PROJECT: LAKE CHAD BASIN REGIONAL INTEGRATIVE ROAD NETWORK PROJECT - CONSTRUCTION OF A BRIDGE OVER RIVER LOGONE BETWEEN YAGOUA IN CAMEROON AND BONGOR IN CHAD

COUNTRY: MULTINATIONAL-CAMEROON/CHAD

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) SUMMARY

<table>
<thead>
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<th>Team Leader</th>
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<th>PICU.1/COCM</th>
<th>6830</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Jean P. MEGNE, Transport Economist</td>
<td>PICU.1/COCD</td>
<td>6368</td>
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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) SUMMARY

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Code SAP</th>
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<tr>
<td>Lake Chad Basin Regional Integrative Road Network Project</td>
<td>P-Z1-DB0-181</td>
</tr>
<tr>
<td>- Construction of a Bridge over River Logone between Yagoua in Cameroon and Bongor in Chad</td>
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<td>OITC</td>
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1. INTRODUCTION

This document is the Environmental and Social Impact Assessment (ESIA) Summary of the Lake Chad Basin Regional Integrative Road Network Project - construction of the bridge over River Logone between Yagoua, Cameroon and Bongor, Chad. This ESIA covers the road and ancillary works except the Yagoua bypass.

It has been prepared in accordance with AfDB environmental and social assessment guidelines and procedures for Category 1 projects. It succinctly presents the strategic, legal and administrative framework of the project, a description of the project and its environment, the alternatives analyzed compared to the option chosen, the project’s environmental and social impacts as well as the recommended mitigation and enhancement measures, the concerns expressed during public consultations and a synopsis of the mitigation and impact enhancement measures as defined in the management plan, and implementation monitoring mechanisms.

2. POLICY, LEGAL, ADMINISTRATIVE, AND INSTITUTIONAL FRAMEWORK

2.1 Legal framework

2.1.1 In Cameroon

In Cameroon, Environmental and Social Impact Assessment (ESIA) is governed by many laws and regulations, the foremost and most relevant of which are the following: (i) Law No. 96/12 of 5 August 1996: framework law on environmental management, which constitutes the basic instrument on environmental protection. It defines the characteristics of projects for which an ESIA is required, the assessment content as well as a number of principles that must be observed for rational environmental and natural resources management; (ii) Law No. 89/027 of 29 December 1989 on toxic and hazardous wastes, which prohibits the use of any kind of toxic product likely to contaminate the soil, water, etc.; (iii) Law No. 94/01 of 20 January 1994 on the forestry, wildlife and fisheries regime, which provides a framework for the integrated, sustained and sustainable management of forestry, wildlife and fisheries resources such as those of the Logone; (iv) Law No. 98/005 of 14 April 1998 on the water regime, which lays down principles for environmental management and public health protection; and in that regard prohibits spills, leaks, disposal, infiltrations, burying, spreading, direct or indirect dumping into surface waters of any solid, liquid or gaseous substances likely to affect the quality of surface or underground water; (v) Decree No. 2013/00172/PM of 14/02/2013 laying down conditions for conducting environmental and social impact assessments. It amends and supplements Decree No. 2005/0677/PM of 2005 and provides some innovations as to differentiation of levels of document review and review costs (TOR and final report) by the Ministry in charge of
Environment; (vi) **Order No. 00001/MINEPDED of 8 February 2016** specifying the various categories of operation for which a strategic environmental assessment or an environmental and social impact assessment is required. According to this instrument, the construction of a major structure (bridge or viaduct spanning over one hundred (100) meters is among the activities that are subject to a detailed EIA, which is precisely the case for this project (vii) **Law No. 85/009 of 4 July 1985 on expropriation for public purposes and compensation terms and conditions** which prescribes the payment of compensation in the event of expropriation. Its scope of implementation covers bare lands, crops, built structures and all other forms of development.

2.1.1 **In Chad**

In Chad, the key national instruments specific to environmental studies that served as the legal framework for this study are: (i) **Law No. 014/PR/ 98 of 17 August 1998, defining the general principles of environmental protection**, that makes it mandatory to conduct an environmental impact assessment "where developments, works or projects are likely to affect the environment on account of their scale or impact on the natural environment; (ii) **Decree No. 630/PR/PM/MERH/2010 of 4 August 2010 regulating environmental impact assessments** which makes ESIA compulsory and lays conditions for the implementation of the related procedure, (iii) **Order No. 039/PR/PM/MERH/SG DGE/DEELCPN/2012 of 29 November 2012 on general guidelines on the conduct of an environmental impact assessment.** This order defines an impact assessment, its content and presentation; and (iv) **Law No. 67-25 of 22 July 1967, on land tenure limits,** which lays down the terms and conditions of land expropriation for a public project.

2.2 **Administrative and Institutional Framework**

2.2.1 **In Cameroon**

In Cameroon, the Ministry of the Environment is responsible for all matters relating to the environment, Nature Protection and Sustainable Development, and it is charged with formulating and implementing the national environmental policy, devising strategies for sustainable management of natural resources and pollution control. It is represented in each Region by its decentralized services. It oversees the two high-level commissions which serve as framework for consultation with partners to align their approaches, notably regarding sustainable management of natural resources, including feedback on ESIAs such as this. These committees include the National Consultative Committee on Environment and Sustainable Development and the Inter-Ministerial Committee on the Environment. Other ministries concerned by ESIAs, including the present one are the Ministry of Forestry and Wildlife, which is responsible, among other things, for anti-poaching and protected species; (ii) the Ministry of Public Works, which is responsible for supervision and technical inspection, the construction of infrastructure and public buildings, and the maintenance and protection of the national road heritage and, in that capacity, coordinates all studies required for adapting infrastructures to local ecosystems in conjunction with the Ministry of Environment, the Ministry in charge of scientific research, research or educational institutions and any other competent body; (iii) the Ministry of Mines, Industry and Technological Development which oversees notably the quarrying of stones (gravel and rubble) for construction; (iv) the Ministry of Agriculture and Rural Development, which is in charge of implementing agricultural and food production promotion policy and which will intervene during crop evaluation for compensation purposes through the departmental services officials. Besides these main ministries, other government departments are involved through several committees at the decentralized level. Civil society associations and local NGOs are generally involved through consultations and they took part in the conduct of this assessment. Similarly, they should be participating in the project implementation.
2.2.2 **In Chad**

In Chad, this ESIA was conducted at a time when the Ministry of Agriculture and Environment was responsible for environmental issues. Today, the Ministry of Environment and Pollution Control is responsible for the design and implementation of strategies, policies and programmes for the rational use of resources and environmental protection. This is the Ministry which, through the Environmental Assessment and Pollution and Nuisance Management Department, reviews and approves terms of reference and issues certificates of conformity if the impact assessments are approved. The other administrative structures concerned by the project are (i) the Ministry of Transport and Civil Aviation Infrastructure, which ensures the implementation of the government's policy on public works, transport, and civil aviation. To this end, it is responsible for planning, programming, and executing construction and maintenance works on roads and related infrastructure. It has an internal unit for Construction Site Environment, Hygiene and Safety, which supports mainstreaming of environmental and road safety issues in all projects and monitors compliance with environmental clauses during works execution; (ii) the Higher National Committee for the Environment, an inter-Ministerial body responsible for stimulating, harmonizing and ensuring the implementation of environmental policies for sustainable development; (iii) local authorities and civil society associations.

2.3 **International Conventions**

Cameroon and Chad are signatories to most international and regional environmental conventions, the foremost being: (i) UNESCO’s Paris Convention concerning the Protection of the World Cultural and Natural Heritage; (ii) the CITES Convention; the United Nations Rio Convention on Biological Diversity (CBD); (iii) the United Nations Framework Convention on Climate Change (UNFCCC); (iv) the Rotterdam Convention on the PIC procedure and the Stockholm Convention on POPs; (v) the Geneva International Tropical Timber Agreement; (vi) the African Convention on the Conservation of Nature and Natural Resources of Maputo, to ensure the sustainable development of African economies; (vii) the Agreement of Cooperation and Consultation between the States of Central Africa for Wildlife Conservation and for the establishment of a Special Fund for Wildlife Conservation.

2.4 **For the African Development Bank (AfDB)**

The Integrated Safeguards System (ISS) through the following five operational safeguards:

- Operational Safeguard 1: Environmental and Social Assessment;
- Operational Safeguard 2: Involuntary resettlement - Land Acquisition, Population
Displacement and Compensation;

- Operational Safeguard 3: Biodiversity and Ecosystem Services;
- Operational Safeguard 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials, and Efficient Use of Resources;
- Operational Safeguard 5: Working Conditions, Health, and Safety

Other relevant policies and guidelines remain applicable once triggered under the ISS. These are mainly (without being exhaustive):

- Bank Policy on Gender (2001);
- Consolidated Framework of Engagement with Civil Society Organizations (2012);
- Policy on Information Dissemination and Access (2012);
- Bank Stakeholder Consultation and Stakeholder Consultation Manual (2001);
- Bank's Population Policy and Implementation Strategy (2002); and

3. PROJECT RATIONALE AND DESCRIPTION

3.1 Rationale

Chad is a landlocked country which relies essentially on neighbouring Cameroon’s communication routes for its supplies and exports. The two countries share a long border with several crossing points which give scope to trade and population movements. Some crossing points along the border are informal and conducive to uncontrolled flows of goods and people. Between Yagoua and Bongor, separated by the River Logone, there is one main crossing point between the two countries. At this crossing point, trade is carried out using dugout canoes belonging to private individuals, or the ferry which breaks down frequently. Furthermore, such rudimentary crossing methods often cause significant loss of life and property.

It is within this context that it was decided to build a bridge over the Logone to directly link the border towns of Bongor in Chad and Yagoua in Cameroon. The project’s overall objective is to contribute towards improving the transport system in the Lake Chad Basin region and thus promote bilateral and sub-regional integration, create more official trading points along the common border over 1 000 km long and boost the economic competitiveness of the cross-border zone of the two countries.

3.2 Project Objectives and Components

The project’s overall objective is to carry out regional development and improve the transport system in the Lake Chad Basin region, thus contributing to the development and economic competitiveness of the cross-border area of the two countries. Its sector objective is to improve the transport logistical chain by creating a new transit route between both countries.
This first phase of the project involves the construction of a new 620 m long bridge over River Logone between the headquarters of Bongor Département in Chad and Yagoua in Cameroon, and access roads of 14.2 km, broken down into 7.4 km on the Chadian side and 6.8 km on the Cameroonian side. The itinerary of the access roads (or connection to the structure) is …long. The localities traversed on the side of Yagoua (Cameroon shore) are: ZEBE 1; ZEBE 2; DROUMKA, KOLON (ENIEG junction); EVECHE, HLEKE, and DJOGÔIDI, OUROU DABAN, OUDATA, KOTKON. On the Bongor side, the access roads traverse GOULMOUN; YAMTCHOUNGA; JAYNA and finally BONGOR (roundabout).

