the complainant may appeal to the courts. It should be noted that the complainant may also refer the matter directly to the judicial authorities without going through the stages of this PGM.

Complaints are consolidated at PCU level. However, specific complaints relating to component 3 will be centralised at SIRAT level. To this end, the Environmental and Social Safeguards Specialists are responsible for registering complaints, organising field investigations for complaints that require prior investigation, mobilising committee players where necessary, providing technical support to the SPCs and monitoring the operation of the various complaints management bodies set up on behalf of the Project, and monitoring and evaluating complaints management and complainant satisfaction.

10.10. OPERATING PROCEDURE FOR THE MANAGEMENT OF NON-SENSITIVE COMPLAINTS

The procedure for managing complaints within the framework of this project involves nine (9) stages, from the registration of the complaint to its complete extinction and the archiving of the resolution file.

10.9.4. Step 1: Reception, recording of complaints and acknowledgement of receipt.

RECEIVING AND RECORDING COMPLAINTS

The channels for receiving complaints are diversified to respect the principle of accessibility and contextualisation. Complaints will be made: (i) verbally by telephone (landline or mobile); (ii) by toll-free number; (iii) in writing: email, SMS, letter; (iv) on the project's computerised complaints management platform; (v) on WhatsApp; (vi) in person; etc. Verbal complaints must be transcribed before the rest of the process to ensure traceability (by the secretariat).

Verbal complaints must be transcribed before the rest of the process in order to ensure traceability (by the secretariat of the complaints management body that received the complaint).

All complaints, whether verbal or written, depending on the level of processing, are recorded immediately in a register available from the various complaints management bodies set up. Addresses and contacts will be given to local residents during MGP dissemination activities. The register will be kept by the rapporteur of the committees, but each member will have complaint registration forms. Complaints can therefore be received by any member of the committee, but must be reported to the person keeping the register so that they can be formally recorded.

In addition to recording written or verbal complaints in the registers, complaints will also be recorded on the computerised complaints management platform.

ACKNOWLEDGEMENT OF RECEIPT OF COMPLAINTS

The members of the bodies (DCCM, CCMC and NCMC) who received the complaint must acknowledge receipt and assess its admissibility. Acknowledgement of receipt is issued by the members of the bodies set up at levels 1 and 2 (CAGP and CCGP) and by the Project's Social Development and Gender and Social Inclusion Specialists at CNGP level within a maximum of two (02) days for complaints lodged by formal and electronic mail. If the complainant submits the complaint himself/herself (by telephone call, text message or direct telephone exchange), acknowledgement of receipt is given or communicated immediately by giving the complainant a complaint reference number. When the complaint is made anonymously, it is processed within the same timeframe and distributed after a proposed response in the area of origin.

10.9.5. Step 2: Complaints examination

ASSESSING THE ADMISSIBILITY OF COMPLAINTS

La The eligibility decision only serves to prompt an initial assessment and response. The adjudicating body responsible for the initial response must follow clear 'guidelines' regarding the types of issues that can be dealt with under the

CMM.

The complaints management bodies (DCCM, CCMC and NCMC), in addition to assessing admissibility, must also decide whether the complaint should be referred to an entirely different resolution body within two (02) days of receipt. Admissibility is based on the following criteria:

- ✓ The complaint indicates that the Project or activities have caused an impact. Negative economic, social or environmental impact on the complainant or may potentially have such an impact;
- ✓ the complaint specifies the type of existing or potential impact, and the way in which the Project's activities have caused or may cause this impact;
- ✓ the complaint indicates that the persons making the complaint are those who have suffered the impact or are at risk; or represent affected or potentially affected stakeholders;
- ✓ the complaint does not relate to matters that have already been resolved to the satisfaction of the complainant;
- ✓ the complaint is sufficiently documented (any relevant documentation on the date, location, ownership, unit involved, copies of any letters or other supporting documents,

LABELLING OF COMPLAINT

Once a complaint has been received, the complaints handling bodies sort it out to distinguish between sensitive and non-sensitive complaints. Sensitive complaints are those involving a flagrant breach of the Code of Conduct, the Code of Ethics and the Safeguarding Children and Vulnerable Adults Policy. Non-sensitive complaints refer to all other forms of complaints or grievances relating to the implementation of project activities in general and the potential environmental and social risks and impacts of project activities.

The admissibility and categorisation of the complaint is assessed within two (02) days from the date of receipt. The complainant will be notified by the means he/she chooses.

10.9.6. Step 3: Investigation into the legitimacy of the complaints

At this stage, information and evidence will be collected to help establish the accuracy and objectivity of the complaint and to select solutions in response to the complainant's queries or

complaints. Although the members of the level 1 and 2 committees (DCCM, CCMC) set may be sufficient to resolve a number of non-sensitive complaints, those that cannot be resolved or that present a complex technical aspect may require further examination by the National Complaints Management Committee. In this case, the Social/Environmental Safeguards Specialist and the Gender and Social Inclusion Specialist will carry out an in-depth investigation in the field before the NCMC proposes a response.

A maximum of five (05) working days after classification and preliminary analysis is allowed for this stage for all non-sensitive complaints requiring further investigation for resolution.

The aim of this stage is to try to understand the complainant's point of view on the issue and what he or she thinks should be done about it. The investigation can then continue with an analysis of the circumstances of the complaint, interviews with the parties involved and consultations with relevant stakeholders. Throughout this stage, it is advisable to pay close attention to the complainant's feelings.

A good investigation process as part of complaints management must ensure that those involved in the investigation are competent, that the complaints resolution process is transparent, that certain complaints are handled and resolved in a confidential manner depending on the sensitivity of the information, and that complaints are handled and resolved fairly and impartially.

10.9.7. Stage 4: Response proposals or development of a draft response

Based on the results of the investigations, a response is sent to the complainant.

This response will show whether the facts complained of are true or whether the complaint should be rejected. The person concerned is notified in writing that the complaint can only be upheld if the facts set out in the complaint are well-founded and justified following the results of the investigations. If the complaint is justified, the complaints management body (depending on the level) will notify the complainant in writing of the key results of their investigations, the solutions adopted following the investigations, the means of implementing the corrective measures, the implementation schedule and the budget (if applicable). The corrective action will be initiated five (05) working days after the complainant acknowledges receipt of the note notifying him/her of the solutions adopted. This is after the complainant has agreed to the proposed solutions.

