The Republic of Ghana
Ministry of Roads and Highways

Republic of Ghana
Feasibility Study for
"Development, Rehabilitation and O&M for Apemenyim - Daboase Road as an Integrated PPP Project"
Final Report

March 2025

Japan International Cooperation Agency

Index Consulting, Inc.
Maeda Corporation
Mota-Engil Engenharia e Construção África, S.A.
Strategic Initiatives Limited

OS
JR(P)
25-012

Executive Summary

Undisclosed due to confidential business information.

Currency Equivalents

(As of 17th February 2025)

Currency unit – US Dollar (USD), Japanese Yen (JPY), and Ghana Cedis (GHS)
1 USD = 151.48 JPY
1 JPY = 0.007 USD
1 USD = 15.45 GHS

VAT Calculations

VAT is excluded in all expense, toll and revenue figures throughout the report.

Sources

Figures and Tables without sources were prepared by the Consortium.

List of Abbreviations

(In Alphabetical Order)

ADF	African Development Fund
AfDB	African Development Bank
ALCH	Abidjan-Lagos Corridor Highway
AIF	Africa Investment Forum
BoQ	Bill of Quantities
CAPEX	Capital Expenditure
CPI	Consumer Price Index
CSCF	Commodity-Specific Economic Conversion Factors
DDS	Detailed Design Study
DFR	Department of Feeder Roads
DSCR	Debt Service Coverage Ratio
DSRA	Debt Service Reserve Account
DTM	Digital Terrain Model
DUR	Department of Urban Roads
ECOWAS	Economic Community of West African States
EI	Executive Instrument
EIA	Environmental Impact Assessment
EIRR	Equity Internal Rate of Return
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction

ESIA	Environmental and Social Impact Assessment
ESG	Environmental, Social, and Governance
FCTC	Fiscal Commitment Technical Committee
FDBOT	Finance, Design, Build, Operate and Transfer
GBG	Gender-Based Groups
GHA	Ghana Highway Authority
GHS	Ghanaian Cedis
GDP	Gross Domestic Product
GIPC	Ghana Investment Promotion Centre
GIIF	Ghana Infrastructure Investment Fund
GIZ	German Society for International Cooperation
GoG	Government of Ghana
GPRTU	Ghana Private Road and Transport Union
GPS	Global Positioning Satellite
GRM	Grievance Resolution Mechanism
GSS	Ghana Statistical Service
IC	Index Consulting, Inc.
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IRI	International Roughness Index
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
JOIN	Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development
JPY	Japanese Yen
KM	Kilometer
KPI	Key Performance Indicator
KTC	Koforidua Training Centre
MDB	Multilateral Development Banks
MIGA	Multilateral Investment Guarantee Agency
MoF	Ministry of Finance
Mota-Engil	Mota-Engil Engenharia e Construção África, S.A.

MRG	Minimum Revenue Guarantee
MRH	Ministry of Road and Highways
NEXI	Nippon Export and Investment Insurance
NGO	Non-Governmental Organization
NPV	Net Present Value
O&M	Operation and Maintenance
OPEX	Operational Expenditure
OVB	Overpass Bridge
PCU	Passenger Car Units
PID	Public Investment Division
PIRR	Project Internal Rate of Return
PSIF	Private Sector Investment Finance
PPP	Public Private Partnership
PCN	Project Concept Note
PCU	Passenger Car Unit
PSC	Public Sector Comparator
PURC	Public Utilities Regulatory Commission
PVLMD	Public and Vested Lands Management Division
PWD	Persons with Disability
SIL	Strategic Initiatives Limited
SDGs	Sustainable Development Goals
SOQ	Seal of Quality
SPC	Special Purpose Company
SRTM	Shuttle Radar Topography Mission
TICAD	Tokyo International Conference on African Development
USD	United States Dollar
VDT	Vehicle Distance Travelled
VHT	Vehicle Hours Travelled
VFM	Value for Money Analysis
VGF	Viability Gap Funding
VOC	Vehicle Operating Cost
VOT	Value of Time Savings

WAGRIC	West Africa Growth Ring Corridor
WB	World Bank

Table of Contents

List of Figures

List of Tables

1. Background

The Development, Rehabilitation, Operation, and Management (O&M) of the Apemenyim-Daboase Road as an Integrated Public-Private Partnership (PPP) Project (hereinafter referred to as the “Project") is a private sector-led proposal (hereinafter referred to as the "Unsolicited Proposal") encompassing greenfield and brownfield components aimed at upgrading, operating, and maintaining the arterial route between Apemenyim and Daboase, which is part of the “Abidjan-Lagos Corridor Highway” under the Economic Community of West African States (ECOWAS).

1.1 Sector overview

To enhance the transportation network, several roads in the Sekondi-Takoradi region have been rehabilitated under the Medium-Term Expenditure Framework (2022 – 2025) of the Ministry of Roads and Highways (hereinafter referred to as "MRH") of the Government of Ghana (hereinafter referred to as "GoG"). Concurrently, the movement of medium and long-distance trucks driving near the port of Takoradi has been steadily increasing, along with a significant number of private vehicles driving in the city center. This surge in traffic has led to frequent congestion during the day, particularly during the morning and evening peak hours, with major intersections being the most affected.

Moreover, although the traffic volume on National Road 1 (hereinafter referred to as “N1 Road”) passing through Takoradi is expected to increase further due to future economic growth, the current traffic and road conditions present significant challenges that necessitate innovative and sustainable solutions. The proposed integrated Public-Private Partnership (PPP) project for the route between Apemenyim and Daboase aims to address these issues by constructing a bypass around Takardi and rehabilitating the N1 Road, with operations and maintenance (O&M) managed under an integrated PPP framework. This initiative will enhance efficiency and facilitate smooth transportation, thereby alleviating traffic congestion in Takoradi, improving safety and comfort, and supporting economic growth.

1.2 Problem being addressed

The project aims to alleviate traffic congestion in the center of Takoradi while efficiently addressing the deterioration of the existing pavement. This initiative is part of the Lagos-Abidjan corridor, which facilitates approximately 75% of the region’s logistics. Additionally, aging of road infrastructure poses significant challenges to efficient transportation in the area. Therefore, the project is anticipated to enhance logistics and stimulate economic growth not only in Ghana but throughout the entire West African region.

The primary advantage of the proposed Public-Private Partnership (PPP) scheme for the project is that it will enable the Government of Ghana (GoG) to rehabilitate the N1 Road, construct a new bypass, and manage the operations and maintenance (O&M) of both roads as an integrated PPP project with minimal financial burden. This integrated approach allows the GoG to allocate limited public funds more efficiently, as the private sector assumes the financial risk associated with upfront capital investments and ongoing operational costs. By securing involvement, the GoG can also leverage the private sector’s capability for innovation and creativity, facilitating the implementation of the latest technologies and best practices in road O&M and surrounding development.

(2) Current economic situation in Ghana

Ghana’s economy has been experiencing moderate growth, with GDP increasing by approximately 2.9% annually in 2023. However, the country is grappling with several challenges, including high inflation, which stood at 38.1% at the end of 2023, rising unemployment at 3.6%, and ongoing issues in the transportation sector, particularly in logistics. Roads play a crucial role in

the movement of goods and services, and the lack of efficient road infrastructure has hindered the maximization of economic output. Traffic congestion, especially around urban areas, such as Sekondi-Takoradi, poses a significant impediment to economic productivity due to their importance in port operations and trade.

Takoradi and Sekondi, along with Tema, are major port cities in Ghana, with Takoradi Port being the country's oldest harbour, established in 1928. This port plays a crucial role in Ghana's maritime trade, handling approximately 25% of the nation's seaborne traffic, 61% of seaborne exports, and 18% of seaborne imports as of 2021[1]. Key commodities managed through Takoradi Port include manganese, bauxite, clinker, wheat, cocoa (both bulk and bagged), quicklime, containerized cargo, and equipment for the mining and oil/gas industries. The strategic location of Takoradi Port also meets the international trade needs of landlocked countries in the Sahel region, such as Mali, Burkina Faso, and Niger, facilitating significant cargo transit for these nations[2]. However, congestion in Takoradi and Sekondi directly hampers the efficiency of port operations and trade activities, adversely affecting the broader economic productivity of Ghana and its neighbouring countries.

Cognizant of the impact of inadequate infrastructure on the economy, the Ghana Infrastructure Plan 2018-2047 emphasizes the expansion of its road network to 253,000 kilometers, increasing the proportion of paved roads to 70%, boosting the vehicular population to 250 vehicles per 1,000 people, connecting urban areas with multi-lane carriageways, increasing the number of tolled roads, widening 1,700 kilometers of urban roads, and developing bypasses for key towns, including Takoradi.

(3) Economic and social losses without the Project

The project is considered vital for economic development in Ghana, particularly in the context of its integration with the larger Abidjan-Lagos Corridor Highway under the Economic Community of West African States (ECOWAS). This corridor supports over 75% of the region's logistics, making it indispensable for both intra-regional and international trade. Additionally, it contributes to the realization of ECOWAS's vision of creating a single regional market by reducing trade barriers, enhancing connectivity, and fostering socio-economic development. Linking five ECOWAS member countries - Côte d'Ivoire, Ghana, Togo, Benin, and Nigeria - the Abidjan-Lagos Corridor is one of the most critical economic arteries in West Africa, serving as a lifeline for regional integration and economic growth. It is home to some of the largest and busiest ports in Africa, including the ports of Abidjan, Tema, Lomé, Cotonou, and Lagos[3]. The corridor is expected to serve an urban population projected to reach 173 million people by 2050, facilitate connections among the most economically dynamic cities, and provide a vital link for landlocked countries such as Burkina Faso, Niger, and Mali, thereby enhancing their trade with global markets[4].

The Apemenyim-Daboase section of the Abidjan-Lagos Corridor, situated in Ghana's Western Region, addresses critical bottlenecks in the transportation system, particularly around Takoradi and Sekondi. This area serves as a vital hub for Ghana's economy, primarily due to the presence of Takoradi Port, a key export point for commodities such as manganese, bauxite, and cocoa. The existing infrastructure is inadequate to handle the heavy traffic volumes, resulting in frequent congestion and delays. The proposed construction, rehabilitation, and integrated management of this section will alleviate congestion, reduce travel times, and enhance the efficiency of goods transportation, thereby directly benefiting port operations and trade.

The Apemenyim-Daboase section has been selected for development under this project due to its

[1] Ghana Port Authority: URL: https://ghanaports.gov.gh/page/index/15/EXKGB1KA/Welcome-Message
[2] Wikipedia | Takoradi Port: URL: https://en.wikipedia.org/wiki/Takoradi_Harbour
[3] European Union: URL: https://www.eeas.europa.eu/node/58359_en
[4] AfDB: URL: https://www.afdb.org/en/news-and-events/press-releases/african-development-bank-and-partners-plan-make-abidjan-lagos-corridor-highway-potent-economic-and-industrial-hub-78940

aging road infrastructure and its location in an industrialized region, which serves as a gateway to Ghana's mining and agricultural exports. Unlike other sections of the corridor that may have been recently rehabilitated or experience lower traffic volumes, this section is heavily burdened by long-distance freight traffic and local commuter vehicles. The condition of the roads is poor, characterized by frequent potholes, erosion, and inadequate capacity, which leads to higher vehicle operating costs and increased accident risks. Furthermore, the strategic proximity of this section to Takoradi Port enhances its economic significance for Ghana compared to other segments of the corridor. The route is not only critical for local traffic but also for regional trade, serving as a vital artery for logistics in West Africa[5]. However, the lack of adequate infrastructure is resulting in significant economic and social losses, particularly in terms of increased transportation costs, reduced trade efficiency, and adverse social impacts such as traffic congestion and road accidents.

(4) Economic losses due to road infrastructure deficiencies

The lack of the Apemenyim-Daboase bypass road, coupled with the ongoing issues affecting the N1 Road, has several direct and indirect economic consequences.

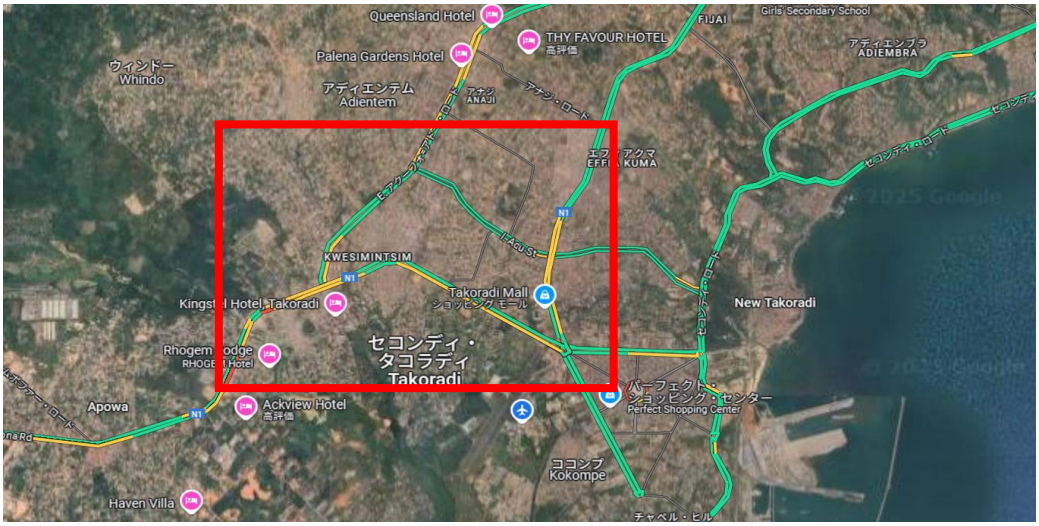
- The aging and inadequate road infrastructure significantly increases transportation costs, particularly for logistics companies utilizing the Abidjan-Lagos Corridor. Consequently, Ghana forfeits substantial economic development opportunities each year due to inefficiencies in the road sector, which include elevated fuel expenses and vehicle maintenance costs resulting from poor road conditions.
- Sekondi-Takoradi, a vital economic hub, frequently experiences traffic congestion, especially at major intersections, where trucks and long-distance vehicles significantly contribute to the issue. These delays lead to a loss of productivity and increased logistics costs.
- The new bypass road is an integral component of the broader ECOWAS highway network, which facilitates 75% of the region's logistics. Without its effective operation, the ability to transport goods efficiently across the region is severely hindered, impacting not only local trade but also international commerce.

(5) Social impact of the inadequate infrastructure

Beyond economic losses, the lack of this road has resulted in several negative social impacts. Poor road conditions, particularly on the N1 Road, have led to an increased frequency of road accidents, causing substantial human and economic losses. Improved road infrastructure would help reduce accidents and enhance safety for both drivers and pedestrians. Additionally, the absence of an efficient road network adversely affects local employment. The construction and operation of the Apemenyim-Daboase section would create a significant number of jobs, both directly (in construction and toll collection) and indirectly (through increased trade and business activity).

Therefore, it can be concluded that the lack of transport infrastructure, such as the new bypass road and the condition of the N1 Road, is not only resulting in substantial economic losses due to heightened transport costs, traffic congestion, and diminished trade efficiency, but is also contributing to social losses, including a higher likelihood of road accidents and missed employment and business opportunities. Addressing these challenges through the prompt implementation of the Project will be crucial for unlocking Ghana's economic potential in the target region and enhancing the quality of life for its citizens.