In addition to these road works, are ancillary works comprising mainly socio-economic facilities for the management of the infrastructure to be constructed (border posts, signaling devices, etc.) on the one hand and, on the other hand, for the enhancement of the positive impacts of the project and mitigating its negative impacts. Overall, the project structure and contents are shown in the table below.

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Detailed description of sub--components</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROAD WORKS</td>
<td>A.1 - construction of the transborder bridge between Yagoua and Bongor, including connecting roads;</td>
</tr>
<tr>
<td></td>
<td>A.2- (i) measures to mitigate environmental impacts and resettlement of the communities affected by the project; (ii) STIs-HIV/AIDS, malaria, road safety and axle load awareness;</td>
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<td></td>
<td>and (iii) inspection and supervision of road and ancillary works.</td>
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<tr>
<td>SOCIO-ECONOMIC FACILITIES</td>
<td>B.1 – Works specific to Cameroon:</td>
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<tr>
<td></td>
<td>(i) training and supporting youth and women to set up development projects;</td>
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<td></td>
<td>(ii) construction of the Zebé general and Yagoua cattle markets;</td>
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<td></td>
<td>(iii) rehabilitation and equipment of classrooms, plus latrines for public schools in Zébé and Kalaket; provision of water points in local schools and villages;</td>
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<td></td>
<td>(iv) lowlands development in Zebé to facilitate redeployment of young canoe operators;</td>
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<td></td>
<td>(v) equipment of the Yagoua regional hospital</td>
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<tr>
<td></td>
<td>B.3. Works specific to Chad</td>
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<td>(i) construction of a parking lot for heavy-goods vehicles at the bridge area;</td>
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<tr>
<td></td>
<td>(ii) provision of ten (10) water points (boreholes) in selected schools and villages;</td>
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<td></td>
<td>(iii) (1) hydro-agricultural facility; (2) poultry farming; and (3) off-season rice farming;</td>
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<td></td>
<td>(iv) supply of farm tools and pumping equipment to groups</td>
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<td></td>
<td>(v) rehabilitation and equipment of the Bongor Technical and Vocational Training Centre</td>
</tr>
<tr>
<td>STUDIES</td>
<td>C.1.1 - studies on the construction of the Garoua - Dourbeye - Bourrha - Mokolo - Kouyape - Kourgui road in the North and Far North Regions, 276 km long;</td>
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<tr>
<td></td>
<td>C.1.2 - Yagoua urban planning study</td>
</tr>
<tr>
<td>TRANSPORT AND TRADE FACILITATION</td>
<td>C.2.1 - Study for the reinforcement and/or rehabilitation of the N'Djamena-Bongor-Moundou-Koutéré road;</td>
</tr>
<tr>
<td>SUPPORT</td>
<td>C.2.2 - Study for the preparation of a Road Transport Master Plan;</td>
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<td></td>
<td>C.2.3 - Bongor urban planning study;</td>
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<tr>
<td></td>
<td>E.1 - Construction and equipment of the border post and annex buildings: (i) an office block with a built-in infirmary; (ii) a power house, (iii) two police stations, (iv) two gendarmerie stations;</td>
</tr>
<tr>
<td></td>
<td>(v) an axle weighing building; (vi) a water tower; and (vii) a block of public washrooms;</td>
</tr>
<tr>
<td></td>
<td>E.2 – Inspection and supervision of border post works;</td>
</tr>
<tr>
<td></td>
<td>E.3 - Training of border services, stakeholder awareness and study trips;</td>
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<tr>
<td></td>
<td>E.4 - Training on use of border post management manual.</td>
</tr>
</tbody>
</table>
The total project cost at the end of the mission is estimated at UA 86.17 million, or CFAF 68.91 billion at the July 2017 UA rate of UA1 = CFAF 799.76. The project will be financed by the African Development Bank Group (AfDB and ADF windows), the European Union and the national counterpart funds of Cameroon and Chad.

Figure 1 below shows the location of this road section.

![Figure 1: Location of the road section](image)

### 3.3 Current State and Constraint

The existing road lies on a plain. The terrain is virtually level. There are also few bends. The road is divided into two by the River Logone. There is no bridge over the river. The current roadway varies between 6 and 9 meters with a land reserve at the edge of the sidewalk ranging between 5 and 10 meters on both sides. This road is impassable during the rainy season when the river overflows. The flood zone covers approximately 5 km.

### 3.4 Key Requisite Inputs

Regarding fill materials, namely sand and gravel, borrow sites have been identified. Three of these sites are located within a radius of 6 km around the Logone Bridge: Two of the borrow sites for fill materials and sand are in Zebe village respectively at PK (Milestone) 4 + 000G and PK 6 + 000G in Cameroon and one in Bongor village on the Chadian side, more precisely at PK 3 + 000G. The volume of materials available on these three sites stands at 9,219 m3, and is shown in Table A below.
### Table 2: Volume of materials available at borrow sites

<table>
<thead>
<tr>
<th>Location</th>
<th>Type of material</th>
<th>Cubature (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrow pit 1 PK4+000 (Cameroonian side)</td>
<td>Yellowish sand clay</td>
<td>5 629.00</td>
</tr>
<tr>
<td>Borrow pit 2 PK 6+000 (Cameroonian side)</td>
<td>Yellowish sand clay</td>
<td>2 182.74</td>
</tr>
<tr>
<td>Borrow pit 3 PK 3+000 (Chadian side)</td>
<td>Multicoloured clay sand, crumbly gravel</td>
<td>1 407.25</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>9 219</td>
</tr>
</tbody>
</table>

Eighteen other borrow sites are located more than 6 km around the bridge. The minimum cubature of materials available on these 18 sites is 3 747 708 m$^3$.

**0/20 ungraded gravel deposit:** A potential deposit of 0/20 ungraded gravel has been located at station 1 (Marao) in Yagoua, meeting the characteristics required for the installation of filters and drains and production of concrete hydro-culverts. The sand equivalent test gives a sand fraction of 94.45.

**Igneous rock quarries:** Two (2) rock sites were located near Yagoua and Maga. The following table provides some information on these quarries.

### Table 3: Igneous rock quarry sites near Yagoua and Maga

<table>
<thead>
<tr>
<th>Rock mass</th>
<th>Location</th>
<th>Type of material</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lara-Yagoua</td>
<td>PK102</td>
<td>Granite gneiss</td>
<td>About 100 m from the road</td>
</tr>
<tr>
<td>Balda-Maga</td>
<td>-</td>
<td>Granite gneiss</td>
<td>500 m from the road</td>
</tr>
</tbody>
</table>

**River Sand Deposits:** River sand is also available on the banks of the Logone. An analysis of samples reveals a mean value equivalence higher than 80 between standard sand and piston sand, showing the near-total absence of fine clay particles, which may result in non-plasticity of the concrete. This will need to be offset by adding fine sand supplies from the quarry.

**Construction Site Water Requirements:** Large volumes of water will be required, particularly during the earthworks phase (to optimize the water content of fill materials and water earthwork platforms to avoid dust, etc.), the construction of facilities and for supply to personnel and site facilities. There are drinking water systems in Yagoua town and Bongor and streams, in particular the mayo which could be used.

**Sites for the operation of crushing plants and concrete and asphalt mixing plants:** crushing plants and concrete and asphalt mixing plants are classified and will require suitable sites (in terms of land area, location distant from dwellings, sensitive sites, landscape, etc.) for their installation and operation.

**Workforce:** Construction site requirements in terms of the workforce size to be mobilized are yet to be estimated. However, it is worth noting that the project will put a premium on employment intensive works.
4. DESCRIPTION OF PROJECT ENVIRONMENT

Direct Impact Area: It is made up of the localities traversed in Yagoua Subdivision (Cameroon) and Bongor Sous-Préfecture (Chad). The said localities are: Zebe 2, Zebe 1, Droumka, and Djogoidi in Yagoua, Cameroon and Goulmoun, Goulmoun Bass, Sale 1 and Sale 2 in Bongor, Chad. This direct impact area also extends to the various borrow sites.

Indirect Impact Area: Administratively, the indirect impact area covers Yagoua Subdivision, Mayo Danay Division and even the entire Far-North Region on the Cameroonian side. On the Chadian side, beyond the areas directly traversed, the project will impact the entire Bongor Sous-Préfecture, Mayo Boneye Département and Mayo Kebbi East Region. In socio-economic and cultural terms, the project’s geographical indirect area of influence extends to the other human settlements of the administrative units managed by the Sous-Préfecture of Yagoua and Bongor as well as the countries of the sub region, whose activities are closely linked to the project, notably the transport chain on the dual corridors of Douala-ndjaména and Douala-Bangu and Douala-ndjaména and Douala-Lagos. As concerns the natural environment, the area of indirect influence also covers floodplains, relics of mangroves and coastal forests which, in the absence of a management plan, may be destroyed by owners of expropriated land in quest of new resettlement sites.

4.1 Physical Environment

Climate

Overall, the project lies in the tropical savannah climate zone with Sahelian traits, which are typically low precipitations ranging between 600 mm and 1200 mm/year. The wet season spans the May to September period, with heavy rains from July to August, followed by a cold season (October to January) and a warm dry season (February to April). Temperatures range from 15°C to 35°C. Rain becomes scanty in volume and abundance as one goes further north. Two air masses predominantly influence the area, namely the harmattan and monsoon winds, in the dry season and wet seasons respectively.

Air Quality and Sound Environment

On the Cameroonian side, the project is in an area with rural features and no polluting chemical industry in the vicinity. If confined to the bridge site and the neighborhoods/villages directly traversed by the access road, one would conclude that the air quality around the project’s impact area is virtually unadulterated.

The noise level is extremely low, and disrupted intermittently by vehicles plying the access road, and the River Logone bank activity. Indeed, according to the measurements made on the Cameroonian side in Yagoua, the noise level varies between 30.9 db and 56.7 db (i.e. below the WHO standard of 70 db). The noise level on the Chadian side in Bongor is virtually the same as that on the Cameroonian side in Yagoua, ranging between 31.2 db and 54.4 db.