Similarly, if the complaint is unfounded, the complainant will be notified in writing, giving reasons.

10.9.8. Step 5: Revision of responses in case of non-resolution at first instance

The measures adopted by the MGP's bodies may not meet with the complainant's approval. In this case, the complainant is given the opportunity to request a review of the Complaints Management Committee's resolution. The period allowed for requesting a review of decisions is a maximum of five (05) working days from the date of receipt of notification of the resolution of the complaint by the complainant. In this case, the management body has five (5) working days to reconsider its decision and propose additional measures if necessary or return to the complainant's request.

If the complainant agrees (as recorded in the reports and minutes of the meetings), the proposed responses are implemented. If the complainant contests the decision of non-admissibility, rejects the proposed direct action or refuses to participate in a more in-depth assessment and stakeholder engagement procedure, the resolution body should clarify the reasons for the complainant's refusal, provide additional information and, if possible, revise the proposed approach. If agreement is still not reached, PGM staff should ensure that the complainant understands the other avenues of redress that may be available, through the administrative or judicial system, and should document the outcome of discussions with the complainant, clearly indicating the options that were offered and the reasons for the complainant's rejection.

NB: In case of anonymous complaints, the village/neighbourhood chiefs will be responsible of relaying and disseminating information in the area where the complaint originated about the solution found to the complaint or claim. All complaints must be dealt with within the stated deadlines and feedback is given directly or indirectly to the complainant.

10.9.9. Step 6: Implementation of corrective measures

The measures recommended by the Complaints Management Committee cannot be implemented without the prior agreement of both parties, especially the complainant, in order to avoid any form of dissatisfaction. The procedure for implementing the corrective action(s) will begin five (05) working days after the complainant acknowledges receipt of the letter notifying him/her of the solutions adopted and, in return, following the complainant's agreement, recorded in a statement of consent. The complaints management body will put in place all the resources needed to implement the agreed resolutions and will do its utmost to ensure that the agreed timetable is adhered to. Minutes signed by the Chair of the Complaints Management Committee and the complainant will mark the end of the implementation of the solutions.

10.9.10. Step 7: Closure or end of complaints

The procedure will be closed by the bodies of the complaints management body if the mediation is acceptable to the various parties, in this case the complainant, and the agreement

is proven by minutes signed by both parties. The file will be fenced after three (03) working days from the date of implementation of the certified response for local or intermediate bodies and five (5) working days by the national body.

The closure will then be documented by these different bodies according to the level(s) of processing involved and the information gathered will be archived in a soft database or in a hard database.

10.9.11. Step 8: Report

All complaints received under the Project's PMM will be recorded in a processing register five (05) working days from the date of implementation of the resolution, for local or intermediate bodies, and seven (07) working days for the national body. This operation will make it possible to document the entire complaints management process and to draw the necessary lessons through a simple and appropriate database designed for this purpose.

The database will also indicate the most frequently recurring problems and the geographical areas from which the most complaints emanate. The information provided by the database will help the Project to improve the mechanism and to better understand and address the environmental and social impacts of the Project and to develop periodic reports (monthly, quarterly and annual) that detail complaints related to systemic implementation issues and those that are individual.

10.9.12. Step 9: Archiving

The project will set up a physical and electronic filing system for complaints. Archiving will take place within six (06) working days of the end of the reporting process. Whatever the outcome, all supporting documents from the meetings that were necessary to reach a resolution will be included in the complaint file. The filing system will provide access to information on: i) complaints received; ii) proposed solutions and iii) unresolved complaints requiring further action.

The electronic filing system will be used to collect information on complaint management from project stakeholders. This system will be designed to collect, store, process, analyse, manage and present all types of complaints, at all Project sites and at the level of the Project coordination bodies.

The applications that will be linked to this system will be the tools that will enable the SIRAT and UCP team to create interactive queries, analyse spatial information, modify and edit data through maps and respond to them. This is a real backbone for the information system, as it will enable all the dimensions to be brought together around a single repository.

Figure 4 below summarises the various stages involved in resolving a non-sensitive complaint in the context of this Project.

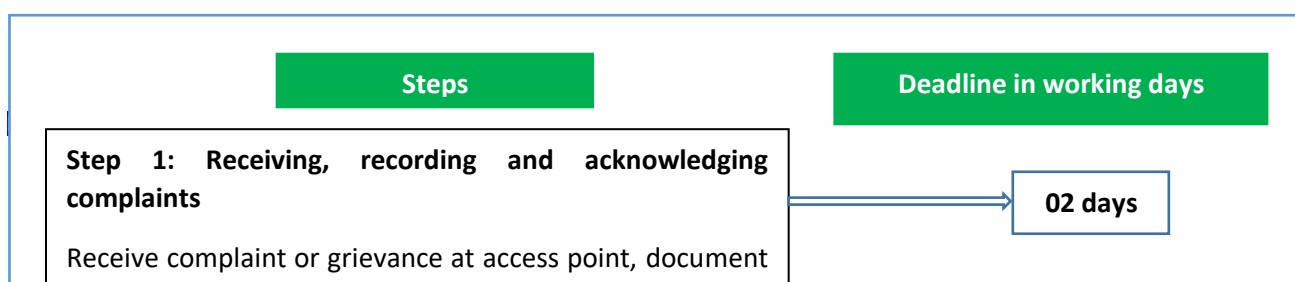


Figure 38: Steps in managing non-sensitive complaints

Source: Adapted from FP2E project, November 2022

10.10. Sensitive complaints management procedure (VBG/EAS/HS)

Due to the specific requirements of managing sensitive complaints, such as confidentiality and the safety of survivors, the amicable conflict management procedure is neither applicable nor authorised for this category of GBV/EAS/HS-related complaints. Specific procedures have been developed for this purpose. A committee will be set up at municipal level, made up of representatives of the bodies most specialised in handling sensitive complaints. The composition of this committee is as follows:

- a representative of the Centre de Promotion Social (CPS) in Cotonou;
- a representative of the Cotonou Health Centre closest to the project;
- a representative of the Republican Police (Judicial Police);
- a representative of the Institut National de la Women (INF);
- A representative of an NGO involved in social protection (GBV/ASR/HS management) at local level.