[5] ALCHDP: URL: https://alchdp.com/about/



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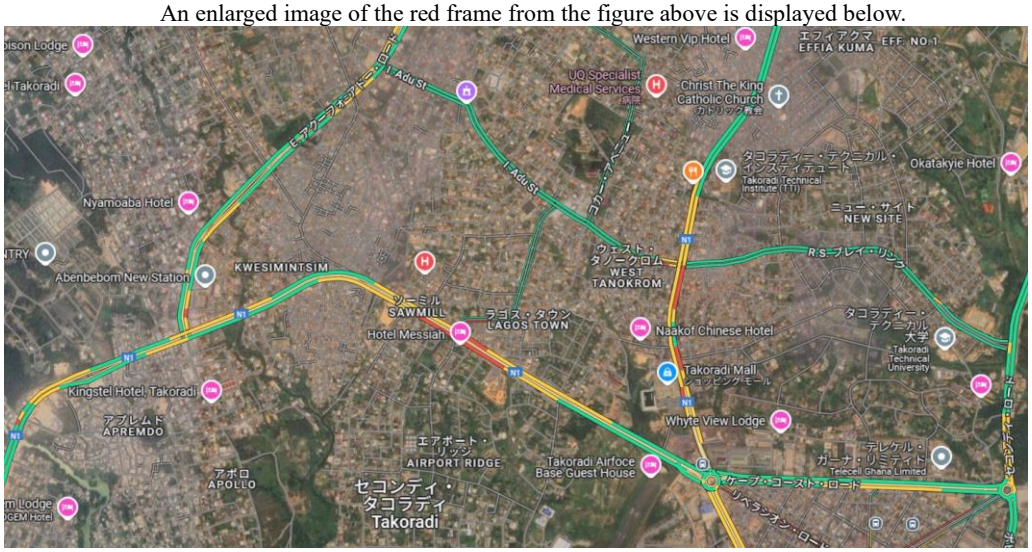


Legend: Fast Slow

Source: Google Earth

Figure 1-1. Congestion map of the Project area

Table 1-1. International Roughness Index (IRI) Ratings: N1 Road (Apemenyim-Daboase)

IRI Rating	Excellent (< 2.5)	Good (2.5 - 3.0)	Fair (3.0 - 4.0)	Poor (4.0 - 5.0)	Very Poor (> 5.0)
N1 Road (project section)	54%	10%	14%	7%	14%

Source: The Consortium

1.3 Alignment with strategic plans and objectives

In conjunction with the rehabilitation of several roads in Sekondi-Takoradi under the Medium-Term Expenditure Framework (2022-2025) of the Ministry of Roads and Highways (MRH)[6], plans are underway for the construction of a ring intersection in Takoradi. This bustling transportation hub faces significant challenges, including frequent traffic congestion during peak hours, particularly at major intersections. The congestion is exacerbated by the presence of medium and long-distance trucks operating near the port, as well as a growing number of private vehicles navigating the city center. The anticipated increase in traffic volumes, driven by future economic growth, poses a substantial challenge

[6] https://www.mofep.gov.gh/sites/default/files/pbb-estimates/2022/2022-PBB-MoF.pdf

for logistics, businesses, and the local population, particularly on the N1 Road , which is already in a deteriorating condition.

The proposed project forms part of the ECOWAS-backed Abidjan-Lagos Corridor Highway, which plays a crucial role in supporting approximately 75% of the region's logistics. However, aging road infrastructure is hindering the corridor's effectiveness in facilitating seamless transportation across the region. As recommended in a study conducted by ECOWAS, enhancing the road system through the improvements of the N1 Road and the construction of a new bypass road, planned as part of this project, will contribute to reducing congestion and smoothening transportation in the area.[7]

The project, which includes both greenfield (new bypass road) and brownfield (N1 Road) components, is anticipated to significantly enhance logistics and stimulate economic growth, not only in Ghana but also across the entire West African region.

1.4 Objectives of the project

The objective of the project is to efficiently develop, maintain, and manage the corridor while enhancing the level of service – specifically, improved traffic flow, reduced travel time, and safer road conditions. Additionally, the project aims to improve vehicle safety and comfort, enhance logistics reliability, promote regional development, and create employment opportunities through an integrated public-private partnership (PPP) initiative.

The project also includes various social development interlinkages that are anticipated to serve as multipliers. These interlinkages are expected to contribute to private sector development in tourism and to support small and medium-sized enterprises in the Sekondi-Takoradi region.

1.5 What has been done so far

For this project, the two memorandums of understanding (MOUs) regarding the promotion of road public-private partnership (PPP) projects in Ghana were finalized during the 7th Tokyo International Conference on African Development (TICAD 7), which took place in August 2019 in Yokohama.

Subsequently, following discussions with the Japan International Cooperation Agency (hereinafter referred to as “JICA”) and MRH, a preliminary feasibility study on the “Mamfe – Koforidua – Bunso” section was conducted over a period of six months, from May to November 2020, as part of JICA’s Preparatory Survey for PPP Infrastructure Project. In contrast, the Parliament of Ghana approved the Design-Build Contract Agreement for the “Peduase – Mamfe – Koforidua” section through public investment in December 2021.

Based on subsequent discussions with the MRH regrading various PPP schemes targeting the road network in Ghana, Japanese investors have concluded exclusive MOUs between MRH, Index Consulting, Inc., and Maeda Corporation. These agreements pertain to both greenfield and brownfield components of the project, which was discussed at TICAD 8 held in August 2022. The aim is to prioritize the materialization of the project in accordance with the MOU schedule.

Subsequently, a Pre-Feasibility Study was conducted to establish an optimal project structuring framework, incorporating key assumptions regarding technical, financial, legal, and risk allocation aspects of the project. This study facilitated discussions with the GoG to reach a preliminary consensus in accordance with the signed exclusive MOUs. Following the incorporation of input and recommendations from the GoG, an Initial Business Case, which proposed the optimal option and scheme along with the findings of Pre-Feasibility Study, was formally submitted to the MRH in May

[7] https://www.afdb.org/en/news-and-events/the-abidjan-lagos-corridor-a-pida-flagship-programme-and-catalyst-for-economic-growth-in-west-africa-16078

2023.

Subsequently, the MRH informed the project proponents of the approval granted in October 2023, as well as the registration of the project as an unsolicited PPP initiative. A unique project code, “1208423001,” was issued by the Ministry of Finance (hereinafter referred to as “MoF") of Ghana, along with directives to conduct a full feasibility study in accordance with sections 55(14) and (15) of the PPP Act 2020.

As another positive development, the project was officially registered as a project in the African Development Bank's Africa Investment Forum (AIF) 2023 Pipeline (Business-to-Business Deal) in November 2023. The AIF is a cross-sectoral platform co-hosted by eight development financial institutions, including the African Development Bank (AfDB), that brings together diverse stakeholders from Africa and beyond. It serves as a venue for innovative initiatives aimed at accelerating their financial closure. The registration of this project in the AIF Pipeline was well received by the AIF Secretariat, which has expressed its intention to continue monitoring the project for potential support measures.

In August 2024, the exclusive MOUs between MRH, Index Consulting, Inc., and Maeda Corporation signed at TICAD 8, were amended to extend the validity period of the MOUs and to recognize the project as an integrated greenfield-brownfield public-private partnership (PPP).

2. Technical Specifications

2.1 Location of the project

Undisclosed due to confidential business information

(1)Road surveys

Figure 2-1. Construction section by the GHA
Undisclosed due to confidential business information

Table 2-1. Construction status photographs by the GHA
Undisclosed due to confidential business information

Table 2-2. Toll gates on N1Road
Undisclosed due to confidential business information

Figure 2-2. The locations of the existing toll gates on the N1 Road
Undisclosed due to confidential business information

Figure 2-3. Improvement policy of N1Road
Undisclosed due to confidential business information

(2)Bridge surveys

Undisclosed due to confidential business information

Figure 2-4. The location of the existing bridges
Undisclosed due to confidential business information

Table 2-3. Field survey photos of No.1 Bridge
Undisclosed due to confidential business information

Table 2-4. Field survey photos of No.2 Bridge
Undisclosed due to confidential business information

Table 2-5. Field survey photos of No.3 Bridge
Undisclosed due to confidential business information

Table 2-6. Field survey photos of No.4 Bridge
Undisclosed due to confidential business information

Table 2-7. Field survey photos of No.5 Bridge
Undisclosed due to confidential business information

Table 2-8. Field survey photos of No.6 Bridge
Undisclosed due to confidential business information

2.2 Scope of services

Table 2-9. Summary of the Apemenyim - Daboase section
Undisclosed due to confidential business information

Table 2-10. Proposed project scope
Undisclosed due to confidential business information

(1)Road design review

Undisclosed due to confidential business information

Figure 2-5. Project scope
Undisclosed due to confidential business information

Figure 2-6. Project highway typical section
Undisclosed due to confidential business information

Table 2-11. Geometric structural criteria
Undisclosed due to confidential business information

Figure 2-7. Proposed road station locations
Undisclosed due to confidential business information

Figure 2-8. Expected layout of the road station
Undisclosed due to confidential business information

Figure 2-9. N1 Road
Undisclosed due to confidential business information

Table 2-12. Pavement structure of the Detailed Design Study (DDS)
Undisclosed due to confidential business information

Table 2-13. Proposed pavement structures
Undisclosed due to confidential business information

Table 2-14. Quantity calculation result of the new bypass road
Undisclosed due to confidential business information

Figure 2-10. N1 Road improvement section (24km)
Undisclosed due to confidential business information

Figure 2-11. N1 Road typical cross section (2 Lanes)
Undisclosed due to confidential business information

Figure 2-12. N1 Road typical cross section (4 Lanes)
Undisclosed due to confidential business information

Table 2-15. Quantity calculation result of N1 Road
Undisclosed due to confidential business information

(2)Review of phase 3: detailed design study (DDS) for Abidjan - Lagos corridor highway

Undisclosed due to confidential business information

Table 2-16. Type of bridges along the main motorway
Undisclosed due to confidential business information

Table 2-17. Variant analysis for bridge length L = 15m to 60m
Undisclosed due to confidential business information

Table 2-18. Assumed new bridges
Undisclosed due to confidential business information

Figure 2-13. The location of the existing bridges
Undisclosed due to confidential business information

Figure 2-14. General structural drawing No. 1 Bridge
Undisclosed due to confidential business information

Figure 2-15. General structural drawing No. 2 Bridge (2 lane)
Undisclosed due to confidential business information

Figure 2-16. General structural drawing No. 2 Bridge (4 lane)
Undisclosed due to confidential business information

Figure 2-17. General structural drawing No. 3 Bridge
Undisclosed due to confidential business information

Figure 2-18. General structural drawing No. 4 Bridge
Undisclosed due to confidential business information

Table 2-19. Quantity summary table (bridges on existing N1 Road superstructure)
Undisclosed due to confidential business information

Table 2-20. Quantity summary table (bridges on existing N1 Road substructure)
Undisclosed due to confidential business information

(3)CAPEX calculations

Undisclosed due to confidential business information

Table 2-21. Cost analysis of greenfield section (48.3 km)
Undisclosed due to confidential business information

Table 2-22. Brownfield section - four lane improvement (24 km)
Undisclosed due to confidential business information

Table 2-23. Summary table for calculation of total CAPEX
Undisclosed due to confidential business information

(4) Maintenance of roadway

Undisclosed due to confidential business information

(6) Contract Period

Undisclosed due to confidential business information

2.3 Roles and responsibilities

Undisclosed due to confidential business information

Figure 2-19. Project Consortium

Undisclosed due to confidential business information

2.4 Output specifications

(1)Output specification for design and construction phases

Undisclosed due to confidential business information

(2)Output specification for operation and maintenance phase

Undisclosed due to confidential business information

(3)Performance indicators to measure performance against those outputs

Undisclosed due to confidential business information

2.5 Payment mechanism

Undisclosed due to confidential business information

Figure 2-20. Proposed Project Scheme of “Concession”

Undisclosed due to confidential business information

Figure 2-21. Alternative Project Scheme of “Hybrid with Availability Payment”

Undisclosed due to confidential business information

3. Options Analysis

Undisclosed due to confidential business information

4. Legal and Regulatory Diligence

Undisclosed due to confidential business information

4.1 Analysis of the applicable legal framework to identify legal requirements and impediments

Undisclosed due to confidential business information

(1) The 1992 Constitution of the Republic of Ghana (the "Constitution") & the Land Act, 2020 (Act 1036) (the "Land Act")

Undisclosed due to confidential business information

(2) Lands (Statutory Wayleaves) Act, 1963 (Act 186)

Undisclosed due to confidential business information

(3)PPP policy and legislation (if passed)

Undisclosed due to confidential business information

Table 4-1. PPP project approving authority
Undisclosed due to confidential business information

(4)Public procurement law

Undisclosed due to confidential business information

(5) Law referring to foreign investment, property, and labor

Undisclosed due to confidential business information

Table 4-2. Immigrant quota
Undisclosed due to confidential business information

(6)Legislation relating to land use planning and environmental law

Undisclosed due to confidential business information

4.2 Legal analysis or project specific issues

Undisclosed due to confidential business information

(1) Financial aspects of the project, including the ability/right to charge users

Undisclosed due to confidential business information

Table 4-3. Approved and proposed road toll rates
Undisclosed due to confidential business information

(2) Use of existing land and assets

Undisclosed due to confidential business information

(3) Commercial viability

Undisclosed due to confidential business information

(4) Tax and accounting issues considered in the financial mode

Undisclosed due to confidential business information

(5) Revenue Guarantee / Sharing

Undisclosed due to confidential business information

(6) Allocation of the risk of the exchange rate fluctuation

Undisclosed due to confidential business information

5. Demand Analysis

5.1 Transportation planning

Undisclosed due to confidential business information

(1) Overview

Undisclosed due to confidential business information

(2) Review of growth rates

Undisclosed due to confidential business information

Table 5-1. Assumed traffic growth rates of the Corridor
(Phase 3: Detailed Design Study Draft – Volume 2-A1)
Undisclosed due to confidential business information

Table 5-2. Summary of Traffic Survey Results (2019)
Undisclosed due to confidential business information

Figure 5-1. Survey Location of Traffic Volume Count (TVC)
Undisclosed due to confidential business information

Table 5-3. Recommended traffic growth rates
Undisclosed due to confidential business information

(3) Traffic analysis

Undisclosed due to confidential business information

Figure 5-2. ECOWAS alignment
Undisclosed due to confidential business information

Figure 5-3. Analysis network
Undisclosed due to confidential business information

Table 5-4. Low volume case: estimated traffic volumes in PCUs
Undisclosed due to confidential business information

Table 5-5. Low volume case: volume-to-capacity ratio
Undisclosed due to confidential business information

Table 5-6. Medium volume case: estimated traffic volumes in PCUs
Undisclosed due to confidential business information

Table 5-7. Medium volume case: volume-to-capacity ratio
Undisclosed due to confidential business information

Table 5-8. High volume case: estimated traffic volumes in PCUs
Undisclosed due to confidential business information

Table 5-9. High volume case: volume-to-capacity ratio

Undisclosed due to confidential business information

5.3 Willingness to Pay (WTP) Survey Results

Undisclosed due to confidential business information

(1) Number of Samples

Undisclosed due to confidential business information

Table 5-28. Number of samples surveyed
Undisclosed due to confidential business information

Table 5-29. Vehicle type of samples

Undisclosed due to confidential business information

(2) Personal Information

Undisclosed due to confidential business information

Table 5-30. Age of sampled drivers
Undisclosed due to confidential business information

Table 5-31. Occupation of sampled drivers
Undisclosed due to confidential business information

(3) Trip Information

Undisclosed due to confidential business information

Table 5-32. Travel time of surveyed vehicles
Undisclosed due to confidential business information

Table 5-33. Trip frequency of surveyed vehicles
Undisclosed due to confidential business information

Figure 5-4. Distribution of travel speed by travel distance
Undisclosed due to confidential business information