Relief

The relief of the localities of Yagoua and Bongor is quite uniform. It is a plain with a gentle gradient forming part of the natural extension of Lake Chad Basin’s alluvial plain. This extremely flat relief hinders rainwater flow (Diamaré Plain to the Logone and Kaélé pediplain), and thus naturally favours floodplain extension. The terrain is characterized by an extensive savannah that expands on over a
level plain, with no mountains jutting out in the horizon, thus offering a panoramic view of the steppe and shrub savanna landscape.

Three soil types make up the Yagoua and Bongor soil structure: (i) Luvisols: characterized by accumulated clay, are found in the Yaere floodplains. These soils are suitable for subsistence farming (sorghum or millet, maize), cash crops (cotton and rice) and grazing; (ii) Fluvisols: concentrated around Lake Chad, along the course of the Logone, and the Mora-Yagoua axis. They are suitable for rice cultivation; (iii) Planosols: characterized by silt surfaces, they are used as pasture where Muskuari is also practised in the dry season. These soils are commonly found in the lacustrine sections of Lake Chad.

**Hydrography and Water Quality**

The project area is dominated by seasonal rivers known as Mayo that dry up entirely in the dry season, pointing to supply difficulties both for the communities and livestock during the lengthy dry season. The project area experiences water scarcity. It is thus foreseeable that the Contractor’s water needs will face competition from the traditional water needs of communities. The Logone is the lone perennial watercourse in the area. Its proximity to the city is a boon for the communities who use it for various purposes. The River Logone is the main tributary of the Chari. The Upper Logone at Lai in Chad consists of its western branch from the North slope of the Adamaoua Plateau and its eastern branch from the Pende. In Bongor, the bridge construction project site, the Logone joins the Cameroon border from the duck’s beak.

Its catchment area measures 73,700 km². An analysis of the Logone water samples shows that while according to standards, this water may not be fit for direct human consumption, its quality is not so poor.

**4.2 Biological Environment**

**Flora**

The impact area vegetation is extremely sparse and severely affected by drought and desertification. In the zone, human activities (agriculture-livestock) have in relatively recent times contributed to the propagation of plant species with Sahelian characteristics. Project area plant formations may be conveniently labelled as "tree savannah" with Acacia senegal and Balanites aegyptiaca. Oftentimes, stands of Aristida spp, Boscia senegalensis and Hyphaena thebaica develop on sandy soils. Around streams, Acacia nilotica, Balanites aegyptiaca and Zizyphus mauritiana are frequent. Carrying capacity overshoot due to livestock is among the foremost reasons for the degradation of the vegetation cover which stretches as far as the eye can see.

Analyses have shown that characteristic floodplain plant species such as Vetiveria nigrita and Vechinochloa pyramidalis, which are more protein-rich and valued by animals, have been replaced by wood species. The access road to be constructed is lined with plants that are not natural vegetation. Most of these plants are reforestation tree species which are planted for their shade. The Neem or Azadirachta indica is the most highly represented. It is estimated that several thousand trees will be felled during the works, especially if no precautionary measures are put in place, particularly through a site traffic plan clearly specifying the detour itinerary. Besides these species are fruit trees, such as jujube, mango, etc.
Wildlife

The Far North Region is currently home to the largest number of mammals in the Waza National Park, located nearly 100 km from Yagoua. The main mammals found here are: elephants, buffoons, gazelles, giraffes and damalisques. Sizable elephant and giraffe populations have a definite impact on the distribution of some wood species such as Acacia seyal. On approaching the Logone, the wildlife is composed of migratory birds, and small game such as squirrels and rabbits. Additionally, there is a proliferation of rodents, mice and rats. It is also home to other bird species, such as vultures, eels, hawks, pikes, pigeons, crows, eagles, guinea fowl, herons, etc. Aquatic fauna includes hippopotamuses, varans and a wide variety of fish species: tilapia, carp, claw, catfish, captain, etc.

Protected Area

The Far North region has a wetland (the Waza-Logone floodplain) and three national parks (Waza, Kalamaloue, Mozogo goro) where poaching poses a management problem. However, none of these protected areas are close to the project site.

4.3. Human Environment

The project’s area of influence consists essentially of Cameroon’s Far North and the Mayo Kebbi East region in Chad. The Logone bridge, the target of Phase 1, will link the towns of Yagoua and Bongor.

The population of Cameroon’s Far North is estimated at 3.7 million and that of the Mayo Kebbi East at 900,000. The Yagoua population is estimated at 125,000 inhabitants, of which 50.9% are women. The population of Bongor was estimated in 2015 at 85,000 inhabitants, of which 50.3% are women. In the project area, there is more ethnic diversity on the Cameroonian side, and more homogeneity on the Chadian side.

Regarding economic activities, it is noteworthy that agriculture, livestock, fisheries, petty trade, motorcycle taxi and canoe crossing are predominant. In both countries, subsistence farming is practised, but much more intensely in Cameroon, judging from the number of plots and the variety of crops cultivated. In Chad, a limited variety of crops are grown, especially in terms of fruits and vegetables. There is a major cotton production activity under the aegis of SODECOTON in Cameroon and COTONCHAD in Chad, as well as a rice-growing activity controlled and promoted by SEMRY. Climate and vegetation are favourable factors for rice and cotton cultivation as well as stock breeding. With cotton factories and an oil mill, Maroua and Bongor are the foremost economic hubs of the project area.

Livestock constitutes a further relatively significant activity in both countries and the main animals raised are cattle, sheep, equines, cows, goats, pigs and poultry. Cattle, sheep, goats and poultry are the most significant on both sides. It is worth noting that, beyond being profitable, stock breeding is carried out more by virtue of the social prestige it brings. Fishing is widely practised in the Logone river by the communities on both banks using lines, nets and traps.

Petty trade is more intense in Cameroon than on the Chadian side. Besides freshly caught fish dealers, there are sellers of fruits and vegetables (tomato, eggplant, pepper, watermelon, etc.), tubers (coco Yam, yam), doughnuts, drinks, etc.
**Crossing of the Logone** features among the leading occupations of the youth residing around the two banks of the Logone. Crossing is by ferry and dugout canoes with paddles and motors. The ferry, run by the local authorities of the two countries who derive earnings from it, transports persons, goods and vehicles from one bank to the other. Crossing is undertaken by males aged between 18 and 50 years. Depending on their sizes, these canoes carry between 5 and 100 passengers. The crossing fare is CFAF 1000/person, with an additional charge for luggage. Goods transported by the canoe from one bank to the other depend on their nature and value. For the populations living around the Logone, the construction of the bridge will mean the loss of some crossing-related business.

Concerning **literacy**, the Far North Region is Cameroon’s least literate, with fewer than three out of ten persons being literate, as against the national average of around seven out of ten. Within the region, there are wide literacy level disparities according to ecological zone, residential environment, living standard and gender. There are nursery, primary, secondary and higher education institutions in the project’s impact area. Enrollment rates are lower than the national average for Cameroon and Chad. Indeed, while Cameroon’s national average rate is estimated at 77%, it is estimated at 46.7% in the Far North. With regard to Chad, the gross primary school enrollment rate is 98% at the national level and 75% in Mayo Kebbi East.

Health wise, the leading pathologies in the project area are due mainly to the lack of hygiene and cleanliness, flooding, lack of drinking water, transit truckers and lack of information and awareness of communicable diseases. These diseases are mainly malaria, waterborne diseases and STD/STIs, HIV/AIDS. Other diseases such as cholera, pneumonia, intestinal worms, colds and meningitis are seasonal.

The existing infrastructure is inadequate quantitatively and qualitatively to meet the needs of project area dwellers. Overall, the facilities are under-equipped. The basic equipment is not always available and there is a shortage of medical and paramedical personnel, as well as non-maintenance of equipment. The level of equipment of existing infrastructure does not enable health workers to conduct at present effective prevention campaigns against the region’s major diseases.

5. **ANALYSIS OF ALTERNATIVES**

5.1 **Without Project Option**

Not constructing the Logone bridge to directly link the border towns of Bongor in Chad and Yagoua in Cameroon and not rehabilitating the access roads will result in the continued underperformance of bilateral trade between the two countries and limited regional integration. The current land-based communication infrastructure linking the two countries will be overburdened and over-exploited, owing to population and traffic increase, thus leading to an economic development shortfall and higher accident risks (loss of life and property) and pollution.

To date, as mentioned above, the bulk of commercial traffic between Chad and Cameroon typically plies the Ngaoundéré-Garoua-Maroua-Kousséri road or the Ngaoundéré-Touboro-Moundou road (which has gained importance since the advent of the Boko Haram phenomenon). This traditional solution is considered a last resort by export traders. The itinerary through the traditional routes is longer than across the bridge, which is the purpose of the Project. Furthermore, it is true that the current risk of sending land surface goods by the river is simply disproportionate. For perishable goods, while part of the cargo may be lost on the traditional route, everything could also be lost on the road under study (using the Logone river) at the slightest disagreement with shippers or canoe operators. However, risk taking must factor in several items, including transport costs and safety.
5.2 Project Implementation Option

In this first phase, the project consists in constructing the bridge with some rectifications of the access roads layout. The "with project" solution is a breath of fresh air to heavy-goods vehicles. Given their output, they represent over 50 per cent of vehicle traffic but merely 20 to 22 per cent of the long-haul fleet, a proportion which applies to the highways in Chad and in Cameroon. The “with project” situation also includes the maintenance required to keep its initial service level as is: routine maintenance works, clearing of ditches and outlets; clearing of the easement and periodic maintenance.

5.3 Site Selection

After opting for the construction of a bridge and its ancillary facilities, it became necessary to find the most suitable site for the bridge. To that end, there were three (3) options: (i) construct the bridge at the present crossing point where there is a ferry; (ii) construct the bridge at a site located upstream of the present crossing point; and (iii) construct the bridge at a site located downstream of the present crossing point. The engineering studies deemed option 3 advantageous, namely, downstream of the present crossing point, for the following reasons: (i) more stable banks; (ii) site located far from the elbow; (iii) smaller, better defined and narrower bed (480m); and (iv) section close to that of the ferry’s passage.

5.4 Analysis of Bridge Construction Variants

There were two technical options for the construction of the projected bridge: a composite framework bridge with dual steel beams or an independent-span viaduct with pre-cast post-tensioned pre-stressed beams. The following table summarizes the comparative analysis of the two bridge design variants, from the environmental, socio-economic and durability perspective.