Sensitive complaints must be dealt with immediately by the Cotonou CPS in the complainant's area. These complaints are systematically forwarded to the national level by the local GBV management committee. A maximum of ten (10) working days is allowed for the proposed response. The complainants concerned will be informed of any additional deadlines. The following steps will be taken to deal with these complaints:

- ✓ Receiving and registering a GBV/EAS/HS complaint
- ✓ Sorting and processing a GBV/EAS/HS complaint
- ✓ VBG/EAS/HS complaint verification process
- ✓ Follow-up and proposed response

10.11. Administrative provisions and recourse to the court for the settlement of complaints

Anyone who feels aggrieved by the implementation of the Project's activities must submit a request to the complaints management bodies, preferably for amicable resolution. If the dispute is not settled, recourse is made to the PCU. This avenue of appeal should be strongly encouraged and supported. But if the claimant is still not satisfied, he or she can take the matter to court. The costs of legal action will be borne by the complainant (non-sensitive complaint). It is therefore in the interest of all Project stakeholders to facilitate participation in the out-of-court settlement process in order to limit recourse to the courts.

10.12. Making the complaints management mechanism operational

The complaints management system will only be useful if the beneficiary communities, the people likely to be affected by the project or to influence its proper implementation, are informed. It is therefore important to make communities understand that they have the right to complain and that all complaints will be dealt with fairly, efficiently and as simply as possible. This will ensure the effectiveness of this PGM. The information, awareness and training sessions will be reinforced by:

- broadcasting the CMM on community radio stations without language barriers (easy French and local languages of the areas concerned);
- The production of kakemonos to be displayed in the Districts (10th, 11th and 12th) and the Cotonou town hall, as well as on the project site;
- the printing and distribution of brochures/prospectuses on the MGP in the localities concerned and on the SIRAT and UCP websites;
- the production of audio-visual capsules for sensitive and non-sensitive complaints;
- The use of these audio-visual clips in training or capacity-building sessions for the committees and during community information and awareness-raising sessions.

Capacity building for stakeholders

Implementation of the MGP for the Vedôkô flyover construction project requires the setting up of bodies to manage sensitive and non-sensitive complaints.

Monitoring and evaluation of the CMM

The aim of the MGP's Monitoring and Evaluation is to improve the project's performance in the complaints management process. It also aims to ensure that the information associated with complaints is used to correct any headcounts or potential problems encountered in the implementation of project activities. It will answer the following questions:

- ✓ Are all those involved in implementing the project aware of the MGP's procedures?
- ✓ How many complaints have been received and by whom?
- ✓ Which levels received and managed the complaints?
- ✓ What is the profile of the complainants (breakdown by age, gender, level of education, etc.)?
- ✓ What are the subjects of the complaints?
- ✓ When and how did the complaints management committees handle complaints?
- ✓ How were the proposed responses communicated to the complainants?

- ✓ Do more complaints come from a particular village?
- ✓ Do certain types of complaint recur systematically?
- ✓ Are there any lessons to be learned from the way the MGP operates?
- ✓ Can the solutions be replicated in other contexts?
- ✓ What should be done in the future to avoid this type of complaint?

Monitoring indicators

The PCU is responsible for the overall implementation and monitoring of this Complaints Management Mechanism (CMM). As such, it will ensure that the system for receiving and monitoring complaints is improved. Particular attention will be paid to claims and complaints from vulnerable people.

10.13. Cost and budget of the complaints management mechanism implementation

The cost of implementation is estimated at **39,800,000 CFA francs (thirty-nine million eight hundred and seventy thousand francs)**.

Table 63 below shows the estimated cost of the complaints management mechanism.

Table 71: Estimated cost of the complaints management mechanism for the Vedôkô flyover construction project

N°	Actions	Periods/deadlines	Structures in charge	Actors involved	Status	Costs (FCFA)
Step 1: Development and implementation of the Complaints Mechanism						
1.	Drafting of the operational complaints management mechanism document	Preparatory phase of the project	PCU	Stakeholders at institutional/municipal level and local communities	Achieved	-
2.	Installation and capacity building of committee members on their roles in complaints management	Project preparation phase	PCU	Stakeholders at institutional/municipal level and local communities	Achieved	-
3.	Publicising the MGP among local communities and PAPs (through radio announcements, information sessions, flyers, posters, town criers).	Ongoing	PCU	UCP Communication Managers	To be achieved	500 000
4.	Acquiring and setting up the equipment and supplies (register, complaints recording form (RAME paper, pen binder, Android laptop, etc.) needed to operate the complaints management mechanism.	Preparatory phase of the project	PCU	Stakeholders at institutional/municipal level and local communities	To be achieved	1 000 000
5.	Operation of the toll-free number for receiving telephone complaints (application fees, charges, GSM network deposit, call handling).	Project implementation	PCU	GSM/ARCEP networks	To be achieved	3 000 000

N°	Actions	Periods/deadlines	Structures in charge	Actors involved	Status	Costs (FCFA)
6.	Recruitment of a consultant to design and set up the computerised complaints management platform (including validation and user training).	Project implementation	PCU	Benin State	To be achieved	5 500 000
7.	Recrutement d'un(e) consultant(e) pour la conception et la production des outils de communication et de sensibilisation (flyers, affiches, capsules audiovisuelles) sur les plaintes sensibles et les plaintes non sensibles	Implementation of the project	CPU	Benin State	To be achieved	5 000 000
8.	Support for the operation of the complaints management committees for the duration of the project (travel, communication, internet package)	Ongoing throughout the project	CPU	Stakeholders at institutional level/Mayor's office and local communities	To be achieved	7 800 000
9.	Recruitment of a receptionist to manage calls and archive complaints	Implementation of the project	CPU	Benin State	To be achieved	8 500 000
10.	Management of cases of GBV/EAS/HS (travel, health, psychosocial and legal care)	Ongoing	CPU	Stakeholders at institutional/municipal level and local communities	To be achieved	1 000 000
	Subtotal 1					32 300 000
Step 2: Monitoring and evaluation of the Complaints Mechanism						

N°	Actions	Periods/deadlines	Structures in charge	Actors involved	Status	Costs (FCFA)
31.	Organisation of quarterly follow-up meetings of complaints management committees on the operation of the MGP	Trimestriel	UCP	Parties prenantes au niveau institutionnel/Mairie et populations	A réaliser	7 500 000
	Subtotal 2					7 500 000
	Estimated overall total					39 800 000

Source: BANCA, November 2022

10.12. Complaints management mechanism put into operation

A complaints management system is only useful if citizens, as users, are informed about it. Once approved, SIRAT will involve stakeholders and beneficiary communities at key stages in the development of the Complaints Mechanism.