(4) Willingness to pay

Undisclosed due to confidential business information

Figure 5-5. Relation between time reduction and payment for time reduction (time reduction 20%)
Undisclosed due to confidential business information

Figure 5-6. Relation between time reduction and payment for time reduction (time reduction 50%)
Undisclosed due to confidential business information

Figure 5-7. Survey Questionnaire (1)
Undisclosed due to confidential business information

Figure 5-8. Relation between toll rate per hour in GHS and diversion rate

6. Financial Analysis

6.1 Estimates of CAPEX and OPEX

Undisclosed due to confidential business information

(1) Consideration of options for financial analysis

Undisclosed due to confidential business information

Table 6-1. Description of the Project options
Undisclosed due to confidential business information

(2) Result of estimation of CAPEX and OPEX

Undisclosed due to confidential business information

Table 6-2. Project cost (inflation rate is reflected)
Undisclosed due to confidential business information

Figure 6-1. Historical data of inflation rate in Ghana
Undisclosed due to confidential business information

Figure 6-2. Historical data of exchange rate of US dollar/Ghanian cedi
Undisclosed due to confidential business information

6.2 Expected sources of financing

Undisclosed due to confidential business information

(1) Debt portion

Undisclosed due to confidential business information

Table 6-3. Envisioned conditions of JICA's PSIF (Loan)
Undisclosed due to confidential business information

(2) Equity portion

Undisclosed due to confidential business information

6.3 Expected cost overruns

Undisclosed due to confidential business information

6.4 Revenue projections

(1) Method of revenue projection

Undisclosed due to confidential business information

Figure 6-3. Assumption of revision of toll fee and service fee linked to inflation rate
Undisclosed due to confidential business information

Table 6-4. Toll fee estimation (N1 Road full concession) in USD

Undisclosed due to confidential business information

Table 6-5. Toll fee estimation (N1 Road full concession) in JPY
Undisclosed due to confidential business information

Table 6-6. Toll fee estimation (N1 Road Option 1 (full concession)) in GHS
Undisclosed due to confidential business information

Table 6-7. Toll fee estimation (N1 Road Option 2 (partial concession)) in USD
Undisclosed due to confidential business information

Table 6-8. Toll fee estimation (N1 Road Option 2 (partial concession)) in JPY
Undisclosed due to confidential business information

Table 6-9. Toll fee estimation (N1 Road Option 2 (partial concession)) in GHS
Undisclosed due to confidential business information

Table 6-10. Toll fee estimation (New bypass road) in USD
Undisclosed due to confidential business information

Table 6-11. Toll fee estimation (New bypass road) in JPY
Undisclosed due to confidential business information

Table 6-12. Toll fee estimation (New bypass road) in GHS
Undisclosed due to confidential business information

Table 6-13. Toll rate comparison
Undisclosed due to confidential business information

(2) Result of revenue projection

Undisclosed due to confidential business information

Table 6-14. Total toll fee revenue (inflation rate is reflected)
Undisclosed due to confidential business information

Table 6-15. Total service fee revenue (inflation rate is reflected)
Undisclosed due to confidential business information

(3) Toll Revenue Estimation

Undisclosed due to confidential business information

Table 6-16.Low case revenue estimation (N1 Road Option 1(Full Concession)) in USD
Undisclosed due to confidential business information

Table 6-17. Low case revenue estimation (N1 Road Option 1(Full Concession)) in JPY
Undisclosed due to confidential business information

Table 6-18. Low case revenue estimation (N1 Road Option 1 (full concession)) in GHS
Undisclosed due to confidential business information

Table 6-19. Medium case revenue estimation (N1 Road Option 1(Full Concession)) in USD

Undisclosed due to confidential business information

Table 6-20. Medium case revenue estimation (N1 Road Option 1(Full Concession)) in JPY

Undisclosed due to confidential business information

Table 6-21. Medium case revenue estimation (N1 Road Option 1 (full concession)) in GHS

Undisclosed due to confidential business information

Table 6-22. High case revenue estimation (N1 Road Option 1(Full Concession)) in USD

Undisclosed due to confidential business information

Table 6-23. High case revenue estimation (N1 Road Option 1(Full Concession)) in JPY

Undisclosed due to confidential business information

Table 6-24. High case revenue estimation (N1 Road Option 1 (full concession)) in GHS

Undisclosed due to confidential business information

Table 6-25. Low case revenue estimation (N1 Road Option 2 (Partial Concession)) in USD

Undisclosed due to confidential business information

Table 6-26. Low case revenue estimation (N1 Road Option 2 (Partial Concession)) in JPY

Undisclosed due to confidential business information

Table 6-27. Low case revenue estimation (N1 Road Option 2 (partial concession)) in GHS

Undisclosed due to confidential business information

Table 6-28. Medium case revenue estimation (N1 Road Option 2 (Partial Concession)) in USD

Undisclosed due to confidential business information

Table 6-29. Medium case revenue estimation (N1 Road Option 2 (Partial Concession)) in JPY

Undisclosed due to confidential business information

Table 6-30. Medium case revenue estimation (N1 Road Option 2 (partial concession)) in GHS

Undisclosed due to confidential business information

Table 6-31. High case revenue estimation (N1 Road Option 2 (Partial Concession)) in USD

Undisclosed due to confidential business information

Table 6-32. High case revenue estimation (N1 Road Option 2 (Partial Concession)) in JPY

Undisclosed due to confidential business information

Table 6-33. High case revenue estimation (N1 Road Option 2 (partial concession)) in

GHS
Undisclosed due to confidential business information

Table 6-34. Low case revenue estimation (New bypass road) in USD
Undisclosed due to confidential business information

Table 6-35. Low case revenue estimation (New bypass road) in JPY
Undisclosed due to confidential business information

Table 6-36. Low case revenue estimation (New bypass road) in GHS
Undisclosed due to confidential business information

Table 6-37. Medium case revenue estimation (New bypass road) in USD
Undisclosed due to confidential business information

Table 6-38. Medium case revenue estimation (New bypass road) in JPY
Undisclosed due to confidential business information

Table 6-39. Medium case revenue estimation (New bypass road) in GHS
Undisclosed due to confidential business information

Table 6-40. High case revenue estimation (New bypass road) in USD
Undisclosed due to confidential business information

Table 6-41. High case revenue estimation (New bypass road) in JPY
Undisclosed due to confidential business information

Table 6-42. High case revenue estimation (New bypass road) in GHS
Undisclosed due to confidential business information

6.5 Proponent's breakeven requirements

Undisclosed due to confidential business information

6.6 Basic financial ratios

Undisclosed due to confidential business information

6.7 Level of viability gap funding if any, expected from the GoG

Undisclosed due to confidential business information

6.8 Estimated NPV and IRR

Undisclosed due to confidential business information

Table 6-43. Estimated NPV, Project IRR, Equity IRR and other KPIs
Undisclosed due to confidential business information

Table 6-44. Discount rate for SPC and the GoG
Undisclosed due to confidential business information

Figure 6-4. Government bond yield in Ghana (2016-2024)
Undisclosed due to confidential business information

6.9 Analysis of impact on financial viability of SPC

Undisclosed due to confidential business information

(1) Medium Risk Scenarios

Undisclosed due to confidential business information

Table 6-45. Estimated NPV, Project IRR, Equity IRR and other KPIs (Medium Risk – Scenario 1)
Undisclosed due to confidential business information

Table 6-46. Estimated NPV, Project IRR, Equity IRR and other KPIs (Medium Risk – Scenario 2)
Undisclosed due to confidential business information

Table 6-47. Estimated NPV, Project IRR, Equity IRR and other KPIs (Medium Risk – Scenario 3)
Undisclosed due to confidential business information

(2) Worst Risk Scenarios

Undisclosed due to confidential business information

Table 6-48. Estimated NPV, Project IRR, Equity IRR and other KPIs (Worst Risk – Scenario 1)
Undisclosed due to confidential business information

Table 6-49. Estimated NPV, Project IRR, Equity IRR and other KPIs (Worst Risk – Scenario 2)
Undisclosed due to confidential business information

Table 6-50. Estimated NPV, Project IRR, Equity IRR and other KPIs (Worst Risk – Scenario 3)
Undisclosed due to confidential business information

7. Fiscal Impact Analysis

Undisclosed due to confidential business information

7.1 Direct Liabilities

Undisclosed due to confidential business information

Table 7-1. Direct liabilities associated with each option

Undisclosed due to confidential business information

7.2 Contingent Liabilities

Undisclosed due to confidential business information

Table 7-2. Contingent liabilities assumptions and considerations

Undisclosed due to confidential business information

Table 7-3. Contingent liabilities assumptions and considerations

Undisclosed due to confidential business information

7.3 Compliance with applicable laws and regulations

Undisclosed due to confidential business information

8. Economic Analysis

Undisclosed due to confidential business information

8.1 Expected values of economic net benefits

Undisclosed due to confidential business information

8.2 VOC savings

Undisclosed due to confidential business information

(1) Methodology

Undisclosed due to confidential business information

(2) Input parameter

Table 8-1. Input parameter for VOC estimation

Undisclosed due to confidential business information

(3) Calculation result

Undisclosed due to confidential business information

Table 8-2. VOC per year in USD

Undisclosed due to confidential business information

Table 8-3. VOC per year in JPY

Undisclosed due to confidential business information

Table 8-4. VOC per year in GHS

Undisclosed due to confidential business information

Table 8-5. VOC Savings per year in USD

Undisclosed due to confidential business information

Table 8-6. VOC Savings per year in JPY

Undisclosed due to confidential business information

Table 8-7. VOC Savings per year in GHS

Undisclosed due to confidential business information

8.3 VOT savings

(1) Methodology

Undisclosed due to confidential business information

(2) Input parameter

Undisclosed due to confidential business information

Table 8-8. Input parameter for VOT savings

Undisclosed due to confidential business information

(3) Calculation result

Undisclosed due to confidential business information

Table 8-9. VOT per year in USD
Undisclosed due to confidential business information

Table 8-10. VOT per year in JPY
Undisclosed due to confidential business information

Table 8-11. VOT per year in GHS
Undisclosed due to confidential business information

Table 8-12. VOT savings per year in USD
Undisclosed due to confidential business information

Table 8-13. VOT savings per year in JPY
Undisclosed due to confidential business information

Table 8-14. VOT savings per year in GHS
Source: The Consortium

8.4 Maintenance cost savings

(1) Methodology

Undisclosed due to confidential business information

(2) Input parameter

Undisclosed due to confidential business information

Table 8-15. Input parameter for maintenance cost savings
Undisclosed due to confidential business information

(3) Calculation result

Undisclosed due to confidential business information

Table 8-16. Maintenance cost savings per year
Undisclosed due to confidential business information

8.5 Accident cost savings

(1) Methodology

Undisclosed due to confidential business information

(2) Input parameter

Undisclosed due to confidential business information

Table 8-17. Input parameter for the accident cost savings
Undisclosed due to confidential business information

(3) Calculation result

Undisclosed due to confidential business information

Table 8-18. Accident cost savings per year in USD
Undisclosed due to confidential business information

Table 8-19. Accident cost savings per year in JPY
Undisclosed due to confidential business information

Table 8-20. Accident cost savings per year in GHS
Undisclosed due to confidential business information

8.6 Economic net benefit and Economic IRR of the Project

Undisclosed due to confidential business information

Table 8-21. Economic net benefit of the Project in USD
Undisclosed due to confidential business information

Table 8-22. Economic net benefit of the Project in JPY
Undisclosed due to confidential business information

Table 8-23. Economic net benefit of the Project in GHS
Undisclosed due to confidential business information

8.7 Additional Analysis

(1) Scenario Analysis

Undisclosed due to confidential business information

Table 8-24. Economic IRR and Economic Cost to Benefit Ratio in each scenario
Undisclosed due to confidential business information

(2) Risk and Sensitivity Analysis

Undisclosed due to confidential business information

Figure 8-1. Fluctuation Range of Economic IRR

Undisclosed due to confidential business information

Figure 8-2. Fluctuation Range of Economic Cost to Benefit Ratio

Undisclosed due to confidential business information

9. Value for Money Analysis

9.1 Framework of VFM analysis

(1) Objective of VFM analysis

Undisclosed due to confidential business information

(2) Survey of existing VFM guidelines

Undisclosed due to confidential business information

Figure 9-1. Alternative aggregations for VFM analysis
Undisclosed due to confidential business information

Figure 9-2. Overview of quantitative VFM Analysis and key methodological issues
Undisclosed due to confidential business information

9.2 Qualitative analysis

Undisclosed due to confidential business information

(1) Long term, predictable need for the service

Undisclosed due to confidential business information

(2) Presence of stable and adequate policy and institutions

Undisclosed due to confidential business information

9.3 Quantitative analysis

(1) Methodology

Undisclosed due to confidential business information

Figure 9-3. Contract structure and cashflow under public procurement
Undisclosed due to confidential business information

Figure 9-4. Contract structure and cashflow under PPP Scheme (Concession)
Undisclosed due to confidential business information

Figure 9-5. Contract structure and cashflow under the PPP Scheme (availability payment)
Undisclosed due to confidential business information

(2) Net cashflow for the GoG under public procurement

Undisclosed due to confidential business information

Table 9-1. The amount of payment by the GoG under public procurement (inflation rate is reflected)
Undisclosed due to confidential business information

(3) Net cashflow for the GoG under the PPP scheme

Undisclosed due to confidential business information

Table 9-2. The amount of payment by the GoG under the PPP scheme
Undisclosed due to confidential business information

(4) Comparison of the net cashflow for the GoG

Undisclosed due to confidential business information

Figure 9-6. Annual net cashflow for the GoG (Option 1)
Undisclosed due to confidential business information

Figure 9-7. Annual net cashflow for the GoG (Option 2)
Undisclosed due to confidential business information

Figure 9-8. Annual net cashflow for the GoG (Option 3)
Undisclosed due to confidential business information

10. Risk Allocation

Undisclosed due to confidential business information

10.1 Approach to risk allocation

Undisclosed due to confidential business information

(1) Risk identification and assessment for the Apemenyim-Daboase road Integrated PPP Project

Undisclosed due to confidential business information

Table 10-1. Risk Prioritization Matrix

Undisclosed due to confidential business information

10.2 Risk allocation principles

Undisclosed due to confidential business information

10.3 Detailed risk matrix

Undisclosed due to confidential business information

(1) Risk identification and categorization

Undisclosed due to confidential business information

(2) Quantitative and qualitative risk assessments

Undisclosed due to confidential business information

(3)Risk allocation

Undisclosed due to confidential business information

(4) Mitigation measures

Undisclosed due to confidential business information

(4) Integration with broader infrastructure goals

Undisclosed due to confidential business information

11.Market Interest Assessment

Undisclosed due to confidential business information

11.1 Institutional support and strategic partnerships

Undisclosed due to confidential business information

11.2 Commitment of core project proponents

Undisclosed due to confidential business information

11.3 Broader market interest, financial viability, competitiveness and institutional safeguards

Undisclosed due to confidential business information

11.4 Market Research for Road Sector PPPs in Ghana

Undisclosed due to confidential business information

(1) Context of Road Infrastructure Development in Ghana

Undisclosed due to confidential business information

(2) Current Trends in PPPs for Road Sector

Undisclosed due to confidential business information

(3) Challenges

Undisclosed due to confidential business information

(4) Market Attractiveness for Road Sector PPPs

Undisclosed due to confidential business information

12.Environmental and Social Impact Assessment

12.1 EIA-related surveys

(1) Site visit

① N1 Road

- The air quality along the road is not good, with a smell of exhaust fumes and dusty air. The impact of exhaust fumes from trucks, trailers and other heavy vehicles are particularly significant.
- The impact of traffic noise and vibration along the road is considerably higher. This is also considered to be an effect of heavy vehicles as well as air quality.
- The river is ochre in colour, although the soil on the riverbank is red. This is said to be due to mining.
- High proportion of heavy vehicles (e.g. freight transport from the port, crushed stone and sand transport).
- There are houses and shops along approximately 45% of the N1 Road.
- There are private shops along the road selling general merchandise, fruit and vegetables.
- Livestock (chickens, goats, cows and horses) are running out onto the road.