<table>
<thead>
<tr>
<th>Variants</th>
<th>Techniques</th>
<th>Environmental</th>
<th>Socio-economic</th>
<th>Durability</th>
</tr>
</thead>
</table>
| Composite framework with dual steel beams. | Deck laid current-wise on multiple single vertical drum piers each 7.40 m long and 2.50 m wide. Floating pile foundations are applied. | - Abundant use of hazardous substances (concrete, fuel, etc.)
- High risk of pollution due to construction machinery
- Accumulation of waste on the piers with flood risk | - Heavier financial investment
- Low social impact of the works (limited local labour due to mechanized works). | The facility requires constant maintenance (repainting of piers, anti-corrosion treatment) |
| Independent-span viaduct with pre-cast post-tensioned pre-stressed beams | Deck rested on thin piers arranged in 3 columns. Each of the 3 columns is 1.60 m in diameter and is surmounted by a 2.40 m wide and 1.50 m high rafter. The columns are driven directly into the ground to serve as bridge foundations. | - Limited use of hazardous substances (concrete, fuel, etc.);
- High pollution risk from construction machinery;
- No waste accumulation on the piers and no flood risk | - Less financial investment;
- Low social impact of works (limited local labour due to mechanization). | The facility requires maintenance as and when necessary (repainting of the piers, anti-corrosion treatment) |

Considering the result of the above analysis, the solution of the viaduct with independent spans and post-tensioned pre-stressed beams (VIPP) is the most advantageous. The following figure illustrates the cross section of the planned bridge type.
Concerning the connecting roads, there were two possible pavement structure options: pavement with 3-cm double-layered surface coating; and pavement with 5-cm bituminous concrete. The above analysis shows that the chosen technical option is a 5-cm bituminous concrete pavement and is more advantageous.
Table 5: Comparative analysis of surfacing variants

<table>
<thead>
<tr>
<th>VARIANTS</th>
<th>COMPARISON CRITERIA</th>
<th>Economic</th>
<th>Durability</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-cm double-layered surface coating</td>
<td>- significant noise pollution;</td>
<td>- Significant economic impact</td>
<td>Limited due to</td>
</tr>
<tr>
<td></td>
<td>- High use of hazardous materials (bitumen, fuel, etc.);</td>
<td>(labour-intensive works);</td>
<td>constant</td>
</tr>
<tr>
<td></td>
<td>- High pollution risk due to construction gear and handling of bitumen and other substances.</td>
<td>- Longer work duration;</td>
<td>maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- More difficult to implement--;</td>
<td></td>
</tr>
<tr>
<td>5-cm bituminous concrete</td>
<td>- Limited use of bitumen and derivatives</td>
<td>- Short execution time;</td>
<td>- More durable</td>
</tr>
<tr>
<td></td>
<td>- Limited noise pollution;</td>
<td>- Easier implementation;</td>
<td>road;</td>
</tr>
<tr>
<td></td>
<td>- Less significant environmental issues</td>
<td>Limited social impact of the works (limited use of labour due to mechanismation)</td>
<td>- Better quality pavement</td>
</tr>
</tbody>
</table>

6. POTENTIAL IMPACTS AND MITIGATION AND ENHANCEMENT MEASURES

The summary of activities concerning the implementation of the three (3) project components is as follows: (i) site layout; (ii) worksite preparation (bush clearing, tree felling, cleaning of ditches); (iii) excavations for construction of bridge abutments; (iv) the opening and operation of borrow sites; (v) supplies to construction sites; (vi) bituminous concrete production; (vii) production and storage of units for the construction of the bridge and other road structures (viii) construction of the bridge over the Logone; (ix) construction of border check points; (x) construction and installation of sanitation structures (concrete gutters, masonry ditches, piers, etc.); (xi) construction of facilities and vertical and horizontal signage; removal of materials and site cleaning.

6.1 Direct Negative Impacts

The solution adopted in this first phase of the project is the construction of 620 m long independent-span viaduct with pre-cast post-tensioned pre-stressed beams and access roads of a total length of 14 km, as well as ancillary works. Environmental and social impacts have been identified and evaluated by project phase and by environment (physical, biological and human). Impacts are identified based on potential interactions (positive or negative) between project activities and environmental components. Based on the three impact characterization criteria (intensity, duration and extent), it was possible to measure the significance of the impacts and thus prioritize what should be avoided, mitigated or offset.

6.1.1 Site Preparation and Construction Phase

6.1.1.1 Biophysical Environment

- **Impact on air quality**: easement clearance and earthworks, roadway construction and vehicle movements on the road under construction will generate dust, emissions of gases including carbon oxides (COx) nitrogen (NOx) and sulfur (SOx) and aerosols, resulting in increased greenhouse gas concentrations in the atmosphere. Concrete mixing, crushing and asphalt mixing plants produce dust while the coating plant produces fumes which may contain Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs) that could affect the health of workers and the local populations. Air pollution may also: (i) reduce drivers’ visibility and cause accidents; (ii) increase the number of respiratory and eye infections among exposed workers and local residents;
• **Impacts on soil structure** (compaction, erosion and loss of soil fertility). Exposed soils can be severely affected by surface erosion if no measures are taken, given that limited organic matter and vegetation cover will be left to slow down run-off. Additionally, the machine movements will contribute to soil compaction particularly in and around the detour and the access to the quarries/borrow sites, leading to soil impermeability and loss of fertility;

• **Water Stress:** The construction works will require significant volumes of water, particularly for concrete production, control of dust emissions on the banks of the Logone, along the corridor of the access road works and during the various cleaning operations. This water will be harvested from the various project water courses, in particular the Mayo Danay in Cameroon and the Mayo Boneye in Chad, some of which dry up in the dry season. A competition would then ensue between the project’s water requirements and those of local communities and livestock. Indeed, the demand for River Logone or Mayo waters will disrupt bathing/swimming activities and those of farmers who use it to water their crops. It is worth noting that due to the project area’s Sudanese climate, the dry season is long and water shortages are commonplace locally.

• **Surface and Ground Water Pollution Hazards:** During the works, dangerous products such as hydrocarbons, lubricants and drainage oils may be accidentally or deliberately spilled into water points, thus creating a diffuse surface water pollution source. On the other hand, some building materials (concrete, laitance, lime, bitumen, etc.) could enter into contact with and pollute the surface water. Water pollution could also arise from direct waste dumping by employees or if Contractors lack appropriate and sufficient toilets for their employees who may relieve themselves in the open field or streams.

• **Hydrological Regime Modification of the River Logone and the Mayo:** The construction of the bridge between Yagoua and Bongor, the construction of road structures over the Mayo and the various facilities may disrupt the flow and regime of the river and the Mayo. There are several reasons for such disruption of the flow of the water courses (Mayo) traversed by the structures to be rebuilt: (i) temporary diversion of the watercourse to dry the bed at the easement; (ii) depositing of fill material on the river bank embankments to improve the seating of the deck, thus narrowing the bed, (iii) accidental or deliberate dumping of excavated materials, resulting in partial or complete river bed obstruction. It is understood that the area is highly flood-prone and any material deposits or watercourse diversion and obstruction could cause an overflow leading to human and material damage.

• **Soil Structure Modification** (compaction, stripping, erosion, loss of arable land): During earthworks, bared and loosened soils will be erosion-prone. In the wet season, large gullies on roads, around the river or on deposited materials are commonplace. Bare soils can be seriously affected by surface erosion due to their limited organic matter to slow down runoffs. Additionally, earthworks, easement clearance and stripping will lead to topsoil loss for crops. Soil compaction will also result in soil impermeability and loss of fertility. Also, the banks of the Logone on the Cameroonian side are highly erosion-prone and this will be pronounced during the works.

• **Soil Pollution Risk:** This risk is due to accidental or deliberate oil spillage in unsuitable areas during construction or cleaning of work equipment, improper storage of fuels, etc. The areas most concerned are fuel depot sites, mechanics garage, washing area, outlets for effluents from the maintenance sites, and the banks of the Logone. Soil pollution may also be caused by other construction site liquid and solid wastes, such as concrete laitance and personnel-generated waste (tin cans, plastics, detergents, etc.).
• **Impacts on Wildlife:** The project area fauna comprises farm animals, birds, fish and occasionally hippopotamuses. Vegetation cover loss due to easement clearance will result in the destruction of wildlife habitat. Work site noise will chase away small animals and cause panic among grazing herds. Work equipment vibrations and quarry blasts will also cause wildlife to flee. Furthermore, surface water pollution will contribute towards degrading the living environment of aquatic fauna.

• **Impacts on Flora:** Easement clearance, shrub clearing and earth moving for ancillary works will entail the felling of about a thousand trees and shrubs planted along the access roads in Chad and Cameroon, as well as those found on both banks of the Logone. These operations will further destroy the vegetation cover, as well as crops and grazing land. The shrubs have a major impact on the entire area’s micro climate and help to improve the ambient air quality.

6.1.1.2 **Human Environment**

• **Expropriation:** The bridge construction over the Logone and ancillary works will strain the movement of traders living along the access roads and river banks. A loss of business activities will ensue that will affect a significant segment of the project area population in several areas of activities, particularly traders, canoe operators, motorcycle taxi drivers, etc. In terms of numbers, the field survey conducted identified a total of 150 affected persons in both countries, with more than 90% in Chad. Among them, there are 17 single women in total who are considered vulnerable persons within the concept of the AfDB policy on involuntary displacement. It is also worth noting the presence of public buildings (mosque, public latrines, prayer grounds, etc.) in the project area that do not belong to individuals but are common facilities.

• **Impact on the Health of Workers and Riparian Populations:** The overall noise level will definitely increase during the works due particularly to blasting in the quarries, compaction roller vibrations, the movements and operation of work equipment and vehicles. The noises will represent a serious nuisance particularly for quarry workers, riparian populations and schools. The noise may also chase off work site area terrestrial and avian fauna. Around towns and villages, earth-moving gear vibrations can unstabilize brick structures. It is worth noting that this impact will be temporary (during the construction phase) and should be mitigated through appropriate measures.

• **Risks of Spread of STIs/AIDS, Meningitis Epidemic, Cholera, Waterborne Diseases, Respiratory Infections, Malaria and Unwanted Pregnancies:** The works will require a major mobilization of labour both local and from afar especially skilled labour. Being separated from their families, some of them will tend to engage in sexual relations with project area ladies, with mutual risks of STI/STD/AIDS contamination. The poverty and low enrollment rate in the area pose a sexual promiscuity risk that could raise STI/AIDS prevalence. Furthermore, on-site inhalation of toxic dusts and inputs and consumption of water polluted by worksite effluents may cause respiratory as well as water-borne diseases. This constitutes a high-intensity impact and will manifest extensively.