In addition, key information about the PGM will be made available to beneficiary communities and other stakeholders. This information will be communicated clearly and in a form appropriate to the target user group. Stakeholders will be aware of the various places where complaints or claims can be lodged and the procedure to be followed.

The various communications can build trust, encourage communities to take ownership of the mechanism and encourage their participation. Similarly, greater transparency and information sharing can serve to strengthen accountability, partners and key stakeholders, including beneficiary communities.

To ensure the effectiveness of this CMM, potential users will be informed about the organisation, their rights and prerogatives in the context of the tarmacing and development work on the Fishing Road. It is essential to make communities understand that they have the right to complain and that all grievances will be handled fairly, efficiently and as simple as possible.

Therefore, as part of the development of this project a stakeholder engagement plan will be put in place to enable each stakeholder to feel involved in the implementation of the project activities on the Fishing Road Axis. The engagement plan will include specific communications on the implementation of the complaints management mechanism.

XIII. RISK AND ACCIDENT MANAGEMENT

10.14. Reminder of the meaning of Risk

Risk is the combination of a hazard, its probability, its severity and its acceptability⁷. The danger is a set of processes that unfolds the chain of events leading to an undesired event (ENS) that can have an impact, generally destructive, on one or more possible targets:

- i) one or more individuals;
 - ii) one or more populations;
 - iii) one or more ecosystems, etc. The preferred targets in this study are personnel for occupational risks and the population affected by the works. The risks on the ecosystems being studied in the other parts of the study.
- Probability is understood as the probability of the sequence of events leading to the ENS;
 - Severity is defined by the effect of ENS on targets;
 - Finally, acceptability is understood as acceptability of the ENS.

The risk analysis here consists of:

- 1) Point out the main dangerous situations related to the implementation of the program;
- 2) Describe the undesired events that may occur with consequences for the health of individuals and the populations concerned;
- 3) estimate the probability that ENS will occur;
- 4) Its acceptability.

This analysis precedes the proposal of prevention and protection measures adapted to each risk, making it possible to reach an acceptable level of residual risk. The probability levels are chosen from "very unlikely" to very probable" and the severity levels from "low to very serious", as detailed in the following table 74.

Table 72 : Risk assessment grid

Probability scale (P)		Severity scale (G)	
Level	Meaning	Level	Effect
P1	Very unlikely	G1 / low	Accident or illness without time off work
P2	Unlikely	G2 / medium	Accident or illness with time off work
P3	Likely	G3 / serious	Accident or illness with partial or permanent disability
P4	Very likely	G4 / very serious	Fatal accident or illness

The intersection of probability and severity illustrated by the following matrix gives the level of acceptability of the risk and consequently the level of priority for the implementation of measures to reduce the danger to an acceptable level. Priority 1 and 2 risks are taken into account.

⁷ According to Cahiers Techniques de CASE France - Jean-Claude JACQUIOT - July 2010

Table 73 : Risk assessment matrix

Severity Probability	G1	G2	G3	G4
P1				
P2				
P3				
P4				

Table 74 : Risk assessment grid

Priority	Acceptability
1	High risk to be taken into account as a priority
2	Important risk to take into account
3	Acceptable risk

10.15. Risks towards people for each type of activity

The activities concerned by this project are: the construction of infrastructures, the development of adjacent service streets and those whose development will contribute to the improvement of water drainage. The key activities of the construction and operation phases will be considered.

10.15.1 Relocation work on various networks (water, electricity, telephone lines, etc.).

The main situations of danger for the work of moving various networks and developing diversions as part of the stormwater drainage project are presented in Table 75.

Table 75: Risk analysis for work to move miscellaneous networks

No.	Main danger situations	Undesirable Events (ENS)/Impact	Risk assessment		
			Probability	Gravity	Acceptability
1	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers that can lead to death, injuries, fractures, lesions, temporary or permanent sensory loss	3	3	
2	Poorly controlled movement of vehicles and construction machinery or their moving parts (excavators, mechanical shovels, Manitou, drilling tools, compressor hose, etc.)	Overturning, tilting, collision or entrainment of a worker that can cause death, injury, fractures, lesions, temporary or permanent sensory loss	3	3	
3	Improper storage, handling, handling or transport of loads (e.g. piping, poles or other materials)	Falling equipment and materials that can cause death, injury, fractures,	3	3	

		lesions, injuries, fractures, trauma			
4	Staff too close to excavations or excavations	Projection of particles (sludge) or sand that can cause eye or skin damage	3	2	
5	Potentially harmful noise (buldozer, shovel, loader, Manitou, compressor)	Prolonged exposure to noise that can lead to occupational deafness	2	2	
6	Excessive working hours and inadequate access to water and sanitation	Exposure to heat or sun and excessive fatigue causing sunstroke, dehydration, metabolic disorder, attention disorder	2	2	
7	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	3	3	
8	Installation of machinery under live overhead power lines	Accidental contact that can cause electrification causing neurological disorders and power cut in the sector	2	4	
9	Inappropriate use of welding stations (HDPE), electrical appliances or various chemical products including hot hydrocarbon binders, glues and strippers.	Vulnerability of workers to burns, electrification, intoxication or respiratory tract disease	2	2	

It should be noted that, in general, the risks come from the dangerousness of operations in a small, noisy, and most often unstable space (mud, sand), requiring the handling of heavy loads (tools and various equipment, poles, cables, *etc.*) and in motion.

10.15.1. Development of diversions

The highest risks are linked to the movement of construction machinery, potentially lethal if they hit a worker. The main specific and in particular cumulative risks concern the movement of machines in the same space as third parties (resident populations, road users) according to their depth and height.