Table 12-1. Field survey photos (N1 Road)

	
Roadside Environment (near Daboase Junction)	Rive Condition (No.6 Bridge)

Source: The Consortium

② ALCH (Apemenyim – Daboase section)

- The terrain is undulating and requires extensive earthworks.
- Most of the planned route passes through plantations (cocoa, coconut, palm, etc.), but also some small settlements, quarries, and factory areas.
- Five interchanges are planned within the section, but one of the access roads (Ntwaaban Road) is unpaved and the road surface is in poor condition (requires separate maintenance. Currently, access is difficult in the rain.)
- The ESIA of ECOWAS does not specifically consider impacts around interchanges.
- There is concern about the farmland being divided by the new road, but box culverts are planned to mitigate this issue.

Table 12-2. Field survey photos (ALCH (Apemenyim – Daboase section))

East direction from the starting point

East direction at Chainage 26+71

East direction at Chainage 30+83 (IC)

West direction from the end point

Crossing road at the end point

Source: The Consortium

(2) Interview

① MRH

- The ESIA for ECOWAS is still in draft form.
- Even if the overall ESIA is approved, the Project section needs a separate EIA and confirmation from EPA.
- EIAs for rest areas and ICs are required, considering the area to be developed.
- Rare monkeys may be present in the Shama area.
- Animal Crossing Culvert is for livestock, not wildlife.
- There are no standards for physical impact assessment.

② GHA

- For ECOWAS/ALCH (Lot2: Ghana), EIA has been submitted to EPA. Awaiting review.
- EIA (1st edition) separately submitted to EPA for ALCH Apemenyim to Takoradi as GHA. Awaiting comments.
- Requested to provide documentation for the EIA between Apemenyim and Takoradi.
- The EIA between Takoradi and Daboase has not yet been conducted.
- Regarding the widening of the current road, an EIA should be required but has not been conducted. Confirmation from the EPA is needed to verify the requirement.
- Regarding EIAs, even if EIA is approved in the overall plan, approval needs to be obtained on a project-by-project basis.
- Under Ghanaian regulations, EIA is mandatory for project implementation, but there is no regulation for SIA (Social Impact Assessment).

12.2 Environmental and social considerations assessment

(1) Prediction and assessment of environmental impact and comparison of alternatives

① Environmental Impact Assessment of "The Feasibility Studies, Environmental and Social Impact Assessment, Detailed Engineering Design Studies for the Construction Works of the Abidjan – Lagos Corridor Highway" Verification (Category A Level under JICA's Guidelines for Environmental and Social Considerations)

The implementing body of the Abidjan-Lagos Corridor Highway (ALCH) development project, which is co-funded by the African Development Bank (AfDB), German Society for International Cooperation (GIZ) and the European Commission, is the Commission of the Economic Community of West African States (ECOWAS). The proposed project will be a six-dual carriage highway construction which extends from Abidjan (Cote D'Ivoire) to Lagos (Nigeria).

Ghana has the longest stretch (Lot 2) of the corridor (466 km) which begins from Apemenyim in the Western Region to Akanu in the Volta Region. In accordance with the requirements of the Ghanaian Environmental Protection Act No. 490 of 1994, and the Environmental Assessment Regulation LI 1562. This Project falls under the category that mandates a full Environmental Impact Assessment (EIA).

The Environmental and Social Impact Assessment (ESIA) conducted by ECOWAS is still in draft form and has been submitted to EPA but not yet approved. In this section, an overview of ESIA is summarized and verified based on JICA guidelines.

Table 12-3. Overview of the ESIA by ECOWAS

Items	Contents
Document	The Feasibility Studies, Environmental and Social Impact Assessment, Detailed Engineering Design Studies for Construction Works of the Abidjan – Lagos Corridor Highway LOT 2: GHANA (Takoradi – Elmina – Cape Coast – Kasoa – Accra – Tema – Sogakope – Akatsi – Dodze – Akanu) = 466km Final Technical – Economic Feasibility Report Volume 11A – Environmental and Social Safeguarding System November 2021
Organization	ECOWAS
Project	Apemenyim – Akanu (L=466km), 6 lanes

Items	Contents
Methodology	The ESIA complies with the AfDB's Environmental Assessment Procedure (ESAP) and Integrated Safeguard System (ISS) Category I and national requirements. Climate Change Impact Assessment complies with AfDB's Climate Safeguard System (CSS) Category II.
Scope of implementation	Baseline data collection (existing physical, biological, socioeconomic and cultural environments of the project areas) Assessment of the Biophysical Environment (flora and fauna, forests and vegetation, water and soil quality, air and noise quality, landscape and aesthetics) Assessment of the socioeconomic impacts (human health, land acquisition, community demography, socioeconomic activities, employment and resettlement) Stakeholders' Engagement Meetings (11 Districts) Environmental and Social Management Plan (ESMP), Environmental and Social Risk Management Plan (ESRMP)
Expected impact	Pre-construction phase: Creation of employment opportunities, Displacement from land acquisition, Loses of vegetation and biodiversity Construction phase: Creation of employment opportunities, Improvement in the local economy, Improvement in Government Revenue, Relocation and resultant disruptions, Land scouring at burrow sites, Water resources contamination, Air pollution, Waste generation, Soil erosion and flooding, Workmen's Camps: noise from material sites, Road and traffic diversion: Operational phase: Enhanced transportation infrastructure to serve agglomeration, Air pollution, Noise pollution, Liquid and solid waste, Volume of vehicular traffic led to road accidents, Highway security which bothering on the trans-boundary safety of ECOWAS citizenry, Loss of cultural heritage sites, local shrines and ritual sites, and groves of some of the communities Decommissioning Phase: Selling the construction materials at a subsidized rate to the locals, Temporary employment opportunities

Source: The Consortium

Table 12-4. Comparison and verification with JICA guidelines

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in the official process?	(a) Y	(a)The draft ESIA report has already been submitted to EPA.
		(b) Are EIA reports, etc. written in the official or widely used language of the country concerned?	(b) Y	(b)Written in English.
		(c) Have EIA reports been approved by the authorities of the host country's government? (If not yet approved, indicate the expected year and month of approval.)	(c) N	(c) It has been submitted, but the expected approval date is unknown. Continue to check the procedural status of the report.
		(d) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?	(d) –	(d) The report has not been approved, so the existence of supplementary conditions is not known. Continue to check the procedural status of the report.
		(e) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(e) –	(e) Unknown. Continue to check the procedural status of the report.
		(f) Are the items listed in Appendix 2 of the JICA Guidelines covered? (The scope and level of detail may be adjusted depending on the potential impact of the project).	(f) –	(f) The items are covered.
		(g) Have environmental and social considerations been verified for the entire scope of the project, cumulative impacts, derived and secondary impacts and impacts due to inseparable projects?	(g) N	(g) The report only considers environmental and social considerations for the main road and does not consider impacts on associated facilities such as IC sections, access roads and service/parking areas.
	(2)	(a) Have local stakeholders been adequately analyzed and identified?	(a) Y	(a) Stakeholder meetings will be held in all municipalities and districts within the

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
	Explanation to the Local Stakeholders			proposed alignment (approximately 14 districts), and so far, stakeholder consultations had been held in 11 districts between September and October 2019.
		(b) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures with meaningful consultation, including information disclosure? Is understanding obtained from the Local stakeholders?	(b) Y	(b) Stakeholder meeting is mandated by the Ghana Environmental Protection Agency Act Ghana Environmental Protection Agency Act 490 (1994) and LI 1652 (15-1). Meetings are held as appropriate, with prior notice given by newspapers.
		(c) For local stakeholder meetings, have records of discussions been prepared, including the gender and other attributes of the participants?	(c) Y	(c)The following items were discussed at the stakeholder meeting; Preservation of water resources / Use of available human resources / Improvement of access to feeder roads / Child labor / Increase in accidents / Improved transportation routes / Pollution / Creation of modernized markets / Community involvement / Compensation / Resettlement / Road management / Gender Issue / Highway robbery and crime / Future land investment and opportunities / Hospitality etc. The gender of the participants has not been confirmed.
		(d) Have the comment from the stakeholders been reflected to the project design?	(d) Y	(d) The opinions of residents and others are reflected in the plan.

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
	(3) Consideration of Alternatives	(a) Has the scope of multiple alternatives to the project/plan been adequately established?	(a) Y	(a) The project analysis identified four different highway alignments, including the "No highway" zero alternative alignment. These route alignments are considered as the "Built-up alternative", "Smart Alternative", "Tunnelway Alternative" and the "Do Nothing Alternative".
		(b) Have feasible alternatives been considered in terms of technical, financial, environmental, and social considerations? (with a view to reducing total GHG emissions, if necessary)	(b) Y	(b) It has been examined through a multi-criteria decision analysis.
		(c) Has a comparison been made with the 'do-nothing' alternative, which does not implement the project?	(c) N	(c) It is listed as an item, but no details are given.
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources in the operation phase, such as vehicles traffic will affect ambient air quality?	(a) Y	(a) Although the impact on air quality has been evaluated as significant, no quantitative estimates have been provided.
		(b) If ambient air quality already exceeds the country's air quality standards, does the project further worsen air quality?	(b) –	(b) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(c) Will construction works cause adverse impacts? Have mitigation measures been considered?	(c) Y	(c) Organized as "Mitigation Measure for the Impacts during Construction Phase"
	(2) Water Quality	(a) Is there a possibility that soil runs off from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?	(a) Y	(a) The impact is assessed as "Medium-High".
		(b) Is there a possibility that surface runoff from roads will contaminate	(b) N	(b) No impact.

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
		water sources, such as groundwater		
		(c) Do effluents from various facilities, such as parking areas/service areas including domestic and rainwater drainage, comply with the country's effluent standards and ambient water quality standards?	(c) –	(c) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(d) Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?	(d) –	(d) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(e) Will construction works cause adverse impacts? Have mitigation measures been considered?	(e) Y	(e) Organized as "Mitigation Measure for the Impacts during Construction Phase"
	(3) Wastes	(a) Are wastes from road maintenance and parking/service areas, etc. properly treated and disposed of in accordance with the country's regulations?	(a) –	(a) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(b) Will construction works cause adverse impacts? Have mitigation measures been considered?	(b) Y	(b) The impact is assessed as "Low", but mitigation measures are organized s "Mitigation Measure for the Impacts during Construction Phase"
	(4) Noise and Vibration	(a) Do noise and vibrations from passing vehicles comply with the country's standards?	(a) –	(a) No quantitative estimates have been provided.
		(b) If noise and vibration in the vicinity of the route already exceed the country's environmental standards, does the project further worsen noise and vibration?	(b) –	(b) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(c) Will construction works cause adverse impacts? Have mitigation measures been considered?	(c) Y	(c) Organized as "Mitigation Measure for the Impacts during Construction Phase"

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions?	(a) N	(a)(b)(c) No protected area within the project section.
		(b) Is there a possibility that the project will affect the protected areas?	(b) N	
		(c) Will construction works cause adverse impacts? Have mitigation measures been considered?	(c) N	
	(2) Biodiversity	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	(a) N	(a)(b)(c) Not included
		(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?	(b) N	
		(c) Does the project involve significant conversion or significant degradation of critical habitats or important forests, and are there concerns about significant impacts on biodiversity? If so, have appropriate measures been taken to address impacts on biodiversity?	(c) N	
		(d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accidents of wildlife and livestock?	(d) Y	(d) Box culverts are planned to be constructed for the livestock movement.
		(e) Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (nonnative invasive) species and pests? Are adequate measures for preventing such impacts considered?	(e) Y	(e)(f)(g)(h) The impact is assessed as "Low", but mitigation measures are organized s "Mitigation Measure for the Impacts during Construction Phase"

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
		(f) In cases where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?	(f) N	
		(g) If there are concerns about other significant impacts on biodiversity, have measures been taken to reduce impacts on biodiversity?	(g) Y	
		(h) Will construction works cause adverse impacts? Have mitigation measures been considered?	(h) Y	
	(3) Hydrology	(a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	(a) –	(a) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(b) Will construction works cause adverse impacts? Have mitigation measures been considered?	(b) -	(b) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
	(4) Topography and Geology	(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?	(a) –	(a)(b) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(b) Is there a possibility that civil works, such as cutting, and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?	(b) –	
		(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(c) Y	(c)(d) The impact is assessed as "Medium-High" and mitigation measures are organized as "Mitigation Measure for the Impacts during Construction Phase"
		(d) Will construction works cause adverse impacts? Have mitigation measures been considered?	(d) Y	

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
4 Social Environment	(1) Resettlement and land acquisition	(a) Is involuntary resettlement caused by project implementation? If so, describe the scale of land acquisition and resettlement.	(a) Y	(a) Land acquisition with resettlement will occur, but the scale is not mentioned in the report. Approximately 200 residences and other structures were identified on the project site.
		(b) If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? Are there any other land acquisitions or livelihood losses?	(b) Y	(b) The road alignment is designed to avoid residential areas as much as possible.
		(c) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?	(c) Y	(c) Stakeholder meeting is mandated by the Ghana Environmental Protection Agency Act 490 (1994) and LI 1652 (15-1).
		(d) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?	(d) Y	(d)(e)(f)(g)(h)(i)(j) The Resettlement Action Plan (RAP) will be prepared. These are presented as "Resettlement and Compensation Entitlements Principles" in the Environmental & Social Management Framework for Road Sector Operations by Ministry of Roads & Highways.
		(e) Are the compensations going to be paid prior to the resettlement?	(e) Y	
		(f) Are the compensation policies prepared in document?	(f) Y	
		(g) Does the plan give appropriate consideration to vulnerable groups among the relocated residents, especially women, children, the elderly, the poor, the disabled, refugees and internally displaced persons, and minorities?	(g) Y	
		(h) Is the compensation to be agreed upon explained in writing to the subject, and is resettlement agreed upon prior to relocation?	(h) Y	
		(i) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the	(i) Y	

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
		plan?		
		(j) Are any plans developed to monitor the impacts of resettlement?	(j) Y	
		(k) Is the grievance redress mechanism established?	(k) N	A stakeholder engagement plan (SEP) is proposed that complies with Ghana's EIA regulations and the African Development Bank's (AfDB) Principle for Stakeholder Engagement. One of the objects of SEP is to establish a formal grievance resolution mechanism. So it will be established.
	(2) Livelihoods	(a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?	(a) Y	(a) Organized as positive and negative impacts. The negative impacts are assessed as "Medium" and mitigation measures are organized as "Mitigation Measure for the Impacts during Construction Phase"
		(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?	(b) Y	(b) Carry out risk reduction measures and monitoring in line with the prescribed impacts mitigation measures to address the issue of greenhouse gases emission for ambience air pollution and local climate warming.
		(c) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?	(c) Y	(c) Increased traffic could lead to traffic accidents during the operation phase. Road safety signage should be installed. And periodic patrols and checks for road usage compliance by administrators should be

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
				enforced.
		(d) Is there any possibility that roads will impede the movement of inhabitants?	(d) N	(d) Where farms are divided by the highway, box culverts are planned to be constructed for farmer's movement.
		(e) Is there any possibility that structures associated with roads (such as bridges) will cause sun shading and radio interference?	(e) –	(e) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(f) Dose the project adversely affect ecosystem services (supply and coordination) and the health and safety of local communities? (especially indigenous peoples and others dependent on ecosystem services).	(f) Y	(f)(g) The impact is assessed as "Medium-High", and mitigation measures are organized as "Mitigation Measure for the Impacts during Pre- construction Phase"
		(g) Will construction works cause adverse impacts? Have mitigation measures been considered?	(g) Y	
	(3) Socially vulnerable people	(a) Are appropriate considerations given to vulnerable groups such as women, children, the elderly, the poor, persons with disabilities, refugees and internally displaced persons and minorities?	(a) –	(a)(b) Not mentioned, However, a stakeholder engagement plan is proposed that complies with Ghana's EIA regulations and the African Development Bank's (AfDB) Principles for Stakeholder Engagement.
		(b) Will construction works cause adverse impacts? Have mitigation measures been considered?	(b) -	
	(4) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a)(b) No heritage within the project section.