• **Traffic Disruption and Destruction of Adjacent Access:** During construction, traffic will be disrupted by earthworks and roadway obstruction by vehicles, machinery and construction materials. The footpaths by which villagers access their fields or dwellings, and the exits of such pedestrian tracks on to the roads may be destroyed, rendering their use difficult. The traffic disruption may cause stop-and-go, reduced speed or detours. This impact will be local low-intensity and short-lived.
• **Work and Traffic Accident Risks (for humans and livestock):** The risks of work and traffic accidents will be fairly high especially for unskilled work in quarries, scaffolding, welding workshops and steel benders, machine operators, carpenters, etc. The different types of trauma can result in temporary work stoppage, permanent work stoppage or, at worst, death. Traffic accidents may also occur in the event of poor site signage. As the bridge will be constructed over the River Logone, drowning risks must also be considered. Stray cattle are recurrent and are also potential sources of accidents. The negative impact of these accident risks is highly significant as such accidents when they occur can seriously and permanently affect the workers and/or communities, even after the project.

6.1.2 **Operating Phase**

6.1.2.1 **Biophysical Environment**

• **Impacts on Water Resources and the Soil:** Following the commissioning of the bridge and access roads, there will be increased truck traffic transporting petroleum products and various other chemicals from one country to another. In the process, traffic accidents could occur. Also, road users oftentimes unwittingly repair their vehicles on the roadway, spilling products that could be drained by running water into water courses. Major cases of soil and stream pollution could occur following accidents involving trucks that may overturn thus offloading their cargo or tank contents into the river, on the roadway or in the open field. Water pollution risks will be greater were such spills to occur on the bridge causing a direct transfer of pollutants into the Logone.

• **Impact on Air:** Gaseous emissions, in particular nitrogen oxides (NO, NO2) stand at 10 kg/year per vehicle. Unburned hydrocarbons represent 38 kg per vehicle annually. Nitrous gases oxidize in the atmosphere and are partially dissolved by the rains. Gaseous organic hydrocarbons bind to dust and are partially absorbed by precipitations. On the one hand, improved road conditions and the bridge construction will generate more traffic, implying an increase of the same magnitude in the number of vehicles as emission sources. Furthermore, the project will increase average traffic speeds, resulting in smoother traffic and generally lower emission ratios than at current speeds (generally atmospheric emission ratios are inversely proportional to traffic speeds).

• **Impacts on Soils:** During the road project’s operation phase, the impacts on soils will be limited to erosion risks, which should be considered an impact (destruction of the environment through gullying, clogging, potential devegetation) but also a major constraint on the durability of built roads.

6.1.2.2 **Human Environment**

• **Collision of Livestock and Herds with Vehicles:** The presence of the newly constructed bridge and roads will constitute a permanent hazard to livestock and cattle that are typically grazed near roads. In the project area, herders habitually leave animals to stray, and the latter often end up on the roads. Should this habit endure at project completion, collisions between the animals and speeding vehicles could be recurrent.

• **Loss of/Decline in Income-Generating Activities of Persons engaged in Crossing and Vegetable Gardening Activities along the River:** In the operation phase, the presence of the bridge will drastically curb the intensity of canoe crossings, resulting in less income for workers in this sector. If no measures are taken, they will face difficulties meeting their needs and those of their families. The loss of income due to reduced riverside market gardening acreage is a negative impact directly caused by the bridge construction.
6.2 Positive Direct Impacts

The labour force requirement for the entire worksite is estimated at hundreds of employees in all positions. The Contractor that will win the contract will recruit nationally and locally. Young job seekers in the riparian villages will be needed for labour intensive works. Additionally, the food, accommodation and leisure needs of strangers will boost the trade sector and other business activities such as accommodation and food services. Accordingly, project input and subcontracting needs will provide an opportunity for national business people to boost their income levels.

During the operation phase, the expected positive impacts are: (i) improved landscape aesthetics around the bridge and access road environment; (ii) less drowning and loss of merchandise during crossings (in dugouts); (iii) improved transport conditions; (iv) reduced crossing time and cost; (v) deepening of socio-cultural exchanges between Cameroon and Chad; (vi) revitalization of lucrative activities and development of localities around the worksites; (vii) furtherance of bilateral and sub-regional integration.

6.4 Cumulative Impacts

There are eight other projects in the project area, namely: (i) Project to develop the road-dike along the River Logone; (ii) Flood Control Programme (PULCI); (iii) Douala-N’Djamena Railway Project; (iv) Project to construct 4 Pumping Stations, 4 Storage Basins and 4 Irrigation Schemes; (v) Project to rehabilitate the Magada-Yagoua Road and create a Bypass. Its purpose is to divert traffic from downtown Yagoua; (vi) Magada Junction-Yagoua Road Re-profiling Project; (vii) Project to build 500 Social Housing Units in the Town of Yagoua; and (viii) Market Construction Project in Zébé.

Cumulative impacts will occur due to the simultaneous implementation of the projects in the same locality. These impacts will manifest through increased risks of deterioration, disruption of existing activities and above all fresh impetus in various kinds of activities, including the movement of people and goods. The methods of exploiting existing agricultural and livestock resources will be expanded. Thus, the living conditions of the local populations will improve thanks to the operators and contractors who will give fresh impetus to agriculture, livestock and fishing activities. Ultimately, the workforce will enhance local human development.

The analysis revealed thirty-three (33) potential impacts depending on the areas concerned and their importance. There are twenty-five (25) negative impacts and eight (8) positive impacts.

6.5 Early Mitigation/Enhancement and Monitoring Measures at this Stage

6.5.1 Normative and Administrative Measures

The purpose is to ensure that the project complies with applicable regulations, and administrative and contractual requirements, in particular:

• **Compliance with Environmental and Social Regulations:** The project implementation must ensure compliance with the environmental regulations in force in Cameroon and Chad and those of the AfDB. In that regard, the ESIA report was validated by the Ministry of the Environment in Chad. For Cameroon, the report has been submitted and is under review.
Compliance with Land Regulations: Since expropriations are required under the project, the resettlement plan must comply with the land regulations in force in Cameroon and Chad. These elements are contained in the Abridged Resettlement Plan (ARP) prepared as a separate document.

Choice and Undertaking of Contractors: Environmental and social clauses will be included in the bidding documents (BD). The environmental component of the site’s internal regulations will also be drafted to include environmental considerations in the contractor’s practices and the conduct of its employees. The Contractor shall be required to hire a person in charge of the Environment.

Establishment of a Workplace Health, Safety and Environment Committee: Its role will be to ensure workplace health, safety and environmental protection. It will also raise environmental awareness among employees and ensure their involvement in the implementation of environmental measures.

Fair, Equitable and Prior Compensation of Persons Affected by the Project for the Assets identified in the RAP. The budget which takes into account all the measures adopted under this plan and includes the operation’s implementation and monitoring and evaluation costs stands at CFA 626.7 million. The Chadian portion of the budget will be covered by loan/grant resources and Cameroon’s will be financed by the government’s counterpart funding for the project.

Contractor's Commitments and Deliverables: The contractor will implement a quality assurance plan (QAP) that includes the environmental compliance clauses it undertakes to meet. It will be recommended that each company for each batch submit to the environmental control office for approval, a site environmental protection plan (SEPP) and a site environmental management plan (SEMP) 60 days after notification of the contract. These documents must indicate at least: (i) the organization chart of the personnel assigned to environmental and social management, with an indication of the environmental and social responsibility of the project; (ii) a description of methods for mitigating biophysical and socio-economic environmental impacts; (iii) the management and rehabilitation of borrow pits and quarries including the management of explosives; (iv) the water resources management plan; (v) erosion, drainage and sediment management plan, (vi) workers’ camp site installation plan with designation of storage areas and equipment locations (vii) the solid and liquid waste management plan, (viii) all site protection measures and enforcement programme; (ix) the site location and general layout to scale; (x) description of methods of avoiding and curbing pollution, fires, road accidents; (xi) health infrastructure and public access in case of emergencies; (xii) worksite regulations on environmental protection and safety; and (xiii) the forward plan for site restoration upon project completion and handover of any borehole facilities to the local communities.

6.5.2 Construction Phase

6.5.2.1 Biophysical Environment

Air Quality Protection Measures: the contractor is bound to take all necessary measures to prevent contamination of worksite surroundings, pavements, road shoulders and sidewalks by dust, muck, sludge or work materials. The contractor’s SEPP contains all such measures and will be approved by the inspection bureau and the implementation unit’s environmental and social team prior to the commencement of works and monitored by them during those works.

Water Stress: To avoid water use-related problems, it is recommended that the contractor drill two boreholes in each country for sampling. In all cases, the contractor will indicate the daily
water collection plan and volume to Construction Inspection which will in turn determine its appropriateness based on the borehole discharge rate. At the end of the works, the boreholes should be handed over to the communities after confirmation through a water quality analysis.

- **Surface and Groundwater Pollution Risks**: To mitigate this impact, there are plans to: (i) prohibit the handling and spilling of dangerous products into marshlands, on the banks the Logone and water courses; (ii) prepare leakproof and impervious areas protected from rain, for refueling and hydrocarbons storage, maintenance and washing of various vehicles and machines; (iii) provide buffers to neutralize pollution in the event of an accidental spill; (iv) construct suitable and sufficient latrines and toilets for worksite personnel; (v) conduct staff awareness sessions to prevent the dumping of any materials or substances that may pollute the waters; (vi) develop an emergency response plan for any accidental spills of a significant amount of pollutants into the water course; (vii) develop a waste management protocol; (viii) develop a water resources protection plan; (ix) avoid any release of materials and wastes into water courses; (x) sensitize employees on worksite health, safety and environment; (xi) prepare a concreted area for washing vehicles and construction machines equipped with a hydrocarbons separator; (xii) prepare an impervious area for bitumen storage; (xiii) sign a contract for the recovery and treatment of hydrocarbon wastes, filters, irons, batteries and other non-biodegradable wastes with a company having an environmental permit.

- **Hydrological Regime Modification of the River Logone and the Mayo**: to mitigate this risk, the contractor must be required to: remove drainage and low-grade materials as and when required from the project easement and avoid deposit of materials on the river banks or less than 100m from water courses; (ii) re-calibrate the Logone river bed and all encroached watercourses to restore the natural flow at project completion, and (iii) verify the blinding of the structures in accordance with technical requirements.

- **Soil Pollution Risks**: The recommended mitigation measures are: (i) installation of a secure storage facility for hydrocarbons and oils, paints and other chemicals and their delivery to a specialized treatment company; (ii) installation of a waste oil tank and return to the supplier for recycling (the contract between the contractor and the supplier must include this recovery clause); (iii) production of labelled half-barrels with a lid for solid waste collection at the worksite camp; (iv) decontamination of all polluted soils at project completion; (v) sensitizing workers to avoid spills and (vi) developing a washing area for vehicles and machinery, equipped with a hydrocarbons separator or decanter.