Table 76 : Risk analysis for diversion development works

No.	Main danger situations	Undesirable events (ENS)/Impact	Risk assessment		
			Probability	Gravity	Accept ability
1	Poorly controlled movement of vehicles and construction machinery or their moving parts (excavator, tractor, compactor, loader, for example)	Overtaking, tilting, hitting a worker or road user that can cause death, injury, fractures, temporary or permanent sensory loss	3	3	

2	Inappropriate storage, handling, manipulation or transport of equipment and materials (e.g. cut or fill)	Equipment or materials accidentally spilled on workers or third parties that may cause injuries, fractures, trauma	1	2	
3	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers that can lead to injuries, fractures, lesions, temporary or permanent sensory loss	2	2	
4	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	2	3	
5	Existing pipelines in service not identified	Pipe rupture resulting in injuries or lesions	1	2	
6	Existing live underground power lines	Accidental contact that can cause electrification causing neurological disorders and power cut in the sector	1	4	

10.16. Earthwork, stripping, excavation work and disposal

The highest risks are linked to the movement of construction machinery, potentially lethal if they strike a worker or a third party. The main specific and particularly cumulative risks relate to the stability of excavations and stacked deposits, depending on their depth and height.

Table 77 : Risk analysis for earthworks, excavation work and disposal

No.	Main danger situations	Undesirable events (ENS)/Impact	Risk assessment		
			Probability	Gravity	Acceptability
1	Poorly controlled movement of vehicles and construction machinery or their moving parts (mechanical shovel, loader, trucks, for example.)	Overturning, tilting, collision or dragging of a worker that can cause death, injury, fractures, temporary or permanent sensory loss	3	3	
2	Inappropriate storage, handling, manipulation or transport of equipment and materials (for example: cut or fill)	Equipment or materials accidentally spilled on workers or third parties that may cause suffocation, injuries, fractures, trauma	3	2	
3	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers that can lead to death, injuries, fractures, lesions, temporary or permanent sensory loss	3	2	
4	Excessive working hours and inadequate access to water and sanitation	Exposure to heat or sun and excessive fatigue causing sunstroke, dehydration, metabolic disorder and impaired attention	3	2	

5	Instability of excavations and cuttings	Landslides from excavations that can cause suffocation, injuries, fractures, trauma	2	3	
6	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	2	3	
7	Existing pipelines in service not identified	Pipe rupture resulting in injuries or lesions	2	2	
8	Installation of machinery under live overhead power lines	Accidental contact that can cause electrification causing neurological disorders and power cut in the sector	1	4	
9	Existing live underground power lines	Accidental contact that can cause electrification causing neurological disorders, death and power cuts in the sector	2	4	

10.17. Construction works for sanitation structures (structural work and placement of compacted backfill)

The highest risks are related to the movement of construction machinery. The specific risks relate to work in excavations, the movement and operations of the machinery used: particle projections (sand, mud) and splinters (rubble); backfilling, equipment or materials falling from work areas, people falling which also require risk minimization measures.

Emphasis is also placed on the absolutely necessary collective and individual protections, and on the risks of falling prefabricated elements, jamming and crushing and accidents generally linked to the handling and installation of elements, formwork, of concreting.

Table 78 : Risk analysis for the structural work

No.	Main danger situations	Undesirable events (ENS)/Impact	Risk assessment		
			Probability	Gravity	Acceptability
1	Aerial work on formwork platforms, ladders, unsecured or poorly secured scaffolding	Falling into the void that can cause injuries, fractures, lesions, temporary or permanent sensory loss	3	3	
2	Equipment or materials not stabilized in elevation (tools, cement, prefabricated elements, etc.)	Falling object or material causing overturning, tilting, collision or entrainment of a worker that can cause death, injury, fractures temporary or permanent sensory loss	3	4	
3	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers to injuries, fractures, trauma	3	3	
4	Unsuitable handling, transport or handling of jacks, formwork, material props, etc.	Wedging, crushing causing injuries and various traumas	3	3	

5	Manual installations and shoveling, repetitive movements or long use of vibrating machines (vibrating points for example)	Vulnerability of workers to injuries, fractures, trauma from falling on the same level	3	2	
6	Manual handling and shoveling, repetitive gestures or long use of vibrating machines (vibrating points for example)	Appearance of musculoskeletal disorders	3	2	
7	Excessive working hours and inadequate access to water and sanitation	Exposure to heat or sun and excessive fatigue causing sunstroke, dehydration, metabolic disorders, attention disorder	3	2	
8	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	2	3	
9	Uncontrolled movement or use of vehicles and construction machinery or their moving parts (concrete mixer, for example)	Overturning, tilting, collision or entrapment of a worker that can cause death, injury, fractures, temporary or permanent sensory loss	2	3	
10	Projection of particles, fall of equipment or materials from work areas, fall of people	Particle projections (sand, sludge), Shards of rubble, Fall of equipment or materials (prefabricated elements), from work areas, Fall of people	2	3	
10	Inappropriate storage, handling, manipulation or transport of equipment and materials	Equipment or materials accidentally spilled on workers which can cause suffocation, injuries, fractures, trauma	2	2	
11	Unsuitable use of electrical appliances, formwork oils, additives, etc. or prolonged contact with cement	Burns (cement scabies, electrification causing neurological disorders, intoxication or affection of the respiratory tract	2	2	
12	Structure instability	Collapse of all or part of the structure which may cause death, injury, fractures, lesions, temporary or permanent sensory loss by falling into the void	1	4	

10.18. Road development earthworks

The highest risks are related to the movement of construction machinery. The specific risks relate to work in excavations, the movement and operations of the machinery used: particle projections (sand, mud) and splinters (rubble); backfilling, equipment or materials falling from work areas, people falling which also require risk minimization measures.

Emphasis is also placed on the absolutely necessary collective and individual protections, and on the risks of falling prefabricated elements, jamming and crushing and accidents generally linked to the handling and installation of elements, formwork, of concreting (table 81).