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
		(b) Will construction works cause adverse impacts? Have mitigation measures been considered?	(b) N	
	(5) Landscape	(a) If there are landscapes that require special consideration, do the project adversely affect them?	(a) N	(a)(b) No landscapes to consider within the project section.
		(b) Will construction works cause adverse impacts? Have mitigation measures been considered?	(b) N	
	(6) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(a) N	(a)(b)(c)(d)(e) No ethnic minorities and indigenous peoples within the section
		(b) Are all the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(b) N-	
		(c) Are indigenous peoples' plans prepared and made publicly available when required?	(c) N	
		(d) Are efforts made to ensure that minorities and indigenous peoples are provided with sufficient information and free prior consent?	(d) N	
		(e) Will construction works cause adverse impacts? Have mitigation measures been considered?	(e) N	
	(7) Working Environment	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?	(a) Y	(a) Comply with Ghana Labor Act 651 (2003)
		(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?	(b) –	(b)(c) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
		(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?	(c) -	
	(8) Community health, safety and security	(a) Are there any negative sanitation impacts, such as disease outbreaks (including HIV and other infectious diseases), due to the influx of workers and others associated with the project? Are mitigation measures provided for the impacts?	(a)	(a) The Director of Policy and Planning of MRH ensures that there is a mainstream of crosscutting issues into all sector plans and projects. These include Environment, Social, HIV/AIDS, Road Safety, gender and Anti-corruption reporting.
		(b) Are there any negative impacts on community safety, such as a deterioration in public security, due to the influx of workers and others associated with the project? Are mitigation measures provided for the impacts?	(b) Y	(b) The impact is assessed as "Medium" and mitigation measures are organized as "Mitigation Measure for the Impacts during Operation and Decommissioning Phase"
		(c) If the partner country or other country uses security personnel or other security personnel employed in the formation and implementation of the project, are appropriate measures taken to ensure that they do not use their security capabilities except for preventive and self-protection purposes?	(c) –	(c) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(d) Will construction works cause adverse impacts? Have mitigation measures been considered?	(d)	(d) The impact is assessed as "Low" and mitigation measures are organized as "Mitigation Measure for the Impacts during Construction Phase"

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
5 Others	(1) Monitoring	(a) Does the proponent develop and implement monitoring programs for the environmental and social items that are considered to have potential impacts?	(a) Y	(a) "Environmental and Social Lisk Management Plan (ESMP)" has been developed.
		(b) What are the items, methods and frequencies of the monitoring program?	(b) Y	(b) The risk management approach will include the following key parameters: • The assessment of the scale of the environmental and social risk • Identifying the resources to be used; and • Implementation of the Risk Management process/plan
		(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	(c) –	(c) Not mentioned. In the EIA to be conducted by the Consortium, the content of the items will be clarified as necessary.
		(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(d) N	(d) The risk monitoring plan will take into consideration the scope of development, the environmental and social sensitivity and the financial, human and technical means available for the monitoring process.
		(e) Are grievance mechanisms for environmental and social considerations in place?	(e) Y	(e) The project will design and operationalize a system of Grievance resolution mechanism (GRM) as required by AfDB.
6 Note	(1) Reference to Checklist of	(a) Where necessary, pertinent items described in the Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).	(a) N	(a) The project will involve the removal of trees on the plantation, but the checklist items are covered.

Category	Items	Main check points	Yes: Y No: N	Specific Environmental and Social Considerations (Reasons for Yes/No, rationale, mitigation measures, etc.)
	Other Sectors	(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(b) N	(b) Transmission and distribution facilities will not be constructed.
	(2) Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a)(b) Although GHG emissions are summarized as a climate change issue, no estimates of project emissions have been conducted.
		(b) For projects that are expected to generate GHGs more than a certain amount, have the total GHG emissions been estimated before the project is implemented?	(b) N	

Source: The Consortium

② The World Bank's four conditions for indigenous peoples and the relationship with protected areas, etc.

A) The World Bank's four conditions for indigenous peoples

According to the Environmental and Social Safeguard Policies of the World Bank, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories
- Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- An indigenous language, often different from the official language of the country or region.

Although Ghana is a multi-ethnic country, there is no protection system or protected areas established for indigenous peoples. The diverse ethnic groups living in Ghana each have their own culture and traditions. The Government acknowledges these diverse groups and often involves traditional rulers and local communities in decision-making processes, particularly on issues affecting local resources and heritage. For example, customary land tenure systems are widely recognized, and local chiefs have considerable influence over the allocation and management of these lands.

No indigenous peoples' reserves exist in the project section, but the presence of indigenous peoples themselves has been confirmed by ECOWAS ESIA.

Table 12-5. Comparison and verification with JICA guidelines

Conditions	Check	Impacts
Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;	-	There is no protection system or protected areas established for indigenous peoples in Ghana.
Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.	✓	A socioeconomic survey in Western Region conducted by ECOWAS ESIA identified 10 indigenous households in the vicinity of the project route.
Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture.	-	There is no protection system or protected areas established for indigenous peoples in Ghana.
An indigenous language, often different from the official language of the country or region.	-	The official language of Ghana is English, but there are multi-ethnic languages. Based on ethnic distribution, the project will pass through Ahanta and Fante-speaking areas. In the section, communication is possible in official and government-recognized languages.

Source: The Consortium

B) The relationship with protected areas

There are 313 protected areas in Ghana and two forest reserves (Inchaban and Sekondi Waterworks (Blocks II&III)) exist in the vicinity of the project route. The N1 Road passes south of Inchaban, while the new bypass road passes between two locations, north of

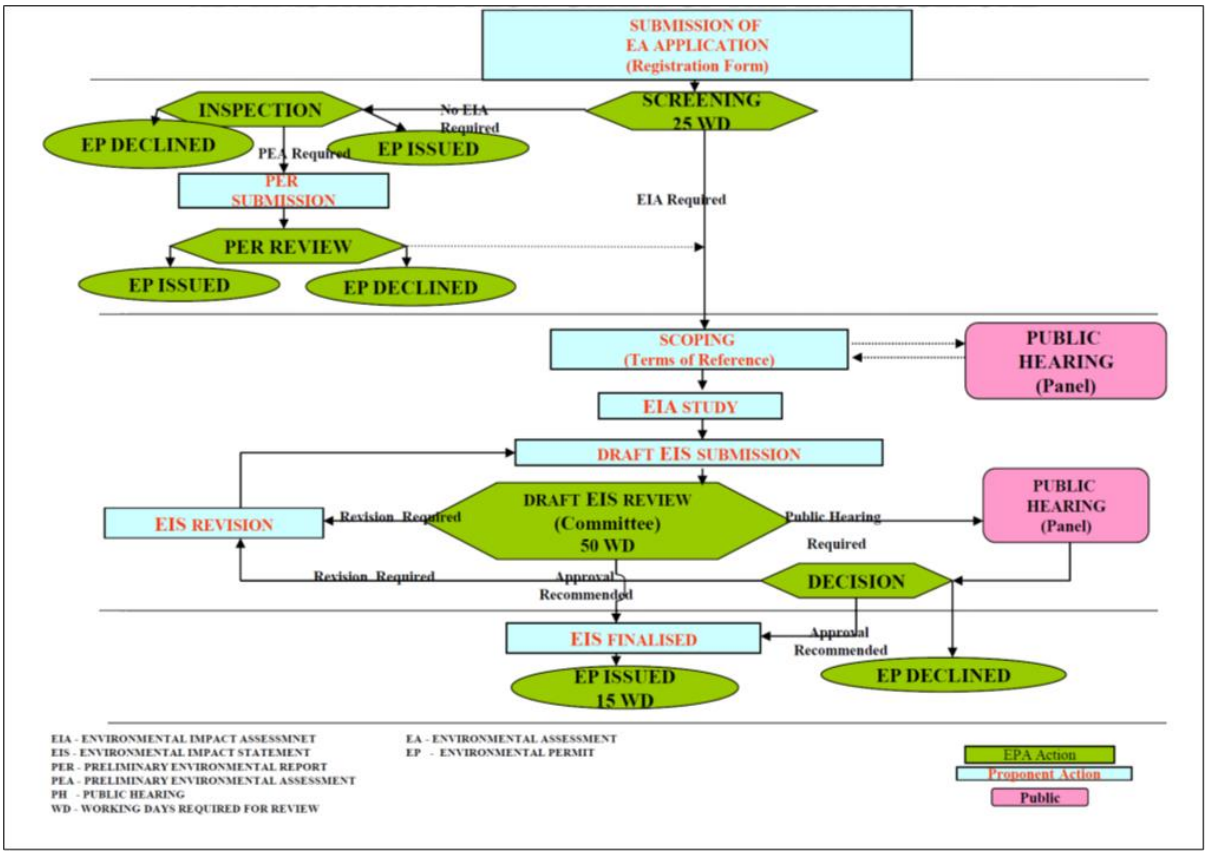
Inchaban and south of Sekondi Waterworks (Blocks II&III). Neither of these routes will pass directly through protected areas, and as the Project plan already avoids protected areas, there will be no impact on protected areas.

③ Confirmation of the Government of Ghana's environmental and social consideration systems and organization

Supervision of environmental administration works is managed by Environmental Protection Agency (EPA) under Ministry of Environment, Science and Technology established under the Environmental Protection Agency Act 1994, Act 490 in Ghana. EPA is structured into six divisions namely;

- Environmental Compliance and Enforcement Division
- Inter-Sectoral Network Division
- Chemicals Control Management Centre
- Programs Planning Monitoring and Evaluation Division
- Finance and Administration Division
- Field Operations (13 regional offices: 3 regions and 10 zonal offices)

According to the Environmental Assessment Regulations 1999, LI 1652 of Ghana, all developmental projects which will cause significant environmental impacts have to undergo the EIA procedure prior to project implementation. The procedure is as shown below.



Source: https://www.epa.gov.gh/epa/sites/default/files/u26/EA%20flowchart.pdf

Figure 12-1. Administrative flow chart of the environmental assessment procedure

(2) Laws and regulations related to environmental and social considerations

Major law and regulation related environmental and social consideration is below.

- Environmental Protection Agency Act (Act 490 of 1994).
- Environmental Assessment Regulations LI 1652, 1993, and (Amendment) LI 2206, 2013
- Environmental Assessment in Ghana, a Guide to Environmental Impact Assessment Procedures" (EPA, 1996)
- The Wild Animals Preservation Act, 1961, (Act 43).
- The Wildlife Conservation Regulations 1971 (LI 685); and
- The Wild Reserves Regulations 1971 (Ll 740).
- The Administration of Lands Act, 1962 (Act 123).
- State Lands Act, 1962 (Act 125).
- State Lands Regulations 1962 (LI 230).
- State Lands (Amendment) (No. 2) Regulations 1963 (LI 285).
- Lands (Statutory Way Leaves) Act, 1963 (Act 186)
- Office of the Administrator of Stool Lands Act, 1994 (Act 481); and
- The Lands Commission Act, 2008 (Act 767)

Environmental standards related environment and social consideration in Ghana are shown below, and some of these standards are considering updating for 2016 version from 2007 version.

- Ambient air standard
- National ambient noise level standards
- National sector specific effluent quality draft standards
- Point Source/Stack Air Emissions Standards

(3) The discrepancy with the "JICA's Guidelines for Environmental and Social Considerations (January 2022)" and methods for its resolution

① Preliminary comparison and consideration of alternatives (including the option of not implementing the project)

A) New bypass road

According to JICA's Guidelines, the analysis of alternatives is described as systematically comparing feasible alternatives on the location, technology, design, and operation of the project, including the "without project" situations. The comparison considers the potential environmental impacts, feasibility of mitigating the impacts, capital and recurrent costs, suitability for local conditions, and institutional, training, and monitoring requirements. It quantifies the environmental impacts to the extent possible, and attaches economic evaluations where feasible, for each alternative. It clearly states the basis for selecting a particular proposed project design and provides justifications for recommended emission levels and approaches to pollution prevention and abatement.

In the ESIA report by ECOWAS, four alternatives are discussed below.

The Built-Up Alternative: The built-up alternative has the highway alignment traversing some built-up settlements and existing infrastructure. In this regard appreciably prominent levels of settlement destruction and resettlements with compensations are envisaged.

The Smart Corridor Alternative: The Smart corridor is the proposed alignment that has bypasses that make use of a greenfield. This is to avoid the build-up areas in as much as practicable to reduce the burden of resettlement and compensation on the project costs.

The Tunnel-way Alternative: The tunnel-way alternative is also proposed to surmount the topographic barriers that present a substantial cost implication on the project, by drilling of tunnels through the highlands lying inland to the northern part of Smart corridor.

Do Nothing Alternative: The last alternative is the Zero alternative which presents a "Do Nothing" scenario, after a considerable period.

It is believed that all detailed studies have been conducted, but there is no description of specific details. Therefore, the ESIA in the section covered by this project (Apemenyim - Daboase) should include detailed comparative results on technical, environmental, and social aspects.

B) N1 Road

The four-lane widening Alternative: The four-lane widening alternative to widen the existing two-lane section to four lanes There are a considerable number of shops and residences along the existing road. Resettlement with compensation for these shops and residences is anticipated.

Do Nothing Alternative: The last alternative is the Zero alternative which presents a "Do Nothing" scenario. In the future, traffic congestion due to increased traffic volume is expected in the suburbs as well as in urban areas where traffic congestion still occurs.

② Conducting scoping (determining the scope of alternatives to be considered, important and potentially important evaluation items, and the survey method)

A) New bypass road (Apemenyim - Daboase)

The new bypass road is part of the ALCH and a draft ESIA was prepared for the entire section within Ghana. As shown in Table 12-4 above, the draft ESIA was checked against JICA's environmental checklist, and the scope was satisfactory. Additionally, GHA is conducting an ESIA scoping for the project sections from Apemenyim to Sekondi-Takoradi and has asked the EPA for comments. The contents of the scoping have not yet been confirmed as they are not publicly available at this time. However, items marked as "Not mentioned" and "No" in the checklist that could be reconsidered should be added to the ESIA for the project section. Further, the timing of the EIA between Sekondi-Takoradi and Daboase has not yet been determined.