- **Tree Felling and Destruction of Natural Vegetation Cover**: Mitigating this impact will require: (i) strictly limiting logging operations on the easement; (ii) setting up the campsite in areas already anthropized; (iii) preserving large-diameter trees where these do not impede the works; (iv) landscaping and tree planting around the bridge, access roads and central islands (there is provision for the planting of 2860 alignment trees, development of 8ha of space and planting on 146.5 of degraded land); and (v) implementing a tree planting plan to compensate for those felled.

- **Habitat Disturbance and Destruction of Terrestrial and Aquatic Wildlife**: Staff awareness campaign on biodiversity conservation; include in worksite regulations clauses requiring staff to comply with hunting and fishing bans; limit to the minimum, trees to be felled, soil surfaces to be exposed in temporary occupation sites, borrow sites and quarries; verify that trees to be felled have no active nests; restore sites after exploitation, through tree planting; prohibit pollution or ruining watercourses and aquatic fauna.
6.5.2.2 **Human Environment**

- **Compensation**: Monitoring the implementation of the RAP and the functioning of the Dispute Resolution Committee. Given that submission of proof of compensation is a prerequisite for starting work on this section, it is important to ensure optimal implementation of the RAP.

- **Riparian Access and Heritage Sustainability**: Provide permanent riparian accesses for roadside buildings abutting on ramps/secondary roads;

- **Displacement of Logone River Bank and Roadside Traders and Loss of Earnings**: this impact will be mitigated through (i) priority recruitment by the Contractor of young people who have lost their business activities due to the project and (ii) allowing food and foodstuff sellers site access, to supply employees.

- **Noise and Nuisances**: Mitigating this impact will require (i) avoiding night work; (ii) ensuring that worksite machines meet soundproofing standards; selecting crushing and asphalt mixing plant sites outside villages; locating workshops and worksite camps at standardized distances from dwellings and schools; providing employees working at noise emitting stations with noise-canceling headsets and informing the public of the use of explosives.

- **Risks of spread of STIs/AIDS, Meningitis Epidemic, Cholera, Waterborne Diseases, Respiratory Infections, Malaria and unwanted Pregnancies.** To mitigate this risk, contractors and their subcontractors shall (i) organize control campaigns to prevent cholera, meningitis, malaria, water-borne diseases and STD/HIV/AIDS by observing strict hygiene, distribution upon hiring, vaccines, insecticide treated mosquito nets and condoms to site staff, and awareness campaigns on prevention of infectious diseases, (ii) supply drinking water to all staff at work; (iii) prohibit uncontrolled dumping of wastes; and (iv) enter into an agreement with a referral hospital to provide medical care to staff.

6.5.3 **Road Operation Phase**

- **Risk of Pollution of Soils and Water Courses (Logone and Mayo)**. At the completion of the bridge and with increased truck traffic transporting petroleum products and various other chemicals from one country to another, there will be road accident and oil spill risks in and around the Logone river, which could lead to water and soil pollution. The proposed mitigation and prevention measures include: (i) awareness of road users and effective technical inspection of vehicles; (ii) installation of a track separator on the bridge roadway to reduce vehicle collisions on the bridge; (iii) speed limits for vehicles.

- **Collision of Livestock and Herds with Vehicles**. To mitigate this negative impact, it is recommended to: (i) install signs for animal crossings and speed limits; (ii) electrify the access roads and the bridge to improve visibility for motorists and other users, and (iii) raise awareness among local stockbreeders.

- **Loss of/decline in Income-Generating Crossing Activities**: With the bridge, this activity will disappear, hence the need to: adopt a policy of redeployment of crossing sector workers (to fishing, farming, tourist crossing and leisure ...). This same measure is suggested to cope with reduced income due to decreased riverside market gardening acreage.
**Supplementary Initiatives:** The project has a socio-economic development component. This is in response to other development needs identified by project area stakeholders. The developments to be undertaken in Cameroon and in Chad differ.

**Specific developments for Cameroon**

- training and supporting youth and women in setting up development projects;
- construction of Zébé general market and Yagoua cattle market;
- rehabilitation and equipment of classrooms, plus latrines for public schools in Zébé and Kalaket; provision of water points in local schools and villages;
- lowlands development in Zebé to facilitate the redeployment of young canoe operators;
- providing equipment for the Yagoua regional hospital.

**Specific developments for Chad**

- Construction of a parking lot for heavy goods vehicles in the bridge area;
- provision of ten (10) water points (boreholes) in some schools and villages;
- (1)hydro-agricultural facility; (2) poultries; and (3) off-season rice production;
- supply of farm tools and pumping equipment to groups;
- rehabilitation and equipment of the Bongor Technical and Vocational Training Centre.

For the resettlement component, see the RAP summary.

7. **RESIDUAL EFFECTS AND ENVIRONMENTAL RISK MANAGEMENT**

7.1 **Negative Residual Effects**

No negative residual impacts of average or high significance are expected after applying mitigating measures. There are minor negative residual impacts requiring no special measures.

7.2 **Environmental Risk**

The environmental risk will be mostly related to accidental spills of hydrocarbons, bituminous products, explosive products and other substances used in road construction. A variety of construction site wastes will be generated. These may be classified as follows: (i) inert wastes, which are essentially concrete, excavation spoils, rubble - tiles, bricks, plaster, sand from demolitions etc; (ii) ordinary waste (wood, plastics, paper/cardboard, ferrous and non-ferrous metals, tapestries, carpets, plants, glazing, electrical wires and cables, PVC pipes, tyres, etc.); and (iii) hazardous waste (paints, mastics, varnishes, aerosols, asbestos, soiled packaging, tar, solvents, oils, adhesives).
An Emergency Response Plan will be put in place to deal with waste and effluent management including accidental spills. Essentially, this plan is designed to: (i) protect the environment. Waste recycling significantly saves natural resources and limits pollution due to burying or unauthorized dumping; and (ii) make construction site savings, given that sound on-site waste management can greatly reduce waste disposal costs; (iii) reduce work site nuisances. Sound waste management helps to (v) limit visual impact, waste and dust emissions and; (v) improve working conditions on the site. An organized site, with no waste strewn around, helps improve working conditions, ease work and increase output.

Other measures include: sensitization and training of site workers and ad hoc teams on rapid response techniques in the event of disasters, safety measures to be taken in dangerous or hazardous areas, sensitization of riparian populations on prevention of health risks and road safety. All these measures will be detailed in the documents to be submitted by the contractor and approved by the control bureau prior to project commencement: (i) the waste management plan; (ii) all site protection measures and enforcement programme; (iii) methods of avoidance and reduction of pollution, fire, road accidents; (viii) health infrastructure and public access in case of emergencies; (ix) worksite regulations on environmental protection and safety.

The operation of concrete mixing, crushing and asphalt mixing plants generates dust while the coating plant produces fumes which may contain Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs) that may affect the health of workers and local populations. Accordingly, the various authorizations must be obtained to ensure that the relevant standards are observed. Such in particular is the case of the study on hazards required by the Ministry in charge of Mines.

8. SUPERVISION/MONITORING AND INSTITUTIONAL RESPONSIBILITIES PROGRAMME

8.1 Supervision

8.1.1 Supervision Objectives and Content

Environmental supervision is designed to ensure the effective implementation of environmental measures. Its main objectives are: (i) to ensure compliance with the laws, regulations and strategies of the administrations involved; (ii) respond to governmental directives on the guidelines set out in the Environmental and Social Impact Assessment Report; (iii) present an environmental assessment in the event of impacts not foreseen by the ESIA and propose appropriate solutions; (iv) enable the developer to respond promptly to the failure of a planned mitigation measure or other unforeseen environmental disruptions; (v) apply sanctions and penalties as provided for in the various contracts between the developer and third parties.

To ensure proper environmental supervision of the project, the steps to be taken are to: (i) prepare the supervision programme; (ii) define the operations to be controlled; (iii) identify and locate sites to be monitored; (iv) make an inventory and include the environmental measures proposed in the Environmental and Social Impact Assessment (ESIA) report.
8.1.2 Operations requiring Supervision

Operations that will require environmental supervision include:

- compliance with the site's environmental regulations;
- presence of mobile and/or fixed signage at sensitive spots (worksites, agglomerations, etc.);
- supervision of the management of unsuitable materials (culvert debris, cut, etc.) deposit sites;
- operation and restoration of borrow pits and site facilities;
- compliance with STI/AIDS prevention measures;
- compensation for damaged property and crops;
- appropriate personal protective gear use by personnel;
- Recovery of used oil and other dangerous wastes.

8.1.3 Supervision Actors

Contractor’s Environmental and Social Officer: Corporate internal control is carried out through an environmental and social team. The company environmental officer will be responsible for implementing some measures, but will remain the lead environmental supervision actor. For company environmental officers, although they are executing agents for some environmental measures, they will be the lead actors of supervision of the implementation of several other measures that will be implemented generally by worksite foremen and garage heads.

Environmental and Social Officer of the Inspection Team: Environmental officers of inspection teams will be the principal environmental supervision agents. Their role will be to ensure proper implementation of environmental measures. To succeed, they must work in close collaboration with their counterparts in companies carrying out the works. The contractual environmental specifications, the SEPP and the PHSS approved will be the contractual reference documents for environmental supervision.

Local populations: The role of local populations in environmental supervision is to ensure that planned environmental measures are properly implemented. To ensure that project activities do not degrade their living environment, local residents shall participate in environmental supervision. To that end, they will need to know their rights and duties, and all environmental directives to be followed, to avoid unfounded claims that could lead to conflict. They shall, as far as possible, report any non-compliance and inadequate compliance with measures provided for.

8.1.4 Supervision tools

For the environmental officers of inspection teams to successfully perform their supervision tasks, they must prepare the appropriate environmental supervision tools, which include:

- environmental identification form (EIF);
- fact sheet;
- environmental scorecard;
- preventive action form;
- awareness meeting minutes;
- environmental non-compliance form;
- correspondence

### 8.1.5 Supervision Indicators

The supervision indicators are provided in the table below.