Table 79 : Risk analysis for road development

No.	Main danger situations	Undesirable cases (ENS)/Impact	Risk assessment		
			Probability	Gravity	Acceptability
1	Equipment or materials not stabilized in elevation (tools, cement, prefabricated elements, etc.)	Falling object or material causing overturning, tilting, collision or entrainment of a worker that can cause death, injury, fractures temporary or permanent sensory loss	3	4	
2	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers to injuries, fractures, trauma	3	3	
3	Unsuitable handling, transport or handling of jacks, formwork, material props, etc.	Wedging, crushing causing injuries and various traumas	3	3	
4	Manual handling and shoveling, repetitive gestures or long use of vibrating machines (vibrating points for example)	Appearance of musculoskeletal disorders	3	2	
5	Excessive working hours and inadequate access to water and sanitation	Exposure to heat or sun and excessive fatigue causing sunstroke, dehydration, metabolic disorders, attention disorder	3	2	
6	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	2	3	
7	Poorly controlled movement or use of construction vehicles and machinery or their moving parts (concrete mixer, for example)	Overturning, tilting, collision or entrapment of a worker that can cause death, injury, fractures, temporary or permanent sensory loss	2	3	
8	Projection of particles, fall of equipment or materials from work areas, fall of people	Particle projections (sand, cement) Fall of equipment or materials (prefabricated elements), from work areas, Fall of people	2	3	
9	Inappropriate storage, handling, manipulation or transport of equipment and materials	Equipment or materials (cobblestones) accidentally spilled on workers that can cause injuries, fractures, trauma	2	2	
10	Unsuitable use of electrical appliances, formwork oils, additives, etc. or prolonged contact with cement	Burns (cement scabies, electrification causing neurological disorders, intoxication or affection of the respiratory tract	2	2	
11	Structure instability	Collapse of all or part of the structure which may cause death, injury, fractures, lesions, temporary or permanent sensory loss by falling into the void	1	4	

10.19. Commissioning of works and maintenance during the warranty period

The highest risks are linked to the movement of construction machinery, potentially lethal if they hit a worker. The main specific and particularly cumulative risks relate to the movement of machinery in the same space as third parties (local residents, road users) and the handling of prefabricated elements that may be damaged, and maintenance work on structures (concreting, formwork, etc.).

Table 80 : Analysis of risks related to the operational phase

No.	Main danger situations	Undesirable events (ENS)/Impact	Risk assessment		
			Proba bility	Gravity	Accept ability
1	Uncontrolled movement of construction vehicles and machinery or their moving parts (excavator, tractor, compactor, loader, for example)	Overturning, tilting, hitting a worker or road user that can cause death, injury, fractures, temporary or permanent sensory loss	3	3	
2	Inappropriate storage, handling, manipulation or transport of equipment and materials (for example: prefabricated elements)	Accidental fall of material on workers or third parties which may cause injuries, fractures, trauma	1	2	
3	Absence or ineffectiveness of collective and individual protections	Vulnerability of workers that can lead to injuries, fractures, lesions, temporary or permanent sensory loss	2	2	
4	Improper driving of vehicles and construction machinery	Exposure of drivers, passengers and third parties to injuries, fractures, trauma and, where applicable, damage or destruction of property	2	3	

10.20. Risks towards property and the natural environment for each type of activity

Risks to property and the natural environment are mainly related to:

- non-compliance with instructions for the equipment and development of boreholes, which can lead to the pumping of contaminated water;
- the uncontrolled or poorly controlled movement of vehicles and construction machinery on the access roads to the construction sites and on the work sites;
- poor conditions of storage, handling, handling and transport of materials (storage of cuttings, poor stowage, non-stable storage area, etc.), which can be the cause of the direct degradation of private or public property by impact, or indirectly degradation of the environment by spillage of products potentially polluting or harmful to the environment;
- the use of electrical equipment and flammable or potentially polluting products;
- Carrying out work close to existing sources of electricity or water pipes that are not or poorly identified, which may be the cause of fires or floods causing the direct degradation of private or public property, or direct degradation of the environment by spillage of products potentially polluting or harmful to the environment.

The main hazard situations, the undesirable events that may result and the associated damage to property and the environment are summarized in the table below for each category of activity. Generally speaking, the probability of occurrence is lower for property and the environment than for people, who are directly involved in the hazard. However, the prevention and minimization measures applicable to people also apply to property and the environment (table 83).

Table 81 : Analysis of risks with regard to property and the natural environment

Activities	Main danger situations	Undesirable events (ENS)/Impact on property or the environment	Risk assessment		
			Probability	Gravity	Acceptability
Displacement of various networks (water, electricity and telephone)	Uncontrolled or poorly controlled movement of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to disputes, indemnification or compensation	3	3	
	Improper use or maintenance of work equipment	Breakage of cables, hoses, tools, breakage of loads, etc. which may cause the release of polluting products into nature	3	2	
	Machinery installations under live overhead power lines	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	1	4	
	Existing live underground power lines	Accidental contact that can cause electrification causing neurological disorders, death and power cuts in the sector	2	4	
Development of diversions	Uncontrolled movement of construction vehicles and machinery or their moving parts (excavator, tractor, compactor, loader, for example)	Destruction of private property or natural resources around the work area leading to conflict, compensation or environmental degradation	3	3	
	Improper use or maintenance of work equipment	Breakage of cables, tools, breakage of loads, etc. which may cause the release of polluting products into nature	1	2	
	Improper driving of vehicles and construction machinery	Accidental contact that can cause electrification causing neurological disorders, death and power cuts in the sector	2	3	
	Existing live underground power lines				
Earthwork, stripping, excavation work and storage	Improper driving of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to conflict, compensation or environmental degradation	2	3	
	Uncontrolled or poorly controlled movement of vehicles and construction machinery or their moving parts (mechanical shovel, for example, etc.)		3	3	
	Inappropriate storage, handling, manipulation		3	2	