Table 12-6. Scoping result of new bypass road

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
Pollution	1	Air pollution	✓	✓	**Construction Phase:** Emission of dust and exhaust gas will increase due to construction equipment operations and traffic congestion in construction sites.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					Operation Phase: In the future, the total amount of air pollution caused by vehicle exhaust gas will increase. However, because of improved traffic efficiency, the amount may be reduced compared to the current situation.
	2	Water pollution	✓	✓	**Construction Phase:** Turbid water will be generated during rainfall periods. **Operation Phase:** Domestic wastewater is discharged from the rest facilities.
	3	Waste	✓	✓	**Construction Phase:** Construction waste caused by construction and demolition works, and general waste from construction office will be generated. **Operation Phase:** General waste is generated from the rest of the facilities.
	4	Soil pollution	-	-	Because materials that may cause soil pollution such as heavy metal and toxic organic matter will not be used in construction and maintenance works, soil pollution is unlikely to occur.
	5	Noise and Vibration	✓	✓	**Construction Phase:** Construction equipment operation will cause noise and vibration. **Operation Phase:** Noise and vibration levels increase due to new vehicular traffic.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	6	Ground subsidence	✓	-	**Construction Phase:** Due to large-scale topographic alteration, ground subsidence will occur. **Operation Phase:** Because there is no large-scale groundwater withdrawal, ground subsidence is unlikely to occur.
	7	Offensive odors	-	✓	**Construction Phase:** Because materials and equipment that may cause offensive odors will not be used in construction and maintenance works, considerable offensive odors are unlikely to occur. **Operation Phase:** Odors are generated from wastes and wastewater from rest facilities.
Pollution	8	Bottom sediment	✓	-	**Construction Phase:** Excavation of the river bottom due to the widening of the bridge section will have an impact on the bottom sediment. **Operation Phase:** Because there are no considerable impacts of turbid water caused by construction works or drainage form roads in operation phase, impacts on bottom sediment are unlikely to occur.
Natural Environment	9	Protected areas	-	-	There is no impact because this is widening of the existing road, and the road does not pass through a protected area.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	10	Ecosystem / Biodiversity / Ecological Service	✓	✓	**Construction Phase**: As agricultural land and forests exist within the project area and earthworks and tree cutting will be carried out, impacts on ecosystems, biodiversity and ecological services will occur during the construction phase. **Operation Phase:** Increased traffic and emissions and reduced green space cause impacts on ecosystems, biodiversity and ecological services.
	11	Hydrology	-	-	**Construction Phase:** Considerable impact on ground water of pilling works is unlikely to occur. **Operation Phase:** Drainage system for rainwater will not change significantly.
	12	Geographical feature	✓	-	**Construction Phase:** Implement large-scale topographic modification. **Operation Phase:** Existing geographical features will not change considerably.
Social Environment	13	Resettlement/ Land Acquisition	✓	-	**Pre-Construction Phase:** Most of the project section is plantations and agricultural lands, interspersed with houses. Therefore, land acquisition and resettlement related to those lands will occur. **Operation Phase:** Additional resettlement and land acquisition

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					will not be required.
	14	Impoverished / Poor people	✓	-	**Construction Phase:** Disturbance in daily activities of street vendors which include impoverished people is likely to occur. Construction will create job opportunities for the poor as unskilled labor. **Operation Phase:** Considerable impact only on impoverished people is unlikely to occur.
Social Environment	15	Ethnic minorities and indigenous peoples	✓	✓	Ten indigenous have been identified along the project route. Therefore, land acquisition, livelihood compensation, and cultural considerations for the indigenous people will occur.
	16	Local economies, such as employment, livelihood, etc.	✓	✓	**Construction Phase:** Construction will create job opportunities for local people as unskilled and skilled laborers. **Operation Phase:** New road will contribute to local economies.
	17	Land use and utilization of local resources	✓	✓	**Construction Phase:** Land acquisition will require a change of land use such as from farm area to road reserve. As a result, local resources will be partially lost. **Operation Phase:** Improved transportation will contribute to effective utilization of local resources.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	18	Water usage	-	-	Because there is no water abstraction during construction and operation phases, considerable impact on water rights and its usage is unlikely to occur.
	19	Existing social infrastructures and services	✓	✓	**Pre-Construction Phase:** Relocation or protection of utilities (service lines) such as water and sewer pipes, electric cable, telephone line and gas pipe will be required. **Construction Phase:** Farming will be affected. **Operation Phase:** The division of the farmland may limit traffic on the site.
	20	Social institutions such as social infrastructure and local decision-making institutions	✓	-	**Pre-Construction Phase:** A wide variety of social organizations exist along the roadside. Stakeholder meetings should be held to build consensus after detailed explanations from the project operator and sufficient exchange of opinions with social institutions along the road. **Construction and Operation Phase:** Compliance with the agreement will not have any impact on the social institutions.
Social Environment	21	Misdistribution of benefits and damages	✓	✓	Misdistribution of benefit between farmers who sold some farmland and those who were not included in the project land may occur.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	22	Local conflicts of interest	✓	✓	Local conflict between farmers who sold some farmland and those who were not included in the project land may occur.
	23	Cultural heritage	-	-	There are no cultural heritage sites along the existing road.
	24	Landscape	✓	✓	**Construction Phase:** Loss of vegetation and construction work will change the landscape. **Operation Phase:** The presence of the road will change the landscape significantly.
	25	Gender	-	-	Because the project is improvement works of existing road, considerable impact only on gender is unlikely to occur.
	26	Children's rights	✓	✓	**Construction Phase:** Loss of playgrounds for children and obstructed routes to school are possible impacts. **Operation Phase:** Impacts may include obstruction of school routes.
	27	Infectious diseases such as HIV/AIDS	✓	-	Increased earning power may encourage workers to have multiple sexual partners. This phenomenon may expose workers and the community to HIV and other STI's
	28	Working conditions (including occupational safety)	✓	-	**Construction Phase:** Impact of waste from construction workers on sanitary conditions around the construction site is likely to occur. Because construction will include works in heights, various

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					accidents may occur. **Operation Phase:** Road operation will not have impact on working conditions.
	29	Accidents	✓	✓	**Construction Phase:** Labor accidents, including tumbling accidents may involve pedestrians and street vendors. **Operation Phase:** Construction of the new road may cause an increase in accidents due to excessive speed.
Others	30	Trans-boundary impacts or climate change	-	✓	**Construction Phase:** Trans-boundary impacts such as climate change are unlikely to occur. **Operation Phase:** Passing traffic may cross the border and impact air quality.

Source: The Consortium

B) N1 Road

According to the Environmental & Social Management Framework for Road Sector Operation (Revised 2017), EIAs are also required for road rehabilitation and widening projects. Rehabilitation and widening works on the N1 Road have already started on some sections, but no EIA has been conducted on the construction sections. The scoping based on the results of the field survey and desk study is shown below.

Table 12-7. Field survey photos (N1 Road)

Roadside Environment (near Daboase Junction)

Rive Condition (No.6 Bridge)

Source: The Consortium

Table 12-8. Scoping result of N1 Road

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
Pollution	1	Air pollution	✓	✓	**Construction Phase:** Emission of dust and exhaust gas will increase due to construction equipment operations and traffic congestion in construction sites. **Operation Phase:** In the future, the total amount of air pollution caused by vehicle exhaust gas will increase. However, because of improved traffic efficiency, the amount may be reduced compared to the current situation.
	2	Water pollution	✓	-	**Construction Phase:** Turbid water will be generated during rainfall periods. **Operation Phase:** Because water quality of rainwater drainage will not change significantly, water pollution will unlikely occur.
	3	Waste	✓	-	**Construction Phase:** Construction waste caused by construction and demolition works, and general waste from the construction office will be generated. **Operation Phase:** Considerable generation of solid waste is unlikely to occur. However, consideration should be given if the rest of the facilities such as service/parking areas are planned.
	4	Soil pollution	-	-	Because materials that may cause soil pollution such as heavy metal and toxic organic matter will not be used in construction and maintenance works, soil

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					pollution will unlikely occur.
	5	Noise and Vibration	✓	✓	**Construction Phase:** Construction equipment operation will cause noise and vibration. **Operation Phase:** Increased traffic volume and speed will elevate noise level.
	6	Ground subsidence	-	-	Because there is no large-scale topographic alteration or groundwater withdrawal, ground subsidence will unlikely occur.
	7	Offensive odors	-	-	Because materials and equipment that may cause offensive odors will not be used in construction and maintenance works, considerable offensive odors will unlikely occur.
Pollution	8	Bottom sediment	✓	-	**Construction Phase:** Excavation of the river bottom due to the widening of the bridge section will have an impact on the bottom sediment. **Operation Phase:** Because there are no considerable impacts of turbid water caused by construction works or drainage form roads in operation phase, impacts on bottom sediment are unlikely to occur.
Natural Environment	9	Protected areas	-	-	There is no impact because the Project involves widening of the existing road, and the road does not pass through the protected area.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	10	Ecosystem / Biodiversity / Ecological Service	✓	✓	**Construction Phase**: As agricultural land and forests exist within the road widening area and earthworks and tree cutting will be carried out, impacts on ecosystems, biodiversity and ecological services will occur during the construction phase. **Operation Phase:** Increased traffic and emissions and reduced green space cause impacts on ecosystems, biodiversity and ecological services.
	11	Hydrology	-	-	**Construction Phase:** Considerable impact on ground water of pilling works is unlikely to occur. **Operation Phase:** Drainage system for rainwater will not change significantly.
	12	Geographical feature	-	-	Existing geographical features will not change considerably. Existing quarry site and borrow pit will be used for aggregate.
Social Environment	13	Resettlement/ Land Acquisition	✓	-	**Pre-Construction Phase:** There are houses and shops along about 45% of the N1 Road in the Project section. A very large number of simple business stores including kiosks, container shops, parasol shops and stall keepers opening along the road will be removed temporarily or relocated. Moreover, removal of houses, commercial buildings and gas stations may be required. **Operation Phase:** Additional resettlement and land acquisition will not be required.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
	14	Impoverished / Poor people	✓	-	**Construction Phase:** Disturbance in daily activities of street vendors which include impoverished people is likely to occur. Construction will create job opportunities for the poor as unskilled labor. **Operation Phase:** Considerable impact only on impoverished people is unlikely to occur.
Social Environment	15	Ethnic minorities and indigenous peoples	-	-	Because the project is widening the existing road, considerable impact on ethnic minorities or indigenous peoples is unlikely to occur.
	16	Local economies, such as employment, livelihood, etc.	✓	✓	**Construction Phase:** Business activities of a gas station, several offices, shops and street vendors beside the N1 Road project section will be closed or suspended. Construction will create job opportunities for local people as unskilled labor. **Operation Phase:** Reduction of travel time by mitigated traffic jams will contribute to local economies. Adaptation of a new intersection configuration will change the land use plan.
	17	Land use and utilization of local resources	✓	✓	**Construction Phase:** Land acquisition will require a change of land use such as converting the commercial area into a road reserve. As a result, local resources will be partially lost. **Operation Phase:** Improved transportation will contribute to effective utilization of local resources. The adaptation

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					of a new road configuration will change the land use plan.
	18	Water usage	-	-	Because there is no water abstraction during construction and operation phases, considerable impact on water rights and its usage is unlikely to occur.
	19	Existing social infrastructures and services	✓	✓	**Pre-Construction Phase:** Relocation or protection of utilities (service lines) such as water and sewer pipes, electric cable, telephone line and gas pipe will be required. **Construction Phase:** Temporary traffic congestion, shift of bus and taxi stations, and disturbance of access to roadside facilities will occur. **Operation Phase:** Crossing roads by pedestrians would only be allowed at designated places (footbridge).
	20	Social institutions such as social infrastructure and local decision-making institutions	✓	-	**Pre-Construction Phase:** A wide variety of social organizations exist along the roadside. Stakeholder meetings should be held to build consensus after detailed explanations from the project operator and sufficient exchange of opinions with social institutions along the road. **Construction and Operation Phase:** Compliance with the agreement will not have any impact on the social institutions.

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
Social Environment	21	Misdistribution of benefits and damages	✓	✓	Misdistribution of benefit between relocated and remaining business stores may occur.
	22	Local conflicts of interest	✓	✓	Local conflict between relocated and remaining business stores may occur.
	23	Cultural heritage	-	-	There are no cultural heritage sites along the existing road.
	24	Landscape	✓	-	**Construction Phase:** Loss of vegetation and construction work will change the landscape. **Operation Phase:** Appearance of widening bridges will change the landscape. However, the impact on the landscape is small.
	25	Gender	-	-	Because the project is improvement works of existing road, considerable impact only on gender is unlikely to occur.
	26	Children's rights	✓	✓	**Construction Phase:** Loss of playgrounds for children and obstructed routes to school are possible impacts. **Operation Phase:** Impacts may include obstruction of school routes and increased hazards when crossing roads.
	27	Infectious diseases such as HIV/AIDS	✓	-	Increased earning power may encourage workers to have multiple sexual partners. This phenomenon may expose workers and the community to HIV and other STI's
	28	Working conditions (including occupational safety)	✓	-	**Construction Phase:** Impact of waste from construction workers on sanitary conditions around the construction site is likely to occur. Because construction will include

Category	No.	Impact Item	Assessment		Reason / Remarks
			Pre-Construction Phase Construction Phase	Operation Phase	
					works in heights, various accidents may occur. **Operation Phase:** Road operation will not have impact on working conditions.
	29	Accidents	✓	✓	**Construction Phase:** Labor accidents, including tumbling accident may involve pedestrians and street vendors. **Operation Phase:** Repaired and widened roads may cause an increase in accidents due to excessive speed and accidents involving crossers.
Others	30	Trans-boundary impacts or climate change	-	-	Trans-boundary impacts such as climate change are unlikely to occur.

Source: The Consortium

③ Discrepancy with the JICA's Guidelines and methods for its resolution

According to the Environmental & Social Management Framework for road sector operations (revised April 2017) prepared by the MRH, the environmental and social issues common to road sector activities in Ghana are listed in the table below.

Table 12-9. Environmental and social issues common to road sector activities

No.	Issues that are common (in a decreasing order)
1	Tree & vegetation removal
2	Topsoil removal
3	Pits/trenches near road
4	Noise
5	Inadequate drains along roads
6	Road construction waste generation & disposal
7	Induced development
8	Stream diversion / blocking
9	Run off
10	Compensation issues/agreement
11	Flooding
12	Cultural concerns
13	Water contamination
14	Habitat disruption

No.	Issues that are common (in a decreasing order)
15	Road accidents
16	Tree & vegetation removal
17	Public Safety
18	Extensive construction (impact) corridor
19	Forestry concerns (e.g. access)
20	Wildlife concerns
21	Resettlement
22	Archaeological losses

Source: 2017 Environmental & Social Management Framework, MRH

In addition, the assessment will consider HIV/AIDS, health and safety impacts, water resource impacts, landscape alternation impacts, impacts on soil, land acquisition and property loss, communities and economic activities impacts, noise and vibration impacts, impacts on cultural resources, habitat destruction and disruption (flora and fauna impacts), waste generation and disposal impacts, traffic disruptions and diversion impacts, utility disruption impacts, and labor influx.

It also specifies that, with regard to land acquisition and compensation, the project will provide prompt and effective compensation at full replacement cost (without deducting depreciation or salvage value) for losses of assets attributable directly to the project, and compensation and rehabilitation assistance will be paid before displacement, etc.

In comparison with JICA's Guidelines, there are no major discrepancies in terms of items, but discrepancies could be avoided by implementing detailed items such as impacts on ecosystem services, ethnic minorities and indigenous peoples, consideration for socially vulnerable groups such as children and gender issues, and climate change impacts without omissions.

(4) Roles of related organizations

This section looks at the MRH in the transportation sector, which is most relevant to the ALCH project.

① The Ministry of Roads and Highways

The MRH has the responsibility for the road infrastructure sector and is mandated to formulate policy, coordinate and oversee the sector, and monitor and evaluate the sector within the areas of road infrastructure development, maintenance and financing of roads. The Units, Agencies, and Departments under the ambit of MRH and their functions:

A) Road Infrastructure

- Ghana Highway Authority (GHA) is responsible for the administration, planning, control, developing and maintaining trunk roads and related facilities in Ghana.
- The Department of Feeder Roads (DFR) is responsible for the administration, planning, planning, planning, control, developing and maintaining feeder roads and related facilities in the country.
- Department of Urban Roads (DUR) is responsible for the administration, planning, control, development and maintenance of urban roads and related facilities in Ghana.