**Table 6: Supervision Indicators**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Indicators: rating parameters</th>
</tr>
</thead>
</table>
| **Choice and preparation of sites for the workers’ camp, fixed installations and asphalt mixing plant** | - Distance from dwellings;  
- environmental sensitivity of the site (slope, vegetation, etc.);  
- regard for existing tree vegetation;  
- floristic species cut down and planted;  
- drainage, soil erosion. |
| **Choice and preparation of quarry and borrow sites** | - Distance from dwellings;  
- environmental sensitivity of the site (slope, vegetation, etc.);  
- removal and storage of topsoil  
- plant species cut down and planted;  
- drainage, soil erosion. |
| **Compliance with occupational safety rules** | - personal safety gear;  
- safety of vehicles and construction equipment;  
- general working conditions;  
- wearing of personal protective gear by personnel;  
- work accident, etc. |
| **Sensitization of staff to environmental protection and STD/AIDS risks** | - information, education and interpersonal communication session;  
- dissemination of messages in the mass media, organized groups, schools, etc.  
- distribution of awareness-raising materials (pamphlets, etc.);  
- distribution of condoms. |
| **Preserving trees on the easement** | - number of trees felled;  
- rationale for felling |
| **Site signage and traffic control** | - number of accidents;  
- traffic interruption frequency;  
- duration of waiting period before crossing a work zone. |
| **Liquid pollutants and solid waste management** | - Concreting of drainage areas;  
- recovery and storage of lubricants;  
- storage of fuels;  
- recovery, evacuation and disposal of solid waste. |
| **Material recycling and deposits management** | - Overall assessment |
| **Restoration of farming lots** | - Restoration of damaged lots. |
| **Restoration of borrow sites** | - Landscape restoration after closure;  
- Spreading and adjustment of topsoil;  
- Rehabilitation as a water point. |
| **Restoration and handover of workers’ camp** | - Dismantling;  
- waste disposal;  
- Elimination of hazard sources;  
- Handover conditions. |
8.2 Monitoring

Monitoring activities will seek to evaluate the effective implementation of the recommended environmental and social measures and their effectiveness. They will also detect any unforeseen environmental or social impacts that may occur during project execution and rectify project activities accordingly.

8.2.1 Monitoring Actors

**Environmental Protection Units of the MINTP (Cameroon) and the Ministry of Infrastructure of Chad:** The environmental and social monitoring of the site will be undertaken in Cameroon by the Department of Road Infrastructure (DIR) through the AfDB -WB Unit and the Infrastructure Environment Protection Unit (CPEI) of the Technical Studies Support Division (DAET). On the Chadian side, it will be the environmental protection unit of the Ministry of Transport and Civil Aviation Infrastructure. Apart from the personnel of the said structures who are responsible for their sovereign missions, the Contracting Authority must recruit a socio-environmentalist who will work in the joint project implementation unit and who will be based at the project site.

**The Environmental Unit of the Joint Management Unit** ensures the implementation of the overall project ESMP, which is delegated to entities such as the DIR/BAD-BM-DAET/CPEI Unit in Cameroon and the Environment Unit of the Ministry of Infrastructure in Chad.

**MINEPDED’s Sub-Department of Environmental Assessment (SDEE) in collaboration with other structures and institutions:** The responsibility for monitoring the environmental management of the project officially lies with the Technical Studies Support Division of the MINTP in conjunction with the Sub-Department of Environmental Assessments (MINEPDED/DAET/SDEE). In principle, copies of monthly environmental and monitoring reports should be sent to the services of MINEPDED Regional Delegation, some of which are representative of the SDEE.

8.2.2 Monitoring Indicators

The table below shows the monitoring indicators.

<table>
<thead>
<tr>
<th>Potential Impacts Identified</th>
<th>Monitoring Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expropriations and involuntary population displacement</td>
<td>- Sign-out forms signed by PAP.</td>
</tr>
<tr>
<td>Employment opportunities / boosting lucrative activities and local development</td>
<td>- Percentage of local people working at the site; - Number of SMEs subcontracted.</td>
</tr>
<tr>
<td>Surface water pollution risks</td>
<td>- Presence of concreted areas at fuel and lubricants distribution areas; - Number of spills observed.</td>
</tr>
<tr>
<td>Disruption/Modification of hydrological regime of watercourses</td>
<td>- Length of bed of re-calibrated watercourses; - Number of outlets directed to rivers;</td>
</tr>
<tr>
<td>Destruction of trees and vegetation cover</td>
<td>- Success rate of seeded and/or reforested species; - Number of borrow sites rehabilitated.</td>
</tr>
<tr>
<td>- Risks of spread of STI/AIDS, - Respiratory infections</td>
<td>- Minutes of STI/AIDS awareness campaigns; - Number of people reached by sensitization; - Referral statistics based on hospital management chart.</td>
</tr>
</tbody>
</table>
| Disruption of traffic, destruction of riparian access /Degradation of traffic routes | - Presence of riparian access;  
- Number of traffic disruptions during the works. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of traffic and work accidents</td>
<td>- Number of accidents recorded during construction.</td>
</tr>
<tr>
<td>Flooding of dwellings and fields adjacent to the road</td>
<td>- Number of recorded complaints from riparian populations.</td>
</tr>
<tr>
<td>Disruptions to commercial activities.</td>
<td>- Number of traders’ complaints registered.</td>
</tr>
</tbody>
</table>

### 8.5 Reports

Quarterly environmental and social monitoring reports should be prepared by the environmental managers of the inspection team. These reports, which summarize their activities and the difficulties encountered, should be submitted to the AfDB.

### 9. PUBLIC CONSULTATION AND DISSEMINATION OF INFORMATION

#### 9.1 Public Consultations with the Communities as a whole

They were held respectively on 31 May 2017 in Yagoua, Cameroon and on 2 June 2017 in Bongor, Chad. The venues for these meetings were the meeting room of the Mayo Danay Divisional Delegation of the Ministry of Economy, Planning and Regional Development (MINEPAT) and the Esplanade of Bongor Town Hall (Chad). Participants included the Sub-divisional officers, village heads, notables, populations, the assessment team composed of MINTP staff and CARFAD staff.

#### 9.2 Public Consultations with Persons affected by the Project (PAP)

The two (2) other public consultation meetings brought together those affected by the project (PAP). They took place on the same dates, that is, on 31 May 2017 in Yagoua, Cameroon and on 2 June 2017 in Bongor, Chad. The venues for these meetings were the meeting room of the Mayo Danay MINEPAT delegation (Cameroon) and the meeting room of Bongor City Council (Chad). Besides the members of the assessment team (MINTP and CARFAD), these meetings were attended by the Mayo Danay senior Divisional Officer, the Mayor of Yagoua, Cameroon, the Regional delegate of the Ministry of Infrastructure (Chad), the mayor of Bongor, the village heads concerned, notables and persons affected by the project.

These public consultations with the PAPs aimed to: (i) recall the regulatory environment for public consultation in the context of the ESIA; (ii) present the laws and regulations on involuntary displacement or expropriation; (iii) discuss proposed expropriation processes/package solutions/offsets.

#### 9.4 Results of Public Consultations for the ESIA

Concerns raised by participants included: (i) expropriations; (ii) destruction of vegetation cover and wildlife habitat; (iii) risk of conflict between the contractor and the local populations; (iv) health risks due to the spread of diseases such as STIs/HIV, as well as traffic accident risks; and (v) increased banditry and theft.
Many grievances were submitted including:

- **In Chad**: (i) the creation of boreholes in the riparian communities at the connecting road and even in Bongor; (ii) hydro-agricultural facilities for rice growing for use by redeployed canoe operators; (iii) construction and rehabilitation of health centres; (iv) construction of classrooms; (v) development of Plot B;

- **In Cameroon**: (i) provision of three (3) boreholes in the Tchouda, Djarwai, Goulock and Guirzilla localities. It should be noted that the current borehole at Guirzilla lies on the project easement (ii) conversion of the Zebe I floodplain into a rice field; (iii) construction of a primary school in Zebe I; (iv) resettlement and compensation of canoe operators working along the river; (v) development of the Zebe II health centre; (vi) rehabilitation of the Zebe II public school and provision of 12 additional classrooms; (vii) construction of 7 boreholes in Zebe neighborhoods, namely 3 boreholes in Zebe Bac district, 2 boreholes in Ngarman district, 2 boreholes in the Lawan district (traditional ruler); (viii) construction of a fence at Zebe Public High School; and (x) electrification of the Zebe health centre.

The bulk of the concerns and grievances are addressed in the design of the project and ancillary works/measures. Participants were notified that grievances would be prioritized and according to the envelope available for ancillary works, many of those grievances would be taken into account. In this regard, there is provision for: (i) Supporting the integration of canoe operators; (ii) rehabilitating schools and health centres; (iii) constructing 3 platforms (ramps) for animal embarkation; (iv) drilling drinking water boreholes; (v) Providing equipment to women's associations;

### 9.5 Results of Public Consultations with PAPs

Overall, the main concerns of the PAPs relate to compensation for property that will be destroyed and support of PAPs in implementing the compensation procedures.

Elaborate explanations were provided on the expropriation procedure and terms and conditions of compensation in case of expropriation for public purposes. It was pointed out that expropriation for public purposes and compensation are governed by numerous laws, such as:

- **In Cameroon**: Law No. 85/09 of 4 July 1985 on expropriation for public purposes and compensation; (ii) Decree No. 87/1872 of 16 December 1987 implementing the above-mentioned Law; (iii) Decree No. 2003/418 / PM of 25 February 2003 fixing the compensation rates to be paid to owners of crops and cultivated trees destroyed for public purposes; (iv) Decree No. 2014/321/ PM of 29 September 2014, fixing the minimum prices applicable to transactions on land forming part of private State property ; (v) Order No. 00832/T.15.1/MINUH/D00 laying down the basis for calculating the market value of constructed structures subject to expropriation for public purposes. Copies of these instruments have been provided to the communities for better ownership.

- **Chad**: These include: (i) Law No. 24 of 22 July 1967 on land ownership and customary rights; (ii) Law No. 67-25 of July 22, 1967, on limiting land rights.

Consultations with local residents brought together traditional, communal and religious leaders, traders, farmers, cattle breeders, CIG members, students and the elite. Discussions during these consultations focused on (i) recalling the regulatory framework for involuntary displacement, (ii) expropriation processes, (iii) damages and compensation, (iv) treatment of cases of untitled land; (v) possible displacement of tombs; (vi) cases of shops with 2 owners, (vii) displacement of construction
materials already deposited on the easement to be cleared; etc. All these questions were satisfactorily answered, as is evidenced in the meeting minutes attached to the RAP.

9.6 Future Consultations

In Cameroon, Article 20 (2) of Decree No. 2013/0171/PM of 14 February 2013 laying down the conditions for conducting environmental and social impact assessments defines the conditions for public participation during the project implementation phase and the same applies for Chad. However, the participatory approach and the public consultation process shall continue during the project review and implementation in particular: (i) for the sites set up and start of works; and (ii) for baseline assessment and monitoring and evaluation of project impacts. These consultations should enable the implementation of the measures advocated in the Environmental and Social Management Plan (ESMP).