	or transport of equipment and materials (e.g.: cut or fill)				
	Pipes or electrical cables in unidentified services	Destruction by flooding or fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Machinery installations under live overhead power lines		1	4	
	Deposit of spoil in unauthorized areas sensitive to the environment	Destruction or disturbance of natural resources (fauna, flora, surface water)	1	4	
Major purge and deposit of products, transport and backfilling of land	Improper driving of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to conflict, compensation or environmental degradation	2	3	
	Uncontrolled or poorly controlled movement of vehicles and construction machinery or their moving parts (mechanical shovel, for example)		3	3	
	Inappropriate storage, handling, manipulation or transport of equipment and materials (for example: cut or fill)		3	2	
	Pipes or electrical cables in unidentified services	Destruction by flooding or fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Machinery installations under live overhead power lines		1	4	
	Deposit of spoil in unauthorized areas sensitive to the environment		1	4	
Removal of pavement, demolition of existing sanitation work	Improper driving of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to conflict, compensation or environmental degradation	2	3	
	Uncontrolled or poorly controlled movement of vehicles and construction machinery or their moving parts (mechanical shovel, for example)		3	3	
	Inappropriate storage, handling, manipulation or transport of equipment and materials (for example cut or fill)		3	2	
	Dig Instability	Destruction of private property or natural resources around the work area (collapse of fence, wall, ramp, falling trees) leading	3	2	

		to conflicts, compensation or environmental degradation			
	Pipelines or buried electrical cables identified or not	Destruction by flooding or fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Installation of machinery under live overhead power lines		1	4	
Structural works: construction of sanitation works	Improper driving of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	3	
	Uncontrolled or poorly controlled movement or use of construction vehicles and machinery or their moving parts		2	3	
	Inappropriate storage, handling, manipulation or transport of equipment and materials		2	2	
	Dig Instability	Destruction of private property or natural resources around the work area (collapse of fence, wall, ramp, falling trees) leading to conflicts, compensation or environmental degradation	3	3	
	Unsuitable use of electrical equipment, formwork oils, additives,	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Pipelines or buried electrical cables identified or not	Destruction by flooding or fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Installation of machinery under live overhead power lines		1	4	
Shoreline protection with Reno Mattress	Improper driving of vehicles and construction machinery	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	3	2	
	Uncontrolled movement or use of construction vehicles and machinery or their moving parts (trucks, excavators, for example)		2	3	
	Inappropriate storage, handling, manipulation or transport of equipment and materials		2	2	
	Structure instability		3	3	
Repair damaged manholes and install new manhole covers on the existing collector	Improper driving of vehicles and construction machinery	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	3	2	
	Uncontrolled movement or use of construction vehicles and machinery or their moving parts (trucks, shovels, for example)		2	3	

Earthworks for the development of the road (laying of paving stones and development up to the residents)	Improper driving of vehicles and construction machinery	Destruction of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	3	
	Uncontrolled or poorly controlled movement or use of construction vehicles and machinery or their moving parts		2	3	
	Inappropriate storage, handling, manipulation or transport of equipment and materials		2	2	
	Dig Instability	Destruction of private property or natural resources around the work area (collapse of fence, wall, ramp, falling trees) leading to conflicts, compensation or environmental degradation	3	3	
	Unsuitable use of electrical equipment, formwork oils, additives,	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Pipelines or buried electrical cables identified or not	Destruction by flooding or fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	2	2	
	Installation of machinery under live overhead power lines		1	4	
Commissioning of the works and maintenance of the works during the warranty period	Improper driving of vehicles and construction machinery	Destruction by fire of private property or natural resources around the work area leading to conflicts, compensation or environmental degradation	3	2	
	Uncontrolled movement or use of construction vehicles and machinery or their moving parts (trucks, excavators, for example)		2	3	

10.21. General measures of prevention and minimization of risks during works

10.21.1. Protection of the staff on site

The company must provide its staff with the necessary PPE for their protection and in particular:

- helmet and safety shoes which must be worn everywhere on the site;
- mandatory gloves for manual demolition work, jackhammer work, digging excavations with shovels, etc.;
- Anti-noise protection for work exposed to noise (use of a compressor, road sinking, demolition with a jackhammer, explosion, etc.);
- Eye protection masks (or visors) and respiratory protection against dust, gases, projections (solid or liquid), against radiation (welding goggles, etc.);
- High-visibility fluorescent vests [HYPERLINK](https://fr.wikipedia.org/wiki/Gilet_haute_visibilit%C3%A9)

"https://fr.wikipedia.org/wiki/Gilet_haute_visibilit%C3%A9" \o "Gilet haute visibilité" to avoid being run over by a vehicle or handling equipment, etc.

In the same dynamic, there should be:

- protection against the risk of electrification, electrocution or static electricity: electricians' gloves, earthing devices (bracelets, poles), etc. ;
- gloves , goggles and mask necessary against 1) splashes of chemical or biological products 2) intense sources of heat and the risk of fire and 3) the risk of wounds (cuts, abrasions, etc.);
- Life jackets against the risk of drowning.

Materials and safety equipment must be in perfect condition and worn, which justifies training in the wearing of PPE and the risks against which they protect.

10.21.2. Collective protection equipment

Collective protective equipment aims to reduce to an acceptable level the risks to which workers and persons outside the site may be exposed. In the case of the project, this will be in particular:

- to avoid exposure to danger or access to a danger zone:
- to ensure that people or body parts cannot be in a dangerous place while respecting the necessary safety distances;
- to avoid projections and collect materials, projected elements and spilled liquids;
- Any risk highlighted during the work must be eliminated or be the subject of appropriate preventive measures (guardrail or fluorescent tape at the edge of an opening, an excavation, scaffolding for work at height, etc.);
- areas presenting risks must be clearly marked (sign, safety cordon, barrier) and/or restriction of access if necessary;
- any dangerous obstacle must be systematically indicated and marked with a white/red or yellow/black colored ribbon; or markings on the ground;
- Raised floors, scaffolding, gangways, etc. must be fitted with guardrails to prevent people from falling and, if necessary, with nets to prevent equipment and materials from falling.

In addition, construction machinery and equipment must have their specific protective equipment (protective covers, fixed or mobile screens, machine enclosure, etc.).

10.21.3 Drawing up a Health and Safety Plan

The work will involve several companies and trades requiring sustained coordination for the safety and health protection of the various stakeholders. A Hygiene Health and Safety Plan (PHSS) establishes the operating methods envisaged in the field, provides information on the various provisions applicable to the operation: intervention on site, hygiene of working conditions, rescue and evacuation; indicates the specific measures to be taken into account to prevent the risks of the operation due to co-activity, as well as the risks specific to the company (ies) incurred by its employees. The agent companies must provide and have their PHSS validated at the start of the

works within a period specified in the contractual documents from the receipt of the contract signed by the client.