B) Road Transport Training

The Koforidua Training Centre (KTC) trains professionals (engineers, contractors, consultants, and administrator staff, among others) in the road transport sector.

C) Road Maintenance and Financing

Road Fund Secretariat as established by Act 536 (1997) finances activities such as routine and periodic maintenance of road and related facilities, upgrade and rehabilitation of roads, activities on road safety, and other relevant matters as may be determined by the Board.

D) Management Safeguards

The Director of Policy and Planning ensures that there is a mainstream of crosscutting issues into all sector plans and projects. These include Environment, Social, HIV/AIDS, Road Safety, Gender and Anti-corruption reporting. The Director undertakes this role with the assistance of two (2) safeguards officers. The Director also coordinates activities of the environmental units of the road agencies, which oversee the day-to-day activities on the projects. On environmental and social issues, the safeguards officers assist the Director Policy and Planning.

E) The PPP Directorate

The MRH has a PPP Directorate, which reports directly to the Chief Director and is responsible for the PPP processes in the road sector from project identification to contract signing and financial closure. This directorate is relevant to the implementation of this ESA because of the policy changes in the road sector to embrace PPP and OPRC models of contracting in road operations/project.

The general roles of the Directorate are capacity building, coordination, facilitation, review and advisory. The Directorate performs its responsibilities in close collaboration with the relevant directorates of MRH and other road agencies by leveraging all PPP skills in the sector to achieve timely delivery of projects. It also maintains a close link with the Public Investment Division (PID) of the Ministry of Finance (MoF) to ensure the proper alignment of the projects with national policy, priorities, and best practices.

(5) Consideration of mitigation measures

With reference to the mitigation measures of the ALCH project, the mitigation measures assumed to be required in the section covered by the project are presented below.

Table 12-10 Possible Mitigation Measure

Phase	Impact	Possible Measures
Pre-construction	Employment creation and income to some skilled and unskilled labor	Economic benefits of the land and site preparation before the construction have the tendencies to create temporary jobs to generate income for a variety of workers depending on their labor needs and requirements. This also has added benefits of generating revenue through taxes to the state.
	Impacts on Vegetation and biodiversity management	Infrastructure being used temporarily such as access roads, stockpiling areas, and borrow pits will avoid wetlands and forest ecosystems of significant biodiversity (flora and fauna) areas in as much as possible by taking into consideration the designs of the highway and how to preserve these protected areas intact. There will also be re-vegetation efforts of all areas cleared of vegetation along the highway through reforestation so that soil erosion can be prevented and also to improve the aesthetic scenery.

Phase	Impact	Possible Measures
	Displacement of People/land management	Early notice will be provided to all potentially affected landowners and tenants prior to work commencing. This will include details of the work schedule, the nature of the work, its location and access requirements. Provision will be made to incorporate the genuine concerns of the landowners into the construction program as much as possible in a comprehensive Resettlement Action Plan (RAP). Areas with the likelihood of properties to be demolished for the purpose of construction, the affected persons will be indemnified in line with the World Bank Environmental and Social Framework (ESF, 2018) on involuntary resettlement, also in tandem with the constitution of the Republic of Ghana.
	Displacement and human residential buildings and commercial/community Infrastructure	Road alignment would be made to avoid densely populated areas as much as possible to avoid massive destruction of property and the relocation of such properties and affected populations. With the aid of a Resettlement Action Plan (RAP), the district assemblies and affected communities shall be informed with respect to the project, through affected populations stakeholder engagement meetings so that they could make preparations for relocation of their properties and utilities before the road construction commences.
	Human and biodiversity will be impacted by the changing climatic patterns	There is no doubt about the enormous implications of the ALCH on climate change in the sub-region. The impacts of climate change from the removal of vegetation. The mitigation measures to be used include the re-forestation of the adjoining areas of the land scape.
Construction	Employment and income generation for skilled and unskilled labor forces	Economic benefits of the land and site preparation before the construction have the tendencies to create temporary jobs and generate income to a variety of workers depending on their labor need and requirements. This would ensure the state's advantage from tax revenue.
	Soil and water contamination and pollution through spillages	All construction equipment would be kept in their proper and efficient state and constantly repaired to avoid oil and fuel leakages leading to spillage.
	Displacement and human residential buildings and commercial/community Infrastructure	Excavated land rubbles and demolished infrastructure creating the building rubbles and other forms of waste will be disposed-off through proper waste management methods of truck tipping and disposal in gully-erosion areas within the adjoining communities. The same waste also has utility in the filling-up of building floors during construction. The waste may be sold or delivered freely to those who will find utility for them. Combustible waste will also undergo controlled burning in incinerated structures. While organic decomposable waste will be made available for used as organic manure for the cultivation of crops by farmers in the adjoining communities.
	Rivers/streams Drainage basin and wetlands siltation	Existing water channels would be protected by dredging as well as Long-span bridges and culverts would be constructed to avoid any

Phase	Impact	Possible Measures
		obstruction of and/or disturbance to the flow of the rivers and streams.
	Soil erosion and flooding	Construction should be carried out in the dry season so that washing away of the soil by rainfall and run-off may be reduced or prevented.
	Air quality (Dust and particulate matter emission and control)	Exposed soil should be covered with water to avoid the release of loose soil material into the atmosphere
	Ambient noise Pollution (noise control)	Noise abatement measures including use of low noise emitting equipment as well as erecting of acoustic barriers at construction sites will assist in ensuring that these impacts are minimized.
Operation and Decommissioning	Employment and income generation through employment for skilled and unskilled labor forces	Economic benefits of the highway during usage and operations for toll collectors and traffic wardens have the potential of creating permanent jobs and generating income to a variety of workers depending on their labor need and requirements. The government will benefit from taxes as revenue as other economic linkages will benefit the citizens.
	Highway safety and security	Road safety signage should be installed at designated points to warn and communicate with motorists using the highway. Periodic patrols and checks for road usage should be enforced.
	Climate impacts mitigation	Incorporate into designs climate-proof infrastructure that provide significant services so that communities along the corridor are less vulnerable during extreme events. Construct proper storm drainage systems, buffer zones, riverbank protection, afforestation along embankments and other methods to reduce flooding.

12.3 Verification of climate change

According to the Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report Working Group I and Working Group II, the following is reported on rainfall in West Africa:

- The impact of climate change on annual mean rainfall is small.
- GWL 2℃ (2℃ increase in global average temperature) is expected to reduce winter rainfall by about 5% and increase summer rainfall by about 5%.
- A GWL of 4℃ (4℃ increase in global mean temperature) is projected to result in a 30% decrease in annual mean daily rainfall and a 30% increase in annual maximum daily rainfall.
- Heavy rains are projected to increase in frequency and intensity, and drought periods are projected to increase in West Africa.
- Annual maximum daily rainfall is projected to increase by 10-20% at GWL 2℃.
- Annual maximum daily rainfall is projected to increase by 6-9%/℃.
- Global overland 10-year and 50-year probable daily rainfall are projected to increase by 14% (12-15) and 14.5% (13-17), respectively, at GWL 2℃.

Based on this report, when designing drainage facilities, it is necessary to check the capacity of drainage facilities when the 10-year return daily rainfall is increased by 14% based on GWL 2℃.

12.4 Alignment of Apemenyim -Daboase Road Project with Key Sustainability Frameworks

The objective of this section is to present how the Apemenyim-Daboase Road project demonstrates commitment to aligning with major sustainability frameworks, including the European Union (EU) Taxonomy, the EU Sustainable Finance Disclosure Regulation (SFDR), the African Development Bank Group's Integrated Safeguard Systems (AfDB ISS), Japan International Cooperation Agency (JICA) Environmental and Social Guidance and Sustainable Development Goals (SDGs). These frameworks shape the project's design, implementation and anticipated outcomes, addressing environmental, social and governance (ESG) priorities while promoting sustainable development. The overview of the project's key features and their alignment with these frameworks are discussed below under the main points:

(1) Environmental Sustainability

- ***Climate Change and Adaptation***

  - ***Greenhouse Gas Emission Reduction***

    The project aims to mitigate greenhouse gas (GHS) emissions by improving traffic flow and reducing congestion through strategic infrastructure upgrades, including the construction of bypass roads and rehabilitation of key road sections. These enhancements are anticipated to reduce vehicle idling and fuel consumption associated with stop-and go traffic, thereby lowering emissions. Specifically, bypass roads will be designed to divert heavy vehicles and through traffic away from city centers such as Takoradi, which will alleviate congestion and improve traffic flow.

    Such measures are of particular importance for Ghana, in which, the transport sector alone was found to be the largest CO2 emitting sector, contributing 38% of the total CO2 emissions. According to the Transport, Climate and Sustainability Global Status Report 2023[8] there was a 14% increase noted in transport CO2 emissions between 2015 and 2021 in Ghana.

    In continuation of measures mentioned above, the project design elements such as optimized road geometry, reduced gradients and increased lane capacity will indirectly improve fuel efficiency. Sustainable construction practices and streamlined logistics operations will also be incorporated to reduce unnecessary travel and emission during the construction phase.

    This approach is consistent with the AfDB ISS[9], particularly its Environmental and Social Safeguard (OS) 3 (Resources Efficiency and Pollution Prevention and Management) which promotes resource efficiency and pollution mitigation, and its overall commitment to Section B to reducing carbon emissions and enhancing climate resilience. The project's intent to reduce emissions aligns with the spirit of EU Taxonomy Regulation [10] on sustainable investment, especially Article 9(a) (Environmental objectives) which focuses on climate change mitigation and Recital 3, which seeks to make financial flows consistent with pathways toward reduced GHG emissions.

    Additionally, the project supports the intent of JICA Guidelines for Environmental

[8]SLOCAT-Ghana: URL: https://tcc-gsr.com/wp-content/uploads/2023/08/Ghana.pdf
[9] African Development Bank Group's Integrated Safeguard Systems pp 53 and 9, available at : https://www.afdb.org/en/documents/african-development-bank-groups-integrated-safeguards-system-2023
[10] EU Taxonomy available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0852&qid=1735554908868

and Social Considerations[11], which in Section 1.4 (Basic Principles on Environmental and Social Considerations**)** emphasizes the promotion of sustainable development by minimizing environmental social impacts. Furthermore, section 2.3 (Impacts to be Assessed) explicitly requires the assessment and disclosure of GHG and climate-related impacts for relevant projects. Moreover, by reducing GHG emissions through traffic management strategies, the project will contribute to the objectives of SDG 13 (Climate action).

- ***Climate Adaptation***

  To address climate adaptation needs, the project will incorporate climate-resilient infrastructure designs such as advanced stormwater drainage systems to effectively mitigate flooding risks, particularly in the project area -Western Ghana which experiences significant rainfalls. Historical flooding events such as Sekondi-Takoradi in 2009 and 2011, which caused substantial disruptions to infrastructure, local livelihoods, and economic activities, only further highlight the urgency of integrating robust drainage and flood management in this climate-vulnerable region[12].

  In doing so, the specific measures by the project to mitigate the flooding risk aligns with the AfDB ISS, OS 4 (Community Health, Safety and Security), which emphasizes infrastructure design to anticipate and reduce the risk from weather events, including flooding. Similarly, the project adheres to EU Taxonomy Article 11 (Substantial contribution to climate change adaptation) by implementing solutions that significantly minimize climate related risks such as floods.

  Sustainability will further be enhanced through the integration of renewable energy solutions. This includes the installation of solar-powered street lighting poles with luminaires along roads and rest stations, as well as the utilization of solar energy in intelligent transportation system applications. Additionally, solar panels installed at rest stations will provide the necessary energy for the facilities and road lighting. According to Government of Ghana, the monthly average solar energy potential in the country is 4.4–5.6 kWh/m2/day[13]. Therefore, the project initiatives of harnessing renewable energy will be consistent with the country's potential and align with AfDB's ISS Clause 10, which encourages the adaptation of energy-efficient technologies and renewable energy sources. Additionally, these initiatives will align with EU Taxonomy Article 10 "Substantial contribution to climate change mitigation" which promotes renewable energy and energy efficiency to reduce carbon emissions. Moreover, JICA's guidelines emphasize the integration of renewable energy to reduce reliance on fossil fuels and align sustainability goals (Climate Change, 6).

  These measures will support SDG 13 (Climate Action) by addressing both adaptation and mitigation strategies, SDG 7 (Affordable and Clean Energy) by promoting renewable energy, and SDG 11 (Sustainable Cities and Communities) by enhancing urban resilience and sustainability.

  Collectively these initiatives will ensure energy efficiency, reduce carbon emissions, and enhance the project's long term environmental resilience, contributing to global climate action goals while addressing local adaptation and sustainability challenges.

➢ ***Resource Efficiency and Circular Economy***

[11] JICA Guidelines for Environmental and Social Considerations available at: https://www.jica.go.jp/english/about/policy/environment/guideline/index.html

[12] Tasantab, J. "Beyond the plan: How land use control practices influence flood risk in Sekondi-Takoradi" Journal of Disaster Risk Studies, Vol.11 No 1, 2019

[13] Status of renewable energy resources for electricity supply in Ghana: URL: https://www.sciencedirect.com/science/article/pii/S2468227620303963

Ghana is advancing a circular economy to boost resource efficiency and sustainability. Initiatives such as Circular Action Plan [14] (CEAP), developed by the Ministry of Environment, Science, Technology and Innovation (MESTI) with the European Union (EU) outlines comprehensive strategies for key sectors such as plastics, agriculture, and textiles, emphasizing local capacity building and gender equality. The Ghana Circular Economy Center (GCEC)[15] lunched with support from UNIDO and Canada to promote circular business models.

The project will focus on the country's circular economy goals by prioritizing sustainable practices such as reuse and recycling materials during road rehabilitation as much as possible, to reduce construction waste. This approach aligns with Article 3(3) (Criteria for environmentally sustainable economic activities) of the EU Taxonomy which emphasizes transitioning to a resource-efficient and circular economy and supports SDG 12 (Responsible Consumption and Production) by promoting sustainable management and efficient use of resources.

Advance pavement technologies, which will enable the incorporation of recycled asphalts[16] and construction debris, may be utilized in the project. Furthermore, excess soil from excavations is repurposed for embankments and other structural applications[17] will be considered. These practices align with the AfDB's ISS OS 3 (Resource Efficiency and Pollution Prevention), which advocates resource efficiency in development projects and JICA Environmental and Social Considerations Section 3 (Procedures of Environmental and Social Considerations). These practices further advance SDG9 (Industry and Innovations, and Infrastructure) by promoting innovative solutions in construction and infrastructure development.

- ***Pollution Control and Biodiversity Preservation***

The project integrates measures to mitigate environmental impacts and conserve biodiversity. To address dust, noise, and water contamination, the project will employ specific actions such as water spraying during the construction to suppress dust [18], consistent with JICA's guidelines emphasizing pollution control and health safeguards under Section 2.3(Impacts to be Assessed). Practices such as covering truck beds and imposing speed restrictions [19] align with Article 12 (Substantial contribution to the sustainable use and protection of water and marine resources) and Article 14 (Substantial contribution to pollution prevention and control) of EU taxonomy. These measures support SDG 11 (Sustainable Cities and Communities) by reducing environmental hazards in urban and rural areas.