Accordingly, a consultation plan for the project stakeholders was prepared and appended to the ESIA report.

9.7 Complaints Management System

The structures responsible for managing grievances or complaints arising from any disagreements in the processing of compensation for expropriation are the Contracting Authority, the Expropriating Authority, the Ministry of Land Tenure, the Rights Establishment and Assessment Board and the Judge. There are also the Facilitation Committee (COFAC) and the Local Committees (COLOC) responsible for facilitating and supporting stakeholder dialogue and negotiations. Complaints are initially handled by the Ministry of Land Tenure which declares the general interest public works to be in the public interest and determines the level of competence of the pre-expropriation commission and, where appropriate, facilitates arbitration in case of unsuccessful negotiations. Thereafter, the verification and valuation commissions/appraisal and valuation committee review the claims of the expropriation victims and submit proposals for solutions to the Minister of Land Tenure. During this process, the Facilitation Committee (COFAC) and Local Committees (COLOC) can be involved to support stakeholder dialogue and negotiations. The Contracting Authority is bound to mobilize appropriations for the compensation of the affected persons. In the event of failed negotiations, the Judge handling the matter confirms, reduces or increases the compensation amount in accordance with the valuation methods established by law.

Other complaints are received directly at the level of the inspection team or the local administration (Divisional Office) and processed by the joint implementation unit.
9.8 Disclosure of ESIA Reports at the National Level

The outcomes of the ESIAs were disclosed in the project area. The ESIA and ESMP report was validated in Chad on 28 June 2017 and the procedure was initiated and the report is under review for Cameroon.

10. SUMMARY OF COSTS OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The overall cost of the ESMP is estimated at CFAF One billion one hundred and seventeen million one hundred and fifty-eight thousand three hundred and thirty one (1,117,158,331) and includes the cost of project-specific measures and the cost of measures to be included in the project cost of site installations, which is the responsibility of the Contractor. In addition, the cost of expropriations stands at CFAF six hundred and twenty-six million seven hundred and sixty-one thousand five hundred and five (626,761,505).

Table 8: Summary of Cost of ESMP Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unit</th>
<th>Q</th>
<th>Unit Cost (CFAF)</th>
<th>Total Cost (CFAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project-Specific Measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raising public awareness of easement clearance</td>
<td>session</td>
<td>2</td>
<td>2500000</td>
<td>5000000</td>
</tr>
<tr>
<td>Construction of boreholes</td>
<td>borehole</td>
<td>4</td>
<td>7000000</td>
<td>28000000</td>
</tr>
<tr>
<td>Worker awareness on spills avoidance</td>
<td>session</td>
<td>6</td>
<td>500000</td>
<td>3000000</td>
</tr>
<tr>
<td>Sensitization to the wearing of PPE to avoid polluted soils-related health problems</td>
<td>session</td>
<td>6</td>
<td>500000</td>
<td>3000000</td>
</tr>
<tr>
<td>Planting of trees around the bridge, access roads, central islands, etc.</td>
<td>ml</td>
<td>2860</td>
<td>4042</td>
<td>11560120</td>
</tr>
<tr>
<td>Landscaping aimed at reforestation of degraded areas to offset trees to be felled</td>
<td>ha</td>
<td>8</td>
<td>2265625</td>
<td>18125000</td>
</tr>
<tr>
<td>Tree planting to reforest degraded areas (old borrow pits, quarries and other available spaces), to offset those deforested by the project</td>
<td>ha</td>
<td>146.5</td>
<td>2126097</td>
<td>311473210.5</td>
</tr>
<tr>
<td>Herders’ awareness</td>
<td>session</td>
<td>6</td>
<td>500000</td>
<td>3000000</td>
</tr>
<tr>
<td>Staff awareness campaign on biodiversity conservation</td>
<td>session</td>
<td>6</td>
<td>500000</td>
<td>3000000</td>
</tr>
<tr>
<td>Establishment of local committees for maintenance of embankments and cleaning of sanitation facilities</td>
<td>Committee</td>
<td>8</td>
<td>10000000</td>
<td>8000000</td>
</tr>
<tr>
<td>Sensitization of populations on: accident risks; the importance of preserving the facilities provided and all facilities; conflict risks and avoidance measures; - etc</td>
<td>session</td>
<td>8</td>
<td>1000000</td>
<td>8000000</td>
</tr>
<tr>
<td>Campaign to sensitize the project area public and users on STI, HIV/AIDS prevention measures</td>
<td>session</td>
<td>32</td>
<td>8000000</td>
<td>25600000</td>
</tr>
<tr>
<td>Involvement of decentralized services in project monitoring</td>
<td>FF</td>
<td>1</td>
<td>60000000</td>
<td>60000000</td>
</tr>
<tr>
<td>TOTAL COST 1 (CFAF)</td>
<td></td>
<td></td>
<td>790 158 331</td>
<td></td>
</tr>
<tr>
<td>Measures to be included in site installations costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. **CLIMATE CHANGE**

### 11.1 Key Issues

Based on the vulnerability analysis of the Bank's climate safeguard system, the project was classified under Category 2. The project area in Yagoua and in Bongor is flood- and drought- prone. Flooding causes erosion and soil displacement, while drought dries up the soil and renders it unfit for farming. Regular water level fluctuations indirectly lead to erosion and soil displacements, resulting in soil instability. These flood-prone soils that are muddy in appearance in the wet season are extremely hard and brittle in the dry season. Soil stabilization is thus a major challenge during the works. Additionally, providing drainage and/or embankments would be required. The destabilization of the bank due to ongoing river bank erosion is likely to increase during the works. Special stabilization techniques (riprap, crib) must be used to curb erosion and consolidate the work platforms.

### 11.2 Adaptation

On the basis of the AREP tool (manual version), the options applicable to the project concern: (i) adapting the design of new infrastructures to increase climate resilience, notably through road boarding, drainage, etc.; (ii) monitoring and cleaning of the road structures; and (iii) stakeholder capacity building.

The project incorporated these issues as follows:

- Boarding of the road on the sections concerned;
- The height of the highest waters from a centennial flow of 2,905 m³s⁻¹ is 325.5 m for the design of the structure, which is higher than that indicated by the local residents (325.284 m) and that corresponding to the flood limit identified on the ground (325.0 m). ;
• Drilling for groundwater resource mobilization and drilling for livestock purposes on both sides along the road (cost is included in that of ancillary works).

• Special treatment will be reserved for flood-prone areas. Indeed, the embankment created in the flood zone will be protected by a 1.5 m high gravity retaining wall of 1-m deep buried crib whose upper part is covered by rock riprap. This erosion control system will be equipped with a discharge structure. Overall, the number of discharge structures to be constructed is 46 on the road section that traverses the swamp. The structures to be built are distributed as follows:
  
  o On the Cameroonian side, the flood zone spans 700 m. Seven (7) equilibrium structures 100 m apart will be constructed.
  
  o On the Chadian side, the flood zone is 4 000 m (4 km) long. Placing the structures 100 m apart will require 39 structures.

Overall, box culverts were preferred to barrels as they are self-cleaning and contribute to optimal water flow.

Furthermore, other projects are ongoing to curb project area flood impacts, namely:

(i) Flood Control Programme (PULCI) under way in the Mayo Danay area. The projected dyke traverses the connecting road from the bridge to Zebe junction (end of asphalted road).

(ii) The road-dyke construction along the River Logone. It will run from the "duck's beak" (Gobo) to Kousseri. This road will be provided to facilitate the link between various localities bordering the Logone to Kousseri in Cameroon. It will cover a distance of 133 km.

11.3 Mitigation

The construction of the bridge will increase average traffic speeds, resulting in smoother traffic and generally lower emission ratios than current speeds (atmospheric emission ratios are generally inversely proportional to traffic speeds). To offset losses due to the carbon sequestration potential as a result of vegetation destruction, there is provision for compensatory reforestation/restoration.

12. INSTITUTIONAL CAPACITY AND ENHANCEMENT PLAN

The key actors responsible for implementing the measures presented in the ESMP will be the Contracting Authority (Ministry of Infrastructure, Transport and Civil Aviation for Chad, and the Ministry of Public Works for Cameroon, through their respective executing agencies, the construction companies and the various sector authorities represented locally such as environmental services, water sector representatives and mining sector representatives of each country. The inspection unit will also be involved in monitoring during the execution of the works.

In accordance with the Memorandum of Understanding, the Joint Management Unit will include a socio-environmental expert. It will be supported by the project executing agencies in the respective countries and has the capacity to monitor the implementation of the ESMP. In Cameroon, this is the MINTP’s Environment Unit and for Chad, the Environment Unit of the Directorate General of Roads.
in collaboration with the Inspection Unit in those countries. To properly fulfill their tasks, these units will be provided institutional support through the project. A coherent annual monitoring programme will be drawn up on the basis of the project implementation schedule and submitted to the Monitoring and Execution Unit of the AfDB/World Bank Road Projects (CSEPR-BAD/BM) of the Ministry of Public Works) in Cameroon via the head of the Mixed Unit. The latter will make the necessary logistical and financial arrangements to ensure its execution. Budgetary provisions will be made under the project management component to enable the implementation of the programme to monitor the implementation of the ESMP. It should be noted that RAP implementation will also be provided by the project management unit supported by the Facilitation Committee (COFAC) and Local Committees (COLOC), which will be established to facilitate and support the implementation of the Consultation and Dialogue Plan with PAPs.

13. CONCLUSION

The ESIA has extensively covered all aspects of a comprehensive ESIA. It advocates an environmental and social management plan, including priority actions which once implemented, are likely to minimize or reduce the identified negative impacts. Provision has also been made for some actions to reinforce the positive impacts identified. Consultation with stakeholders took place and this consultation is expected to continue throughout the project cycle. The ESIA has therefore met the national regulatory requirements for impact studies and the Cameroonian and Chadian authorities have already granted certificates of conformity. The ESIA also meets the requirements of the Bank’s ISS and its environmental and social assessment procedures.

14. REFERENCES AND CONTACTS

The summary is based on the following documents:

- Ministère des Travaux Publics (MINTP)- Construction du Pont Logone-Plan Abrégé d’Action et de Réinstallation, June 2017;
- Ministère des Travaux Publics (MINTP)-Projet de construction d’un pont sur le fleuve Logone entre Yagoua (Cameroun) et Bongor(Tchad) et des aménagements connexes ; June 2017

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