The PHSS is a site work tool. It directly concerns the various site operators for the proper execution of their respective tasks. The person responsible for carrying out the work in the company uses the document as a permanent reference during the work. Managers or supervisors responsible for carrying out the work use it as a guide describing all the means to be implemented for each phase of the work. Site personnel find the document helpful in carrying out their tasks. It is also the operational support for staff training.

The PHSS is addressed to i) the coordinator responsible for the Safety and Health component at each of the companies, ii) the contracting authority and, where applicable, iii) the competent health and safety and labor inspection authorities. In all cases, at least one copy of the PHSS is permanently kept up to date on the site by each of the companies.

At the start of the works, the representative of the project owner proceeds with each company, including subcontractors, to a detailed visit of the site during which are specified in particular, according to the works that this company is about to carry out, the specific safety and health instructions and observations to be observed and transmitted for the entire operation.

10.21.3. Prevention in terms of staff health and hygiene

Companies must set up an intervention framework to preserve the health of their staff and ensure their care in the event of a health problem related to site activities (site infirmary, medicine box), have a first aider, and identify appropriate healthcare establishments and personnel for the different types of pathology or accident. The personnel working on the site must have been declared fit for the tasks entrusted to them by the competent medical personnel during a medical examination. In addition, employees must receive specific awareness raising on the consumption of alcohol, drugs, personal hygiene and the risks associated with STIs/HIV/AIDS.

The various non-mobile worksite areas will have lavatories. Maintenance agents are also appointed to ensure the cleanliness of all facilities and appropriate management of site waste.

10.21.4. Communication, training and évaluation

10.21.4.1. Communication

A communication plan is designed to support the implementation of the project.

A supervisory staff must be provided with liaison vehicles and mobile phones. In addition, the list of contacts in the event of an emergency or accident must be posted so that it is accessible to all employees.

10.21.4.2. Information and training

Each employee must be informed about the challenges of the work, the risks associated with the work, the PPE available to them, the procedures to be followed in the event of an incident/accident, the medical equipment and facilities put in place. Specific training for each type of work and activity and safety meetings in general at least once a week will be provided by the site safety manager.

Reports

Security level assessment reports must generally be drawn up on a monthly basis, making it possible to monitor the assessment criteria such as:

- the number of working hours in the month;
- the summary of training or information activities related to safety;
- the number of incidents/accidents or occupational illnesses with work stoppage;
- The number of breaches of safety instructions observed.

In addition, any incident or accident must be the subject of a detailed report in order to keep a formal trace of the events having affected the site and to analyze the event in order to adapt the prevention and intervention measures.

10.21.4.3. Rescue organisation

Companies must establish and distribute instructions in the event of an incident or accident. In general, an internal operation plan will be designed and implemented within the framework of the project; the procedure is as follows:

- alert a manager as soon as possible, specifying the place, the nature of the incident/accident and the condition of the injured person(s);
- mark out the site of the accident and ensure that there are no risks for people and property (particularly in terms of traffic);
- inform the emergency services by the responsible person;
- Inform the Client and the family of the situation.

10.21.4.4. Fire safety

Fire safety is ensured by the installation of equipment and by specific instructions known and followed by the personnel. Fire prevention and firefighting equipment concerns:

- the installation of fire extinguishers in perfect condition and valid in all construction vehicles;
- the packaging of flammable or explosive products in suitable containers;
- the installation of fire detectors in premises at risk.

The fire prevention instructions concern:

- shutdown of engines during unloading;
- removing or covering with sand or earth all traces of fuel, oils or other flammable products;
- welding operations carried out outside vegetated areas;
- Disconnecting and storing electrical tools at the end of the day.

The fire-fighting instructions include, in the event of a fire starting, alerting the firefighters, creating a firebreak strip with the appropriate means and sending a water tank truck to the places. Employees are trained in measures to prevent and fight the risk of fire.

CONCLUSION

The Vèdoko flyover construction project is an initiative to improve the transport sector. Although beneficial for development, its implementation will have both positive and negative impacts on the environment and the human milieu.

The positive impacts of this project are numerous, ranging from comfort, fluidity and speed of traffic to the development of commercial centres and access to social infrastructure. The project will also give the area an exclusive aesthetic and landscaping touch, with particular emphasis on green spaces. It will also create hundreds of temporary jobs for workers in the beneficiary localities, boost women's incomes and develop income-generating activities around the technical bases and construction sites, etc.

It will also help to reduce greenhouse gas emissions and combat climate change (purification of ambient air, carbon sequestration, CO₂ absorption, energy efficiency). The construction of the Vèdoko flyover will have a beneficial effect, as by reducing emissions it will contribute to compliance with the United Nations Framework Convention on Climate Change.

As for the negative impacts, they mainly concern: the increase in dust, noise pollution and vibrations, the deterioration of customary views, the risks of soil and water resource pollution, difficulties in accessing homes, economic activities and facilities, the permanent loss of economic activities, disruption to road traffic, the risk of accidents, the prevalence of diseases (STIs, HIV/AIDS and COVID 19), etc.

The study shows that if the environmental and social measures are effectively taken into account during the works, the negative effects identified in the identification and analysis of environmental impacts will be largely acceptable in relation to the socio-economic benefits generated by the project. Thus, given the overall controllability of the potential negative impacts in relation to the scale of the positive effects of the works, and on the basis of the analysis of the effects, it can be deduced that the environmental feasibility of the project remains very appreciable in terms of sustainability.

The implementation of this Environmental and Social Management Plan is estimated at 120,900,000 FCFA (One Hundred and Twenty Million Nine Hundred Francs), excluding the cost of implementing the Action and Resettlement Plan, and corresponds to the amount that the project will have to provide for informing and raising the awareness of local populations and implementing environmental measures.

In addition, it is suggested that the Minister in charge of the Environment, when issuing the CCE, send a copy of it along with the Environmental and Social Management Plan to all the institutions mentioned in it and responsible for monitoring the implementation of the Management Plan and the Monitoring/Supervision Program for this project.

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