Noise impacts will be considered and will be minimized by:

1. **Use Modern Equipment**: Modern construction equipment is often designed to be quieter. Regular maintenance also helps keep noise levels down.
2. **Install Noise Barriers**: Temporary noise barriers or acoustic curtains can

[14] Circular Economy Action Plan and Roadmap in Ghana, available at: https://acenfoundation.org/project/circular-economy-action-plan-and-roadmap-in-ghana/

[15] Available at: https://www.unido.org/news/unido-canada-and-ghana-launch-ghana-circular-economy-centre-support-countrys-transition-circular-economy

[16] Toward a sustainable 100% recycling of reclaimed asphalt in road pavements, available at: https://trimis.ec.europa.eu/project/toward-sustainable-100-recycling-reclaimed-asphalt-road-pavements

[17] Hale, S., Roque A.J., Okkenhau G., Sørmo E. "The Reuse of Excavated Soils from Construction and Demolition Projects: Limitations and Possibilities" Sustainability 2021, 13(11), 6083

[18] IFC General Environmental, Health and Safety(EHS) Guidelines (2007), "Particulate Matter (PM)" available at: https://www.ifc.org/content/dam/ifc/doc/2023/ifc-general-ehs-guidelines.pdf

[19] IFC General Environmental, Health and Safety(EHS) Guidelines (2007), "Mobile Sources – Land-based " available at: https://www.ifc.org/content/dam/ifc/doc/2023/ifc-general-ehs-guidelines.pdf

significantly reduce the spread of noise. These barriers can be placed around noisy equipment or along the perimeter of the construction site.

3. **Implement Administrative Controls**: Schedule noisy activities during less sensitive times of the day and limit the duration of noisy operations.
4. **Use Soundproofing Materials**: Incorporate soundproofing materials in the construction process, such as sound-absorbing panels and insulation.
5. **Engage with the Community**: Informing nearby residents about the construction schedule and expected noise levels can help manage expectations and reduce complaints.
6. **Personal Protective Equipment (PPE)**: Provide workers with ear protection to safeguard their hearing.

By taking these measures, we will utilize them to address the AfDB's commitment, requirements and responsibilities outlined in the AfDB ISS for Environmental and Social Risks and OS 2 (Labour and Working Conditions) and OS 3 (Resources Efficiency and Pollution Prevention and Management) measures. Furthermore, by taking these measures, we are also addressing the requirements set out in JICA's Environmental and Social Guidelines -Appendix 7, Monitoring Items, which include compliance with noise and vibration standards to ensure effective environmental and social performance monitoring.

The water contamination will be minimized through the following:

1. **Implementation of Erosion and Sediment Control Measures**: Use silt fences, sediment basins, and erosion control blankets to prevent soil erosion and sediment from entering water bodies.
2. **Proper Storage and Handling of Chemicals**: Store chemicals in secure, covered areas and handle them carefully to prevent spills. Use secondary containment systems to catch any leaks.
3. **Regular Maintenance of Equipment**: Ensure all construction equipment is well-maintained to prevent oil, fuel, and hydraulic fluid leaks.
4. **Use Portable Restrooms**: Provide portable restrooms for workers to prevent contamination from human waste.
5. **Establish a Spill Response Plan**: Have a clear plan in place for responding to spills, including the necessary equipment and trained personnel.
6. **Monitor Water Quality**: Regularly test nearby water bodies for signs of contamination and take corrective action if needed
7. **Educate Workers**: Train construction workers on best practices for preventing water contamination and the importance of protecting water quality

Water contamination will be prevented through the AfDB ISS Environmental and Social Mitigation Measures, specifically focusing on OS 1 (Assessment and Management of Environmental and Social Risks and Impacts) and OS 3 (Resource Efficiency and Pollution Prevention Management). Additionally, these measures will address the requirements set forth in the JICA Environmental and Social Guidelines Appendix 7 (Monitoring Items).

Moreover, these actions will ensure compliance with the provisions outlined in Article 12 (Substantial contribution to the sustainable use and protection of water and marine resources), Article 14 (1) (a) and (b) (Substantial contribution to pollution prevention and control), and Article 17 (Significant harm to environmental objectives) of the relevant frameworks. By adopting these strategies, we aim to mitigate water contamination risks effectively, ensuring environmental sustainability and alignment with international standards. Biodiversity conservation will be supported through reforestation efforts using native plant species, transplanting existing vegetation during construction, maintaining good drainage and natural water flows, minimizing roadside habitat loss, and exercise care in the siting and design of borrow pits, construction camps, and other complementary

facilities[20]. These efforts align with JICA's commitment to biodiversity preservation under Section 2.3 and the EU Taxonomy Article 9 (f). These actions will contribute to SDG 15 (Life on Land) by protecting terrestrial ecosystems and biodiversity.

(2) Social Sustainability

- ***Community Engagement and Livelihoods***

The project will emphasize stakeholder engagement, local employment and training programs as an integral component of its construction and operational phases to promote community involvement and economic development. According to Internation Trade Administration (ITA), the construction industry has accounted for more than 15% of the nation's annual GDP in recent years[21]. Such stakeholder engagement aligns with AfDB's ISS OS 10 (Stakeholder Engagement and Information Disclosure) which underscores the importance of meaningful consultations and inclusive communication with project stakeholders throughout the project life cycle. It also adheres to JICA's Guidelines for Environmental and Social Considerations, which prioritize participatory processes to enhance community ownership and transparency.

During both the construction and operation phases, the project will generate significant local employment opportunities. It will also support associated industries such as material supplies, logistics and maintenance services, adhering to the principle of fair treatment and non-discrimination outlined in AfDB's ISS OS 2 (Labour and Working Conditions) and be EU Taxonomy Article 18 (Minimum safeguards), ensuring ethical labor practices.

Tailored training programs will equip local workers with skills in sustainable construction methods, enabling them to participate meaningfully in infrastructure development and related activities. These initiatives align with JICA's emphasis on capacity building and skill development for local resilience which will support SDG 8(Decent Work and Economic Growth) and SDG 11 (Sustainable Cities and Communities).

- ***Inclusive Development***

The project will emphasize the inclusivity and equity by promoting local hiring and implementing specific measures to support marginalized groups and gender equality in both construction and operation period. In Ghana, only 3% of workers have been reported to be women out of the total employed by the construction industry in the country[22]. Therefore, in applying the approach, whereby the project will target for local hiring, skill development programs and gender action plans to support concerted efforts to encourage women to develop talents in diverse roles and fulfilling jobs across the construction industry. Furthermore, community advisory boards, workshops and training courses will be considered and implemented. In alignment with the AfDB's ISS OS 7 (Vulnerable Groups), the project will enhance opportunities for vulnerable groups, including women and marginalized communities, to participate in and benefit from the development process.

While land acquisition and compensation will be managed by the Government, the monitoring program will be considered to ensure a fair and transparent process. The project will consider a complementary and supportive role to ensure that process will align

[20] Ledec G. and Posas P. "Biodiversity Conservation in Road Projects", Transportation Research Record, Paper No. LVR8-1154

[21] ITA Ghana: URL: https://www.trade.gov/country-commercial-guides/ghana-construction-and-infrastructure-industry

[22] ALIGN Ghana: URL: https://www.alignplatform.org/resources/women-work-engaging-young-women-construction-ghana

with AfDB's ISS and JICA Environmental and Social Considerations Guidelines.

The project will actively promote gender equality especially in operation phase. The diverse job opportunities will be considered for women including technical supervisory not just traditional administrative and clerical positions. In doing so, specific quotas, gender-sensitive recruitment, flexible work policies, technical training, capacity building workshops, inclusive procurement to support women-owned businesses gender sensitive workplace policies as highlighted in AfDB Gender Strategy and JICA Environmental and Social Considerations 1.1. (Policy). These initiatives will address systematic barriers and align with SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities), fostering equitable labor force participation and socio-economic development.

The Apemenyim-Daboase road project demonstrates a strong commitment to sustainability by aligning with key frameworks such as EU Taxonomy, AfDB ISS and JICA Environmental and Social Guidelines, and SDGs. Through its comprehensive approach, the project integrates climate mitigation and adaptation strategies, promotes resource efficiency, and circular economy principles, prioritizes pollution control and biodiversity preservation, and ensures community engagement and inclusive development. By adhering to these standards, the project not only enhances its long-term resilience but also contributes to global sustainability goals while addressing local, social and economic and environmental priorities.

12.5 SDGs Impact Interlinkages of the Project

The objective of this section is to present an analysis of how the Project aligns with the United Nations Agenda 2030 Sustainable Development Goals (SDGs) overall for Ghana, beyond just the transportation sector, considering its impacts on multiple SDGs. Although it is a road sector Integrated PPP project, the following analysis describes how the Project contributes to key sustainable development agendas, addressing critical challenges for Ghana, such as poverty reduction, economic growth, infrastructure development, education, gender equality, and environmental sustainability.

Source: UN.org for SDGs logos and icons

Figure 12-2. Agenda 2030 – Sustainable Development Goals

(3) Identification of SDGs Impacted by the Project

The Project impacts multiple SDGs that are relevant at national and sub-national level both to Ghana. However, due to reasons related to availability and authenticity of data, this analysis is limited to national level for Ghana, with data sourced from "The UN Sustainable Development Report 2024 by Sustainable Development Solutions Network. The directly linked SDGs attributed to this Project include:

SDG 1 (No Poverty): The Project's potential to create jobs and promote inclusive growth will contribute to poverty reduction through direct and indirect job creation, improved infrastructure, and enhanced economic activities which aligns with the Ghana's national ambition and global commitment to eradicate poverty by year 2030. As of now, Ghana's poverty rate, taken as the headcount ratio of population living under less 2.15 USD/day (326 JPY) (33 GHS) is at 17.87% in 2024.

SDG 8 (Decent Work and Economic Growth): The Project supports broader regional infrastructure goals, enhancing connectivity and fostering economic development across West Africa. By improving transportation networks, the project contributes to sustainable economic growth, driving infrastructure development, creating jobs, and increasing productivity. The construction of the project will not only create opportunities for local labor but will also generate employment for industries related to road construction, such as materials suppliers, transportation and equipment providers. The maintenance of road infrastructure is also expected to employ numerous skilled and unskilled laborers, directly contributing to employment opportunities. Currently, unemployment of Ghana's labor force is at 3.57% and the country's GDP growth is projected to be 2.8% according to the IMF.

SDG 9 (Industry, Innovation, and Infrastructure): As a critical infrastructure initiative, the project supports broader infrastructure goals, enhancing connectivity and economic development across West Africa. The Project strengthens transportation networks, which in turn supports industrial development, fosters innovation and improves market access. By improving transportation and industrial infrastructure, the Project addresses much needed improvements in Ghana's low infrastructure development score of just 2.4% in 2023 on a scale of 1 to 5 (1=worst and 5=best). Technological innovations expected from this Project during development and operations phase are also expected to support Ghana's overall achievements under this SDG.

(4) Interlinkages of the Project to Specific SDGs Targets

Beyond the transportation sector, the Project has implications across multiple SDGs, supporting economic development, gender equality, climate action, and institutional reforms. The global relevance of these impacts enhances the significance of the Project beyond Ghana.

① Social Impact Linkages

- For **SDG 1 (Poverty Alleviation),** the Project is expected to generate significant employment opportunities, contributing to poverty alleviation. With a poverty rate of 17.8%, the Project's large-scale infrastructure investments could drive economic inclusion and sustainable livelihoods for local communities.

- Under **SDG-4 (Education)**, improved transport infrastructure has a direct impact on access of youth to schools and higher education institutions. Presently, Ghana's lower secondary education completion rate was at 74% in 2019, and its literacy rate stood at

93% in 2020. The Project also offers opportunities for the upskilling of existing labor force employed during its development and operational phases.

- For **SDG-5 (Gender Equality)** and **SDG 10 (Reduced Inequalities),** enhanced transport infrastructure also promotes gender equality and inclusivity through access and choices of employment and educational opportunities for marginalized groups, especially women. At present, the ratio of female-to-male labor force participation rate in Ghana is 90, and the ratio of female-to-male years of education received was 72 in the year 2022. This is expected to be positively impacted by the Project by narrowing the abovementioned gaps for the beneficiary population around the Project.

② Economic Impact Linkages

- Under **SDG-8 (Economic Growth)** and **SDG-9 (Industrialization)**, the Project, has direct alignment through direct job creation and enhanced transport infrastructure. It will support innovation, by improving industrial capacity and transportation networks in Ghana by faster carriage of goods and services, boosting trade and commerce. This will lead to increased economic activities and growth. Furthermore, reliable infrastructure is a key factor for attracting both domestic and foreign investments, which could further stimulate economic growth and job creation.

- For **SDG 11 (Sustainable Cities & Communities)**, the Project's role in sustainable urbanization aligns with SDG targets of making cities inclusive, safe, and resilient. In 2020, Ghana stood at 52% for the proportion of population with access to public transport in cities. The improvements envisaged under this Project will support GoG's ambition to provide better access to public transport in the target location.

③ Environmental Impact Linkages

- Under **SDG 12 (Sustainable Production)** and **SDG-13 (Climate Action),** with the strong experience and capabilities of international partners supporting the Project, the application of modern techniques are expected for the Project, aligned with SDG targets for promoting sustainable production and consumption patterns. The waste management and construction components are expected to be aligned with sustainable practices, reducing resource depletion and environmental impact. The detailed environmental impact assessment and mitigation measures outlined in this report further support the Project's emphasis on reducing environmental impact of the Project as much as possible, while fulfilling the critical need of improvements in infrastructure for Ghana. Climate change mitigation efforts, particularly through low-carbon transportation systems, often require improved transport infrastructure, which will be supported through outcomes of this Project.

④ Global Partnerships for the SDGs (SDG 17)

- As a PPP, the Project has been designed to encourage and utilize institutional, technical and financial partnerships across sectors and borders, contributing to SDG 17's goal of strengthening global cooperation for sustainable development. The integration of international investments and local partnerships for the Project ensures a broad-based approach to achieving the SDG targets for Ghana. The Project is also expected to enhance PPP capacity strengthening of the relevant institutions of Ghana by fostering cooperation among local and global stakeholders, ensuring adherence to high standards of PPP project development and administration.

13.Stakeholder Analysis

Undisclosed due to confidential business information

13.1 Stakeholder categories and analysis

Undisclosed due to confidential business information

Table 13-1. Stakeholder categories and analysis

Undisclosed due to confidential business information

13.2 Engagement strategy

Undisclosed due to confidential business information

13.3 Engagement with ALCoMA

Undisclosed due to confidential business information

Table 13-2. List of stakeholder meetings

Undisclosed due to confidential business information

14.Project Implementation Plan

14.1 Institutional considerations

Undisclosed due to confidential business information

14.2 Procurement plan

Undisclosed due to confidential business information

14.3 Implementation plan

Undisclosed due to confidential business information

Table 14-1. Implementation schedule

Undisclosed due to confidential business information

15.Conclusion

Undisclosed due to confidential business information

Annex 1: Statements of information verification and sign-off

Undisclosed due to confidential business information

Annex 2: Financial and Economic Model

2.1 Financial Model

Undisclosed due to confidential business information

2.2 Economic Model

Undisclosed due to confidential business information

Annex 3: Risk Assessment and Comprehensive Risk Matrix

Undisclosed due to confidential business information

Annex 4: Document List

1. Feasibility Study Report (Undisclosed and Disclosed Versions)
2. Statement of information verification and sign-off from advisors
3. Financial and economic models
4. Annexes 1 to 6

Annex 5: Market Testing Feedback

Undisclosed due to confidential business information

5.1 Survey Method

Undisclosed due to confidential business information

5.2 Survey Sheet

Undisclosed due to confidential business information

Annex 6: Other Relevant References and Documents

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6.4 Wearing Calculations

Undisclosed due to confidential business information

6.5 Side Drain Calculations

Undisclosed due to confidential business information

6.6 Culvert Calculations

Undisclosed due to confidential business information

6.7 Detailed Design Drawings

Undisclosed due to confidential business information

6.8 Minutes of the Meeting

Undisclosed due to confidential business information